

MetroWest+

Portishead Branch Line (MetroWest Phase 1)

TR040011

Applicant: North Somerset District Council 6.26 Surface Water Drainage Strategy for Portishead and Pill Stations, Haul Roads and Compounds The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, Regulation 5 (2)(a) Planning Act 2008

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The original submission version of this document can be found in Appendix 17.1 of the ES. The document contained within the ES will not be updated. However, this standalone version of this document may be updated and the latest version will be the final document for the purposes of the Order.

Notice

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Document history

Project	Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme					
Planning Inspectorate Scheme Reference	TR040011					
Volume and Application Document Reference	6, 6.26					
Document title	Surface Water Drainage Strategy for Portishead and Pill Stations, Haul Roads and Compounds					
Regulation Number	Regulation 5(2)(a)					
Applicant	North Somerset District Council					
Lead Author	DB at CH2M					

Version	Date	Status of Version
Rev: 01	08/11/19	Application Issue

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1. Introduction

- 1.1 The four West of England authorities North Somerset Council ("NSC"), Bristol City Council ("BCC"), Bath and North-East Somerset Council ("B&NES"), and South Gloucestershire Council ("SGC") are jointly promoting a programme of rail enhancement projects known as MetroWest. The MetroWest programme includes MetroWest Phase 1, MetroWest Phase 2 and smaller projects such as specific new/re-opened stations. MetroWest Phase 1 is being led by NSC on behalf of the four councils as a third party rail project working with Network Rail Infrastructure Limited ("NRIL"). MetroWest Phase 1 involves providing a new train service between Portishead, Pill and Bristol Temple Meads, an upgraded train service for the Bristol to Avonmouth and Severn Beach line, and local stations between Bristol and Bath
- 1.2 The scope of this drainage strategy is to outline the drainage design works for the MetroWest scheme development sites as detail below:
 - Pill station carpark and drop-off area
 - Portishead station carparks and associate roads
 - Construction compounds:
 - Haul roads (temporary compound)
 - East of Portishead Station (temporary compound)
 - C15 Sheepway (permanent and temporary compounds)
 - C14 The Portbury Hundred (temporary compound)
 - C13 Lodway Farm (temporary compound)
 - C9 Ham Green (permanent and temporary compounds)
 - C4 Clanage Road (permanent and temporary compounds)
- 1.3 The design approach sets out the rationale behind the development of the surface water drainage strategy.
- 1.4 The selection and application of SuDS solutions has also been determined with respect to the confines and nature of the proposed development.

2. General Approach

2.1 In developing this drainage design, a number of assumptions have been made to reflect the design development stage at the time of writing. For the construction stage, a conservative approach has been taken. This assumes that any contractor would surface all the construction compounds such that they would be considered impermeable. It is recognised that this may well not be the case with a wide range of options available to contractors which offer more porous surfaces, and that not all the construction areas would be surfaced. Nevertheless, the adoption of this worst-case scenario does mean that generally, the maximum requirements are presented and that actual drainage proposals by contractors are likely to have less in the way of drainage requirements during construction.

3. Design Criteria

3.1 The design criteria used, detailed in table 1 below, are according to North Somerset Council's (NSCs) requirements for a design life of 60 years for the drainage system in the permanent development sites and for a design life of 1-2 years for the temporary development sites.

	Design return period	Exceedance flows return period	Climate change allowance
Permanent development sites	1:30	1:100	40%
Temporary development sites	1:30	1:100	10%
		11 1	

Table 1. Design criteria

3.2 Maximum discharge rates:

- For green-field sites: green-field peak rate or max. of 2.5 l/s
- For pre-developed sites: green-field peak rate or min. of 2.5 l/s if attenuation is possible, otherwise a reduction of 30% for the existing discharge rate.
- For Pill Station and Portishead Station- based on the Concept Drainage, attached on Appendix G.
- 3.3 Table 2 shows the parameters considered for the greenfield discharge rate calculations. The whole scheme falls within hydrological region no. 8.

Site	SAAR (Standard Average Annual Rainfall) (mm)	SPR (Standard Percentage Runoff)
Portishead Station	889	0.15
Pill Station	882	0.4
Haul Roads	827	0.37
Compound east of Portishead Station	894	0.15
C-15 Sheepway Compound	827	0.37
C-14 Portbury Hundred Compound	841	0.37
C-9 Ham Green Compound	839	0.47
C-13 Lodway Farm Compound	841	0.37
C-4 Clanage Road Compound	836	0.15

Table 2. Parameters for greenfield discharge rate

4. Exceedance flows

- 4.1 Exceedance flows would normally be expected to inundate the drainage system and therefore the design approach was to convey and store exceedance volumes above ground until there is sufficient capacity within the drainage system to accept inflows again (i.e. after the storm event has passed).
- 4.2 The management of exceedance flows is an integral part of the overall site design and as such, will be allowed for in the drainage design.
- 4.3 Exceedance routes up to the 1 in 100-year rainfall event, with an allowance for climate change have been included at the drainage strategy and demonstrate that any exceedance flow will be managed within the site extents.

5. Design Approach

- 5.1 In accordance with the National Planning Policy Framework and the relevant planning practice guidance¹, surface water runoff will be managed as close to where it falls as possible to mimic natural drainage. North Somerset Sustainable Drainage Developer Guide² (NSSDDG) also states that treating the runoff at source is important and their preferred option is to treat and convey the runoff on the surface.
- 5.2 NSSDDG indicates where infiltration SuDS can be potentially used within the authority's area. The guidance recommends that where soils may be slow draining, have a shallow water table, are located on floodplain deposits, or have some combination of these characteristics, infiltration is not recommended. In this case the preferred storage forms are: ponds, porous pavement layer with impermeable membrane or wetlands. Based on the NSSDDG maps, the proposed development areas in Portishead Station and Haul road have significant constraints for infiltration SuDS since they're located within flood zones 2 or 3.
- 5.3 Consequently, infiltration is not recommended in the proposed development areas. Instead, a combination of traditional drainage and SuDS including bioretention areas, permeable pavement, detention basins, filter drain and swales, are promoted to ensure pollutants in surface water flows are minimised and exceedance flow paths are managed.
- 5.4 The drainage provisions promoted to support the development sites (Portishead Station, Pill Station, haul roads and the compounds) are detailed in Section 5, and on the associated drawings presented in Appendix B, C, D, and E.

¹ Planning Practice Guidance: [https://www.gov.uk/government/collections/planning-practice-guidance] ² North Somerset Sustainable Drainage Developer Guide: [http://www.n-somerset.gov.uk/wpcontent/uploads/2015/12/sustainable-drainage-developer-guide.pdf]

5.5 Surface water drainage calculations have been undertaken using MicroDrainage WinDES software. The calculations establish the type and sizing of drainage assets promoted to manage the surface water runoff. These calculations are presented within Appendices B, C, D and E for each development area respectively.

6. Development sites

6.1 **Portishead Station**

6.1.1 The proposed drainage for the carparks and highways work at Portishead Station have been analysed on a catchment basis. Four catchments have been identified as shown on drawing 467470.BQ.04.20-DS-Portishead of Appendix B.

6.2 Catchment A.1

- 6.2.1 Catchment A.1 lies to the northwest of the proposed development including the proposed car park and footpaths. The area is currently part of the former railway line and scrub area.
- 6.2.2 Specifically, the development area will discharge to the watercourse to the north west of the site. This watercourse is a main river, Portbury Ditch, under the EA jurisdiction. The EA has verbally advised that the discharge rate into the ditch shall be set by NSC flood authority. North Somerset Levels IDB has confirmed that all the impermeable areas including the parking should be discharged at greenfield rates and volumes or 2.5l/s as the minimum practicable (refer to Appendix A).
- 6.2.3 As described in section 4 of this document, infiltration is not considered to be a viable option for this area and thus it is proposed to collect the runoff water through permeable pavement (concrete block paviours) in the southern parking bays (aisles to remain asphalt), with a 300 mm deep clean stone reservoir layer which extends beneath the adjacent footpath.
- 6.2.4 The runoff will be attenuated within the 300mm depth of clean stone reservoir layer which will also provide treatment as the water flows through the stone and the geotextile membrane. The water will then be conveyed in a linear swale with check dams spaced every 54m (that include an orifice at the invert level of the swale) which will provide storage and attenuation. The connection between the reservoir layer and the swale will be made by a 100mm pipe. The discharge to Portbury Ditch is designed to be limited to 2.5l/s by flow control at the chamber downstream the swale outlet.
- 6.2.5 For further details, refer to DRG. 467470.BQ.04.20-DS-Portishead in Appendix B.
- 6.2.6 The suggested dimensions of the swale can be found in Table 3:3 below.

Swale	Approx. length (m)	Depth (m)	Base width (m)	Side Slope (1:x)	Top width (m)	Greenfield runoff (l/s) for 1in30 yr	Admissible peak flow (I/s) for 1in30 yr
1	275	0.450	1	4	4.6	0.6	2.5

6.2.7 The analysis of water levels, in vicinity of the proposed Portbury Ditch outfall, for 25 year and 50 year climate change (assumed to be 20%) scenarios are 4.85m and 7.05m respectively. For a 1 in 30 year event this has been interpolated as 5.29m (refer to Appendix A). A capacity check with Microdrainage software has been undertaken and confirms that both the swale and the permeable pavement are suitable for this tide lock level of 5.29m for a 1 in 30 year including an allowance of 40% climate change.

Exceedance flows

6.2.8 Exceedance flow, based on 1:100 return period plus 40% allowance for climate change, is designed to be managed within the footprint of the carpark, to allow the water level to rise from the drainage system up to 16mm above surface at the lowest points of the carpark. The total flooded volume for the 100yr return period is 177m³. The southern swale top embankment should be raised by 100mm above the footpath level to contain exceedance volumes within the carpark.

Further work

- 6.2.9 The existing ditch should be surveyed (connectivity and levels) to investigate connection for discharging.
- 6.2.10 The Environment Agency should be contacted to agree discharge point.

6.3 Catchment A.2

- 6.3.1 Catchment A.2 lies to the north of the proposed Portishead railway station and includes the diversion of an existing road and roundabout. The diverted road and new roundabout will tie into Harbour Road to the west and Phoenix Road to the east of the existing roundabout.
- 6.3.2 There is an existing surface water drainage network in this catchment area, which is identified on Wessex Water services plan as a highway drain. The existing highway runoff discharges via 225mm pipe into 'The Cut' watercourse on the north-east of the area (shown on the Appendix B drawings as the proposed discharge point). This approach is based on the Concept Drainage Report attached in Appendix G.
- 6.3.3 For determining the discharge flow rate from this catchment, an assessment has been carried out to calculate the existing discharge rate for the pre-development site (impermeable catchment of 3,130 m²). A MicroDrainage model was created for this purpose to simulate the existing drainage system, based on the assumption that the existing drainage system was designed for no-surcharge during 1:1 year rain event with no climate change allowance (See Calculations at

Appendix B). The model results showing existing peak flow of 65 l/s for 1:30 return period. As recommended in the North Somerset Sustainable Drainage Developer Guide, a reduction of 30% has been applied to restrict the proposed drainage discharge to 45.5 l/s.

- 6.3.4 It is proposed that the road area will fall into three bio-retention areas, where the runoff water will settle and infiltrate into porous layer which will outfall to proposed drainage pipe. This system will include an overflow set to 150 mm below road level. For the areas where draining into the bio-retention areas is not viable, trapped-gullies are proposed to collect the run-off discharging into the proposed sewer. For attenuation, off-line storage of 9 m³ and 22.5 m³ are proposed to be located beneath the bio-retention areas. The proposed drainage pipeline of 225mm diameter will convey the runoff from the bio-retention areas along Phoenix Way to discharge into the existing watercourse, as shown in Drawing 467470.BQ.04.20-DS-Portishead on Appendix B.
- 6.3.5 For limiting the outfall flow rate, an orifice flow control is proposed before the discharge point.
- 6.3.6 The proposed runoff will be treated by a combination of filtration through the bioretention areas (vegetation, soil and filter material), or in other locations by trapped-gullies and a subsequent bypass oil separator before discharge.

Exceedance flows

6.3.7 The proposed drainage system will surcharge during 1:100 years rain event without flooding to the highway.

Further work

- 6.3.8 During detailed design, survey should be included to assess the capacity of the existing drainage highway network, to include the existing discharge structure.
- 6.3.9 As depth of the drainage system might be limited due to tide-lock level of 5.29m, alternatives of slot-drain or beany blocks should be considered during detailed design to replace the drain sewer at the upstream of the system.

6.4 Catchment A.3

- 6.4.1 Catchment A.3 lies to the south of the proposed railway station and includes a new road and footways that tie into Quays Avenue. The impermeable area for this catchment is 2,918m².
- 6.4.2 There are no available Wessex Water sewer records of an existing surface water drainage network on Quays Avenue, other than gullies. Therefore, it is assumed that a highway pipe network is present. The existing impermeable area for this catchment is 2,166m².
- 6.4.3 For determining the discharge flow rate from this catchment, an assessment has been carried out to calculate the existing discharge rate for the pre-development.

A MicroDrainage model was created for this purpose to simulate the existing drainage system, based on the assumption that the existing drainage system was designed for no-surcharge during 1:1 year rain event with no climate change allowance (See Calculations at Appendix B). The model results showing existing peak flow of 52 l/s for 1:30 return period. As recommended in the North Somerset Sustainable Drainage Developer Guide, a reduction of 30% has been applied to restrict the proposed drainage discharge to 35 l/s.

- 6.4.4 An option is that the highway runoff would be captured by a dry swale on the west side of the highway as shown in Drawing 467470.BQ.04.20-DS-Portishead. The carriageway would be profiled to drain to the west side of the catchment into the proposed swale with filter drain.
- 6.4.5 An alternative would be to capture the highway run-off to the east and into the open space to the south of the station building.
- 6.4.6 Site constraints would mean this catchment would be drained through a mix of filter drain and swale. On the west side for example, between the proposed bus stop and the catchment boundary, the upper part of the catchment will need to be drained by a filter drain as there is not enough room to accommodate a swale. On the east side the area available for a swale is constrained by the footpath at the junction at Galingale Way needing a pipe connection into the existing highway drainage.
- 6.4.7 The filter drains would be generally 1.5m deep by 1.5m wide and incorporates a 225mm perforated pipe to convey the runoff. Where sufficient space is available, a dry swale would be proposed. The swale slopes would be set to 1 in 4 as recommended in the SuDS Manual to prevent erosion channelling from lateral inflows, thus giving a swale of generally 0.35m deep. The width and depth would vary depending in the space available. The swale would be the fall of the proposed highway with a longitudinal gradient ranging from 1 in 50 at the top to 1 in 80 at the end.
- 6.4.8 The swale would be a lined under-drained swale, which will allow the infiltration of the runoff into the filter trench beneath the base during the more frequently occurring storms to provide treatment of the most contaminated runoff. The swales sides and infiltration trench would be lined with an impermeable membrane to ensure that flows are treated before discharge and not infiltrated directly to the ground.
- 6.4.9 Check dams are promoted along the swale to restrict peak flows and enhance infiltration to the filter trenches. The check dams would be spaced every 20m and set at 0.15m below the top level of the swale to keep a reasonable freeboard.
- 6.4.10 The swale would discharge into the existing drainage network on Quays Road. A flow control system will be included in the most downstream chamber to restrict flows at 35l/s as calculated before.

Exceedance flows

6.4.11 Exceedance flow, based on 1:100 return period plus 40% allowance for climate change, is designed to be managed within the footprint of the dry swale and the adjacent footpath without affecting the proposed highway. The hydraulic model showed that the total flooded volume is 14m³. The flooded volume will exceed the system from the downstream end and will be temporally stored on the surface of the system and the adjacent footpath until the drainage system has enough capacity to deal with those flows.

Further work

6.4.12 Existing manholes and drainage system to be surveyed (CCTV, connectivity and levels) to investigate connection for discharging.

6.4.13 Assess the capacity of the existing highway drainage network.

6.5 Catchment A.4

- 6.5.1 This catchment is located at the north east of the development area and includes the station car parking and hardstanding by the Portishead station. The site's impermeable area is 3,689 m².
- 6.5.2 Runoff will be collected via linear drainage channels, which will feed into a shallow (300mm deep) geocelullar crate system located beneath the parking bays. The runoff will be treated in several steps as it passes through the drainage network as set out below;
 - 1. Runoff passes into the Permachannel unit which traps silt and coarse particles.
 - 2. Runoff leaves the Permachannel by a diffuser unit which provide a further filtration of oils.
 - Runoff then reaches the first geocellular crate which is fitted with a 'Biomat'. The Biomat geotextile traps oils and other hydrocarbon based floatable contaminants and biodegrades these.
 - 4. Runoff will then leave the Permavoid geocellular crates by an orifice plate flow control before discharging into a watercourse.
- 6.5.3 The run-off discharge from the car-park will be restricted to max flow rate of 2.5 l/s as there is enough room available to attenuate flows at greenfield runoff peaks or a minimum practicable of 2.5l/s.
- 6.5.4 Proposed discharge point is to the proposed highways drainage system for Catchment A.2, which outfalls into 'The Cut' watercourse to the north east of the compound as shown in drawing no. 467470.BQ.04.20-DS-Portishead in Appendix B.
- 6.5.5 For modelling purposes, the car-park has been divided into three sub-catchments therefore, three sets of calculations are attached in Appendix B.

Exceedance flows

6.5.6 Exceedance flow, based on 1:100 return period plus 40% allowance for climate change, is designed to be managed within the footprint of the carpark, to allow the water level to raise from the Geo-cellular storage and up to 3-11 mm above surface at the lowest points of the carpark. This volume of water is designed to be held by the pavement kerbs. During an exceedance event, the discharge flow rate can reach a peak of 4 l/s for a duration of 500 minutes.

Further work

6.5.7 During detailed design, the existing drainage system should be surveyed (CCTV, connectivity and levels) to assess the capacity and consider discharging to it.

6.6 Pill Station Carpark

- 6.6.1 Pill station carpark is located between the railway line, Monmouth Close and Avon Road. The catchment area of the carpark is 1,488 m².
- 6.6.2 Surface water runoff from the car park up to the 30 year return period plus a 40% allowance for climate change will be collected through permeable pavement (concrete block paviours) in the parking bays (aisles to remain asphalt), with a clean stone reservoir beneath (this does not extend beyond the parking bays). The runoff will be attenuated within 330mm depth of clean stone (reservoir layer) which will also provide treatment as the water flows through the stone and the geotextile membrane. The reservoir layer will outfall through an orifice flow control limited to 5 l/s (based on the Concept Drainage Design Report Rev 01 from January 2017 refer to Appendix G).
- 6.6.3 The proposed discharge from the reservoir layer will connect into the existing highway drainage system on Avon Road.
- 6.6.4 The drop-off area located at Station Road is proposed to be drained in a similar approach with permeable pavement and reservoir layer beneath the three disabled parking spaces. Discharge will be into the existing highway drainage on Station Road.

Exceedance flows

6.6.5 Exceedance flows, based on 1:100 year return period plus 40% allowance for climate change, are designed to be managed within the footprint of the carpark. During an exceedance event, water level will surcharge the subbase pavement layer but it will emerge on the carpark surface. The discharge will reach a peak of 5.2 l/s for a duration of 100 minutes.

Further work

6.6.6 Existing manholes and drainage system in Avon Road and Station Road to be surveyed (CCTV, connectivity and levels).

6.7 Haul roads

- 6.7.1 Surface water runoff from haul roads up to the 30 year return period plus a 10% allowance for climate change will be captured by ditches, with no exceedance flows occurring up to 100 year return period. In case of blockage, exceedance will be temporarily stored on the surface of the haul roads until sufficient capacity is available within the drainage network.
- 6.7.2 The temporary haul roads will lie alongside the railway for 1,290m between Portishead and Portbury Hundred construction compound. The haul roads will be approximately 8m wide and the running surface is assumed to be constructed of a Clause 803 (SHW) Type 1 sub-base. Although this granular material is not totally impermeable, the catchment areas of the haul roads have been assumed to be 100% impermeable for the calculations.
- 6.7.3 Check dams will be promoted along the proposed ditches to capture sediment and minimise contaminated runoff being discharged to downstream watercourses. The accumulated silt will need to be removed and disposed of periodically. The spacing of check dams will depend on the longitudinal slope of the ditches which is still uncertain due to the absence of proposed ground model. The calculations to size the ditches have assumed a relatively flat gradient of 1 in 400 for all the ditches draining the haul roads. The design will need to be checked to confirm that it is adequate when the proposed ground levels are available.
- 6.7.4 It is recommended to undertake a survey of the conditions and capacity in the receiving watercourses prior to works commencing onsite and on completion in order to confirm there is no larger silt deposits due to the works.
- 6.7.5 Discharge from the ditches need to be attenuated at greenfield runoff rates or 2.5l/s as the minimum practicable. Vortex flow controls (VFCs) or other types of flow control will be used to achieve the discharge requirements. As runoff peaks are going to be attenuated at greenfield rates, the removal of contaminants through settling and adsorption will be enhanced.
- 6.7.6 The haul roads will cross existing drainage ditches that will need to be culverted during the duration of the works and subsequently reinstated on completion. A hydraulic assessment should be carried out to estimate the culvert diameter with the minimum requirement being 750mm diameter.
- 6.7.7 The suggested dimensions of the ditches can be found in Table 4: and the alignment and discharge points are presented in Drawing 467470.BQ.04.20-DS-Haulroads in Appendix D.

Ditch	Approx. length (m)	Depth (m)	Base width (m)	Side Slope (1:x)	Top width (m)	Greenfield runoff (l/s) for 1 in 30 yr	Permissible peak flow (l/s) for 1 in 30 yr
D1	376	0.8	0.8	1	2.4	2.2	2.5
D2	297	0.8	0.7	1	2.3	2	2.5
D3	187	0.7	0.5	1	1.9	1.2	2.5
D4	343	0.9	0.5	1	2.3	2	2.5
D5	87	0.6	0.5	1	1.7	0.7	2.5
D6	297	0.8	0.7	1	2.3	2	2.5

Table 4: Dimensions of the proposed ditches for Haul roads

6.7.8 During detail design, if there is not enough room to accommodate the proposed ditches alongside the haul roads, shallower and narrower ditches could be promoted, with attenuation taking place in detention basins before the discharge to the receiving watercourses, subject to sufficient space being available at the discharge points to accommodate the basins. Runoff from the haul roads will be conveyed by the ditches and piped to the detention basins. The discharge from the basins would be restricted by flow controls. The suggested dimensions of the ditches and detention basins can be found in Table 5 and Table 6 below.

	Approx. length Depth (m) (m)		Base width (m)	Side Slope (1:x)	Top width (m)	Pipe outlet (mm)
D1 and D2	673	0.4	0.5	1	1.3	300
D3, D4, D5 and D6	617	0.4	0.5	1	1.3	Twin 300

Basin	Approx. base area (m²)	Approx. base area (m²)	Volume available (m³)	Depth (m)	Side Slope (1:x)	Greenfield runoff (l/s) for 1 in 30 yr
D1 and D2	201	452	326.5	1	4	4.3
D3, D4, D5 and D6	361	680	512.2	1	4	5

Table 5 : Dimensions of the alternative proposed haul roads ditches

Table 6 : Dimensions of the proposed detention basins for alternative haul roads ditches

6.7.9 There is an option to connect the runoff from the Haul roads to the adjacent track drainage, subject to Network Rail consent, rather than constructing a new drainage system. At this scenario, the proposed ditches (No.1 - 6) will not be required. In addition it is like that the surfaced width of the haul road would be reduced.

6.8 Temporary Construction Compounds

6.8.1 Introduction

- 6.8.1.1 This section includes the drainage strategy for the construction compounds. The compounds listed below are not included in the scope of this report:
 - Compound to the north of Portishead station (refer to sheet 1 of Appendix H). For this area, it is assumed the car park would be implemented and used as a compound with its drainage design as described above (refer to Drawing 467470.BQ.04.20-DS-Portishead of Appendix B).
 - M5 compound (refer to sheet 6 of Appendix H). This area is already a hardstanding area.
 - Compound located between Lodway Farm compound and Pill station car park (the garages by Avon Bridge, refer to sheet 7 of Appendix H). This area is an existing highway.
 - Small compound located to the south-east of Pill station car park, next to Station Road (refer to sheet 8 of Appendix H). Only the design of the drainage of the car park will be undertaken (refer to Drawing 467470.BQ.04.20-DS-Portishead of Appendix B).
 - Small compound located to the west of Watch House Road (refer to sheet 8 of Appendix H). This area was already developed.
 - Compound to the west of Winterstoke Road (refer to sheet 19 of Appendix H). This area is an existing car park.

6.8.2 Compound located to the east of Portishead Station

- 6.8.2.1 The compound to the east of Portishead Station is a temporary site for the construction of Trinity footbridge that will cross over the railway. The compound has an approximate proposed footprint of 0.106 ha. The surface material for the hardstanding of the temporary compound is assumed to be type 1 aggregate.
- 6.8.2.2 It is assumed that the terrain will fall from south-west to north-east. Surface water runoff from this compound up the 30 year return period plus an allowance for climate change of 10% (since this compound is temporary) will be captured by a filter drain installed along in the southern edge of the compound and then then discharge into the Cut at the greenfield runoff rate of 2.5l/s (minimum practicable).
- 6.8.2.3 The suggested dimensions of the filter drains can be found in Table 7 and the alignment and discharge points are presented in Drawing 467470.BQ.04.20-DS-East_of_Portishead in Appendix E.

Approx. length (m)	gth Depth Width (m) (m)		Pipe diameter (mm)	No. of pipes at the bottom of the trench
150	1.4	0.45	150	1

Table	7:	Filter	drains	for	compound	l to	the	east	of	Portishead	Station

- 6.8.2.4 The calculations to size the filter drain assumed a gradient of 1 in 200. The design will need to be checked to confirm that it is adequate when the proposed ground levels are available.
- 6.8.2.5 For pollution control purposes, the filter drain provides water treatment and sediment removal as runoff percolates through the granular material. Additionally, filter drains will be lined with a geotextile for further water treatment and to avoid infiltration of runoff into the ground. It is recommended that at the beginning of the run of the filter drain, a chamber with a grated gully is installed to allow for maintenance. It is recommended to install a bypass separator in case oil handling is proposed within this compound.

Exceedance flows

6.8.2.6 The construction of a bank surrounding the compound is proposed to control the exceedance flows. The proposed filter drain present flooding for the 1 in 100 year return period event (see Table 8):

Dusinana	Exceedance flood volume (m ³)				
Elements	30 year return period; 10% allowance for climate change	100 year return period; 10% allowance for climate change			
Filter drain	0	7.6			

Table 8: Exceedance flood volume

Exceedance routes are proposed to be located along the northern edge of the compound towards a green area located to the north-east of the compound. This area has a surface of 1512m².

6.8.3 C15 Sheepway Compound

- 6.8.3.1 Sheepway compound is located at the junction between the railway line and Sheepway Road. The site will include 0.042ha temporary compound and 0.065ha permanent compounds. The design of the compound includes green areas and hardstanding for parking and welfare facilities.
- 6.8.3.2 This compound will include a small amount of parking, welfare facilities and materials storage.

- 6.8.3.3 Only existing topographic data was available at present. The drainage system has been designed to drain from south to north and it should be checked when the proposed ground model is available.
- 6.8.3.4 Surface water runoff from the permanent area of the compound up to the 30-year return period plus 40% allowance for climate change will be captured by a french drain and discharge either to the Network Rail drainage system to the south or to an existing ditch to the west of the site as shown in Drawing 467470.BQ.04.20-DS-C15 in Appendix E. The discharge will occur at greenfield runoff rates or 2.5l/s as the minimum practicable.
- 6.8.3.5 The suggested dimensions of the French drain can be found in Table 9 and the alignment and discharge point are presented in Drawing 467470.BQ.04.20-DS-C15 in Appendix E.

-	Approx. length (m)	Depth (m)	Width (m)	Pipe diameter (mm)	No. of pipes at the bottom of the trench
_	113	1	0.7	150	1
Table	9: Dimensions	of the Frenc	h drain for the	e permanent area f	or Sheepwav Compo

- 6.8.3.6 Surface water runoff from the temporary area of the compound for the 30 year return period plus 10% allowance for climate change will be captured by filter drain and then conveyed by pipes to discharge into existing ditches at the greenfield runoff rate.
- 6.8.3.7 The suggested dimensions of the filter drain can be found in Table 10.

Approx. length (m)	Depth (m)	Width (m)	Pipe diameter (mm)	No. of pipes at the bottom of the trench
139	1	0.3	150	1

Table	10: Filter	drains	for the	temporary	area for	Sheepway	Compound
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- 6.8.3.8 The calculations to size the filter drains assumed a gradient of 1 in 400. The design will need to be checked to confirm that it is adequate when the proposed ground levels are available.
- 6.8.3.9 The proposed footpath shall be drained to the adjacent field. The area at the east side of the compound is recommended to be discharged to the track drainage.

Exceedance flows

6.8.3.10 For the permanent area, the French drain will flood for the 1 in 100 return period event but there is no flooding for the 1 in 30 return period. There is no flooding for the temporary area in either the 1 in 30 return period event or for the 1 in 100 return period event (see Table 11).

Drainage elements	Return Period (yr)	Climate Change (%)	Exceedance flood volume (m³)
French Drain	30	40	0
French Drain	100	40	4.2
Filter drain	30	10	0
Filter drain	100	10	0

Table 11: Exceedance flood volume for the temporary and permanent areas

- 6.8.3.11 Exceedance routes are proposed to be located at the northern side of the compound as shown in drawing 467470.BQ.04.20-DS-C15 in Appendix E.
- 6.8.3.12 During detailed design, there might be opportunities to propose flooded volumes to be managed within the compound site, once the layout of the compound has been designed.

Further recommendations

- 6.8.3.13 Historic borehole logs undertaken in the vicinity of the compound available in the BGS viewer were used to investigate the ground water flood risk. The highest ground water level encountered in the area was at 4.5m BGL. If during the construction ground water is found close to the surface (ie: 2m BGL), the drainage system will need to be revised to suit the ground water conditions.
- 6.8.3.14 Further consultation with the EA will be undertaken during the detailed design phase to check if compensatory flood storage is required.

6.8.4 C14 Portbury Hundred Compound

- 6.8.4.1 Portbury Hundred compound is located south of Sheepway, between the railway line and the A369 Portbury Hundred highway and to the west of the crossing of Station Road and the A369. It has a proposed footprint of 11.4 ha and the surface is assumed to be constructed of Type 1 aggregate. Although this granular material is not totally impermeable, for the scope of this report it has been assumed that it is completely impermeable for the calculations.
- 6.8.4.2 This construction compound could include a large amount of parking spaces for staff vehicles, storage of materials, offices and welfare facilities. The materials stored could be sleepers, drainage, troughing, energy recovery units for vegetation removal, spoil, ballast and track formation. Plant vehicles will circulate in the area, including dumpers, excavators, dozers and lorries.
- 6.8.4.3 No topographical data was available at present. Therefore, since the existing ditches SG1 and D4 are flowing from north to south, it was assumed the terrain is falling from north to south in this area.
- 6.8.4.4 With the aim of not posing any flood risk to the new railway and to the access track located in the southern edge of the compound, the proposed fall of the

ground will be towards the south-west and south-east, having a watershed along the axis of the access track up to the northern edge. In case of flooding, only the lower-western and lower-eastern corners of the compound would be affected, keeping the access track and the majority of the compound free of flooding.

- 6.8.4.5 The compound will be then divided into four sub-catchments: A and B and C and D (see drawing 467470.BQ.04.20-DS-C14 in Appendix E for reference).
- 6.8.4.6 Sub-catchments A and B would fall towards south-west, making the ditch in sub-catchment A and the pipe in sub-catchment B tend towards the south. C would fall towards the south-east, making the pipe in this area lean towards the south. D would fall towards the south, making the ditch in sub-catchment D falling towards the south-west, in order to convey the runoff towards the basin located in the southeast corner of sub-catchment C.
- 6.8.4.7 In the scenario set out below, surface water runoff from this compound up the 30-year return period plus an allowance for climate change of 10% (since this compound is temporary) could be captured by filter drains installed in each sub-catchment and then conveyed by ditches or pipes to two attenuation basins, which will then discharge into two existing ditches at the greenfield runoff rate. Obviously a contractor may wish to adopt a different approach.
- 6.8.4.8 The suggested dimensions of the filter drains can be found in Table 12: and the alignment and discharge points are presented in Drawing 467470.BQ.04.20-DS-C14 in Appendix E.

Approx. length (m)	Depth (m)	Width (m)	Pipe diameter (mm)	No. of pipes at the bottom of the trench
100	1.4	0.45	150	1

Table 12: Filter drains for Portbury Hundred Construction Compound

- 6.8.4.9 The calculations to size the filter drains assumed a gradient of 1 in 200. The design will need to be checked to confirm that it is adequate when the proposed compound ground levels are available.
- 6.8.4.10 For pollution control purposes, filter drains provide water treatment and sediment removal as runoff percolates through the granular material. Additionally, filter drains can be lined with a geotextile for further water treatment and to avoid infiltration of runoff into the ground. It is recommended that at the beginning of the run of each filter drain, a chamber with a grated gully is installed to allow for maintenance.
- 6.8.4.11 In the case of fuel and oil handling occurring, a separate drainage system will be installed including oil separator to treat flows. All fuel and oil storage tanks

would be installed within a bunded area with 110% storage volume of the tank available, should the tank be ruptured or a spill occur.

6.8.4.12 The results from the hydraulic modelling show that a filter drain with such dimensions is able to drain a contributing area of 0.27 ha. Considering this the number of filter drains necessary to drain each catchment are shown in Table 13:

Sub- catchment	No. of filter drains
А	13
В	13
С	10
D	8

Table 13: No. of filter drains needed in each sub-catchment.

6.8.4.13 In sub-catchments A and D, runoff conveyed by filter drains would be collected by two ditches flowing along the western and southern edges of the compound respectively. It is proposed that these ditches are grass-lined and that they include an impermeable lining. The proposed indicative dimensions for these ditches are the following:

Ditch	Approx. length (m)	Depth (m)	Base width (m)	Side Slope (1:x)	Top width (m)
Catchment A	386	1	1	3	7
Catchment D	230.5	1	1	3	7

Table 14: Dimensions of the proposed ditches for Portbury Hundred construction compound.

- 6.8.4.14 The calculations to size the ditches assumed a gradient of 1 in 500. The design will need to be checked to confirm that it is adequate when the proposed ground levels are available.
- 6.8.4.15 It is proposed to include check dams to be installed just upstream of each filter drains connection. This will provide attenuation of peak flows and pollution control, allowing for sediment settling. Also, it must be noted that the grass lining in the ditches provides water treatment as well.
- 6.8.4.16 In sub-catchments B and C, runoff conveyed by filter drains would need to be collected by two pipes flowing along the western and eastern edges of these catchments respectively. The proposed dimensions for these pipes are shown in Table 15:

Pipes	Approx. length of total run (m)	Longitudinal slope (1:x)	Pipe diameter (mm)
Catchment B	222	100	525

Pipes	Approx. length of total run (m)	Longitudinal slope (1:x)	Pipe diameter (mm)
Catchment D	144	100	525

Table 15: Dimension of the proposed pipes for Portbury Hundred construction compound.

- 6.8.4.17 The calculations to size these pipes assumed a gradient of 1 in 100. The design will need to be checked to confirm that it is adequate when the proposed ground levels for the compound area are available. Due to the large diameter of these pipes, they may have limited cover. If this is the case during detailed design, it is recommended to install protection to these pipes or prevent heavy loads being placed on them. Chambers will need to be included every 100m maximum for maintenance purposes.
- 6.8.4.18 Two attenuation basins would be constructed in this compound in this scenario: Basin 1 could be located in the south-western corner and Basin 2 could be located in the southern edge of the compound, close to the right boundary of sub-catchment C (see drawing 467470.BQ.04.20-DS-C14 in Appendix E for reference). Basin 1 is proposed to discharge into the existing ditch SG1, located to the west of the construction compound, while Basin 2 is proposed to discharge into existing ditch D4, which crosses the compound in its central part. Therefore, the portion of ditch D4 within Portbury Hundred Compound is proposed to be culverted. Discharge into the existing D4 culvert is subject to IDB consent (see Appendix A). The indicative dimensions for the basins are displayed in Table 16:

Basins	Depth (m)	Top area (m²)	Base area (m²)	Total volume available (m³)	Greenfield runoff (I/s) for 1 in 30 yr
Basin 1	1.5	2850	1968	3493	45.5
Basin 2	1.5	2000	1271	2433	31.6

Table 16: Dimensions of the proposed attenuation basins for Portbury Hundred compound.

6.8.4.19 Regarding pollution control, the detention basin would provide water treatment within a forebay that allows for sediment settling. The sedimentation forebay will be at least 10% of the total basin area as recommended in the SuDS Manual. In addition, it is recommended to install gabion baskets within the basins to provide additional sediment catching. If the compound is to be used to store ballast, it is recommended the installation of bypass separators at the outlets of both basins.

Variable impermeability scenarios

6.8.4.20 The dimensions of the proposed attenuation basins (Table 17) are indicative for the 1 in 30-year return period flood event and assuming that the site is 100% impermeable.

- 6.8.4.21 The maximum volume of the basins has also been calculated considering the 1 in 5 and the 1 in 10-year return period flooding for the two basins with 100% permeability.
- 6.8.4.22 Additionally, in order to test differing impermeability scenarios, the maximum volume of the basins has been calculated considering 75% and 50% impermeability for the two basins for the 1 in 30-year return period. Results are presented in Table 17 below.

Basins	ns Return Perme Period (yr) (%		Maximum Volume (m³)
Basin 1	30	100	2,623
Basin 1	5	100	1,746
Basin 1	10	100	2,043
Basin 1	30	75	1,902
Basin 1	30	50	1,218
Basin 2	30	100	1,816
Basin 2	5	100	1,203
Basin 2	10	100	1,410
Basin 2	30	75	1,313
Basin 2	30	50	836

Table 17: Basin's volumes for different return periods and permeabilities

Exceedance flows

- 6.8.4.23 The construction of a bank surrounding the compound is proposed to control the exceedance flows.
- 6.8.4.24 The filter drains and the ditch for sub-catchment D are the only elements of the drainage system that flood during the 1 in 100 return period event (see Table 18:).

Drainago	Exceedance flood volume (m ³)				
Elements 30 year return period; 10% allowance for climate change		100 year return period; 10% allowance for climate change			
Filter drain	0	7			
Ditch for catchment D	0	2.3			
Total flooded volume	0	308			

Table 18: Exceedance flood volume

6.8.4.25 It has to be noted that the exceedance flooded volume shown in Table 18: for filter drains corresponds to one filter drain. Considering all the filter drains to

be installed in this compound would give a total exceedance flooded volume of 308 m³.

- 6.8.4.26 Exceedance routes are proposed to be located in the south-western corner of sub-catchment A towards the green area located to the west of Portbury
 6.8.4.27 Hundred compound and in the southern edge of sub-catchment D towards a green area located between the compound and the A369 (see drawing 467470.BQ.04.20-DS-C14 in Appendix E for reference).
- 6.8.4.27 During detailed design, there might be opportunities to propose flooded volumes to be managed within the compound site, once the layout of the compound has been designed.

Further recommendations

- 68428 Historic boreholes logs undertaken in the vicinity of the compound available in the BGS viewer were used to investigate the groundwater flood risk. The highest level at which groundwater was encountered in the area was at 1.7 m bgl, which is the reason why all drainage is proposed to have a depth of 1.5 m or less. It must be noted that one of the boreholes available in the BGS viewer, undertaken to the south-east of the site, water was encountered at 2.13 m bgl after what it rose up to 0.91 m bgl. The SUDS Manual recommends investigating groundwater levels to ensure the base of the proposed drainage system is at least 1 m above the maximum anticipated groundwater level. Prior to construction it is therefore recommended that piezometers are installed to monitor groundwater levels over a 6 month period taking in April and May which are typically expected to be the peak for groundwater levels in the UK. If groundwater is encountered less than 1 m below the invert level of the proposed drainage system, the drainage design should take this into account and be amended accordingly.
- 6.8.4.29 Topographical survey is required in order to finalise the drainage system design, as described above, for the Portbury Hundred construction compound. If the existing ditches are found to be at a higher level than the proposed attenuation basins, the drainage proposals will need adjusting if feasible, or alternatively a pumping system may be required.
- 6.8.4.30 Further consultation with the EA will be undertaken during the detail design phase to check if compensatory flood storage will be required.

6.8.5 C13 Lodway Farm Compound

6.8.5.1 Lodway Farm compound is located adjacent to the M5, to the south of the railway line immediately North of Pill. It has a proposed footprint of 8.2 ha and the surface is assumed be constructed of Type 1 aggregate. Although this granular material is not totally impermeable, for the scope of this report it has been assumed that it is completely impermeable for the calculations. Within the compound there are archaeological and reptile areas and these

areas have been excluded from the drainage system of the compound. The total contributing area of this compound after the exclusion of these areas is 6.36ha.

- 6.8.5.2 This construction compound will include a medium amount of parking spaces for staff vehicles, storage of materials, offices and welfare facilities. The materials stored will be sleepers, drainage, troughing, energy recovery units for vegetation removal, spoil, ballast and track formation. Plant vehicles will circulate in the area, including dumpers, excavators, dozers and lorries, and a short section of temporary track may be constructed to allow trains onto the area for ballast removal and delivery.
- 6.8.5.3 Surface water runoff from this compound up the 30 year return period plus an allowance for climate change of 10% (since this compound is temporary) will be captured by filter drains in this scenario, and then conveyed by a runoff collector along the northern edge of the compound to an attenuation basin. This would will then discharge into an existing culvert to the north, subject to confirmation by Network Rail, at the greenfield runoff rate. The existing ground falls towards the railway and therefore the proposed location of the drainage collector is inevitable. The drainage collector would need to be of a sort which allows vehicles to pass over it onto the track works.
- 6.8.5.4 The suggested dimensions of the filter drains can be found in Table 19 and the alignment and discharge points are presented in Drawing 467470.BQ.04.20-DS-C13 in Appendix E.

Approx. length (m)	Depth (m)	Width (m)	Pipe diameter (mm)	No. of pipes at the bottom of the trench
Varies	1.4	0.45	150	1

Table 19: Filter drains for Lodway Farm Construction Compound

- 6.8.5.5 The calculations to size the filter drains assumed a gradient of 1 in 200. The design will need to be checked to confirm that it is adequate when the proposed ground levels are available.
- 6.8.5.6 For pollution control purposes, filter drains provide water treatment and sediment removal as runoff percolates through the granular material. Additionally, filter drains will be lined with a geotextile for further water treatment and to avoid infiltration of runoff into the ground. It is recommended that at the beginning of the run of each filter drain, a chamber with a grated gully is installed to allow for maintenance.
- 6.8.5.7 In the case of fuel and oil handling occurring, a separate drainage system will be installed including oil separator to treat flows. All fuel and oil storage tanks will be installed within a bunded area with 110% storage volume of the tank available, should the tank be ruptured or a spill occur.

6.8.5.8 One attenuation basin would need be constructed in this compound drainage scenario, located in the north-western corner of the compound (see drawing 467470.BQ.04.20-DS-C13 in Appendix E for reference). The basin is proposed to discharge into the existing culvert at the northern part of the compound. The exact location of the existing culvert is to be confirmed by Network Rail. The proposed dimensions for the basin are displayed in Table 20:

Basins	(m)	(m ²)	(m ²)	available (m ³)	(l/s) for 1 in 30 yr
Basin	1.5	2,601	1,728	3,224	43.2

Table 20: Dimensions of the proposed attenuation basin for Lodway Farm compound.

6.8.5.9 Regarding pollution control, basins provide water treatment allowing for sediment settling. In addition, it is recommended to install gabion baskets within the basin to provide additional sediment catching. Since the compound will be used to store ballast, it is recommended the installation of bypass separators at the outlet of the basin. In addition, the basin should be constructed with a forebay at the inlet, and a micropool at the outlet to aid sediment control.

Further work

- 6.8.5.10 Historical borehole logs undertaken in the vicinity of the compound available in the BGS viewer were used to investigate the groundwater flood risk. The highest level at which groundwater was encountered in the area was at 1.7 m bgl, which is the reason why all drainage is proposed to have a depth of 1.5 m or less. The SUDS Manual recommends investigating groundwater levels to ensure the base of the proposed drainage system is at least 1 m above the maximum anticipated groundwater level. Prior to construction it is therefore recommended that piezometers are installed to monitor groundwater levels over a 6 months period taking in April and May which are typically expected to be the peak for groundwater levels in the UK. If groundwater is encountered less than 1 m below the invert level of the proposed drainage system, the drainage design should take this into account and be amended accordingly.
- 6.8.5.11 Topographical survey is required in order to finalise the drainage system design for the Lodway Farm compound.
- 6.8.5.12 Further consultation with the EA will be undertaken during the detail design phase to check if compensatory flood storage will be required.

6.8.6 C9 Ham Green Access point and compound

6.8.6.1 Ham Green Access point and compound is located to the north of the eastern portal of Pill Tunnel. Ham Green Lake is located just to the east of the access point compound. This compound has a proposed footprint of 0.491 ha, from

which 0.286 ha are the temporary compound and 0.204 ha will be the permanent construction. The permanent construction comprises a Network Rail pedestrian and vehicular access road, as well as some space for parking and landscaped areas. Low loaders to drop off RRVs will be using the entrance area to the access point. Network Rail is proposing a permeable solution for the temporary compound.

- 6.8.6.2 Surface water runoff from the permanent areas of the compound up to the 30 year return period plus an allowance for climate change of 40% will be captured by a linear ditch (0.172ha) that will be connected to a filter drain at the eastern edge of the turn area. Discharge from filter drains will be attenuated in a Geo-cellular storage or similar, with 34.2m³ required storage volume. It is recommended the discharge from the Geo-cellular storage to be connected to the existing Network Rail silt trap before outfall to Ham Green Lake. The system will discharge into the silt trap at greenfield runoff rates or 2.5l/s as the minimum practicable.
- 6.8.6.3 Network Rail has been informed of the discharge flow rate and volumes arriving to the silt trap (see Appendix A) from the access point. Since the capacity of the silt trap is unknown it has been agreed that the drainage will be treated prior to discharging to the silt trap. Therefore, a bypass oil separator is recommended before the connection with the existing outfall to provide water treatment. During detailed design, survey of the silt trap is required to identify its capacity.
- 6.8.6.4 The suggested dimensions of the ditch for the permanent areas is shown in Table 21: and the alignment and discharge points are presented in Drawing 467470.BQ.04.20-DS-C9 in Appendix E.

Approx. length (m)	Depth (m)	Top width (m)	Base width (m)	Side slope (1inX)
 190	0.8	2.1	0.5	1

Table 21: Dimensions of the proposed ditch for the permanent areas Ham Green Compound

- 6.8.6.5 In terms of pollution control, several measures are proposed to prevent any sediment from reaching Ham Green Lake. Check dams will be installed along the proposed ditch to capture sediment. The accumulated silt will need to be removed periodically. The spacing of check dams will depend on their height and the longitudinal slope of the ditch which is still uncertain due to the absence of a detailed proposed ground model.
- 6.8.6.6 A silt pollution control (i.e. straw bale barrier) has been proposed to be placed during construction at the eastern edge of the site (as shown in 467470.BQ.04.20-DS-C9) to protect the Ham Green Lake from runoff and to provide temporary pollution control.

Exceedance flows

- 6.8.6.7 Exceedance routes from the Geo-cellular storage location towards the green areas are located to the east of the compound, between the compound fence and the Ham Green Lake (see drawing 467470.BQ.04.20-DS-C9 in Appendix E for reference).
- 6.8.6.8 Since the proposed drainage system is discharging into the lake, exceedance events could cause the Ham Green Lake to spill. Then, exceedance flows were checked for 100 yr return period. For the permanent areas, the pipeline running from the Geo-cellular storage towards the existing silt trap from Network Rail presents flooding for the 1 in 100 year return period:

Drainage Elements	30 year return period; 40% allowance for climate change	100 year return period; 40% allowance for climate change
Outlet Pipeline	0	1.9m ³
	Table 00, Evenedance flood	u a lu una a a

Table 22: Exceedance flood volumes

Further recommendations

- 6.8.6.9 Historical boreholes logs undertaken in the vicinity of the compound available in the BGS viewer were used to investigate the ground water flood risk. The highest ground water level encountered in the area was at 22m BGL. If during construction ground water is found close to the surface, the drainage system will need to be revised to suit the ground water conditions.
- 6.8.6.10 Survey of the existing silt trap in the Railway Network drainage system outfall into the Ham Green Lake to be undertaken to check if it can accommodate the runoff from the compound.
- 6.8.6.11 Further consultation with the EA will be undertaken in the detail design phase to check if compensatory flood storage will be necessary.

6.8.7 C4 Clanage Road Compound

- 6.8.7.1 C4 Clanage Road compound is located to the west of Bristol, between the A369 and the railway line. This compound has a proposed footprint of 0.6137 ha, from which 0.312 ha are the permanent construction and 0.3017ha are the temporary compound. The surface material for the hardstanding of the temporary compound will be type 1 aggregate.
- 6.8.7.2 This site will be the main compound for construction activities through the Avon Gorge, including track works, earthworks, underbridge strengthening, signalling and telecoms. The site will be used as a medium-sized parking area, for materials storage, offices and welfare facilities. RRAP will be

installed to allow RRVs access into the gorge, for which the construction of a ramp will be required to facilitate this.

- 6.8.7.3 The site is in flood zone 3 and is prone to waterlogging. It is understood that this will mean that the compound may be occasionally flooded and it is accepted that it not be possible to use for periods of time. In addition, it is proposed that materials and equipment will only be stored there for immediate maintenance activities.
- 6.8.7.4 No topographical data is available at present. Therefore, for the purpose of the drainage design of the temporary areas, it is proposed that the ground falls south-east, to allow for a low point in the south-eastern corner of the temporary extents.
- 6.8.7.5 Surface water runoff from the temporary areas of the compound up to the 30 year return period plus an allowance for climate change of 10% would be captured by a runoff collector and then discharge unattenuated via a pump supplied by Network Rail to the River Avon, subject to Environment Agency's consent (refer to Appendix A). The runoff collector is proposed to run along the southern edge of the temporary compound, ending in the south-eastern corner.
- 6.8.7.6 In terms of pollution control, a bypass separator is recommended before the discharge to the River Avon to provide water treatment.

7. Contributing areas & Runoff assessment

7.1 As any additional runoff up to the 30yr return period is to be managed in a sustainable way through the implementation of SuDS, there should be no increase to flood risk posed from surface water, including during exceedance events up to the 100yr return period. Pre- and post-development areas are presented in Table 23: to Table 26: below.

		Por	tishead Sta	ation		
	Pr	e - development		Po	ost - development	
Catchment Area	Permeable area (m²)	Impermeable area (m²)	Total (m²)	Permeable area (m²)	Impermeable area (m²)	Total (m ²)
C.1	7,513	0	7,513	1,410	6,103	7,513
C.2	1,702	3,130	4,832	752	4,080	4,832
C.3	2,322	2,166	4,488	1,570	2,918	4,488
C.4	1,822	1,867	3,689	100	3,589	3,689

Table 23: Pre- and post-development areas in Portishead Station

			Pill Station			
	Pre - development Post - development					
Catchment	Permeable area	Impermeable area	Total	Permeable area	Impermeable area	Total
Area	(m²)	(m ²)	(m²)	(m²)	(m ²)	(m²)
	8,455	0	8,455	2,352	6,103	8,455
		Table 04. Due and use	- 4 - 1 1	and any as in Dill Otation		

Table 24: Pre- and post-development areas in Pill Station

	Haul roads
Pre - development	Post - development

Area	Permeable area (m²)	Impermeable area (m²)	Total (m ²)	Permeable area (m²)	Impermeable area (m²)	Total (m ²)
1	3,286	0	3,286	0	3,286	3,286
2	2,963	0	2,963	0	2,963	2,963
3	1,759	0	1,759	0	1,759	1,759
4	2,966	0	2,966	0	2,966	2,966
5	1,020	0	1,020	0	1,020	1,020
6	2,970	0	2,970	0	2,970	2,970

Table 25: Pre- and post-development areas for Haul Roads

Table 26: Pre- and post-development areas for compounds

*Both permanent and temporary impermeable areas have been considered.

8. Modelling

8.1 The hydraulic modelling results show that runoff up to a 1 in 30-year return period (which has 3.33% chance of occurring in any given year) will be contained in the proposed drainage features without flooding. A list of the assets for the development site, with corresponding references to the drawings and calculations, are shown in Table 27. It should be noted that calculations and drawings are presented in Appendices B, C, D and E for each development area respectively.

Development Area	Drawing Reference	Calculation Reference – 1 in 30-year results
Portishead Station Cat A.1 (Appendix		467470.BQ.04.20-DS-
B)	_	PortisheadCat.A.1Calculations
Portishead Station Cat A.2		467470.BQ.04.20-DS-
(Appendix B)	467470.BQ.04.20-DS-Portishead	PortisheadCat.A.2Calculations
Portishead Station Cat A.3		467470.BQ.04.20-DS-
(Appendix B)		PortisheadCat.A.3Calculations
Portishead Station Cat A.4	_	467470.BQ.04.20-DS-
(Appendix B)		PortisheadCat.A.4Calculations
Pill station carpark (Appendix C)	467470.BQ.04.20-DS-Pill	467470.BQ.04.20-DS-PillCalculations
Haul roads (Appendix D)	467470.BQ.04.20-DS-Haulroads	467470.BQ.04.20-DS-HaulroadsCalculations
Compound east of Portishead Station		467470.BQ.04.20-DS-
[work is in progress] (Appendix E)		EastPortisheadCalculations
C15 Sheepway compound (Appendix	467470.BQ.04.20-DS-C15	467470.BQ.04.20-DS-C15Calculations
<u>E)</u>		
C14 Portbury Hundred compound	467470.BQ.04.20-DS-C14	467470.BQ.04.20-DS-C14Calculations
(Appendix E)		
Turning area for construction vehicles	467470.BQ.04.20-DS-	467470.BQ.04.20-DS-
east to C14 (Appendix E)	C14turningarea	C14turningareaCalculations
C13 Lodway Farm (Appendix E)	467470.BQ.04.20-DS-C13	467470.BQ.04.20-DS-C13Calculations
C9 Ham Green compound (Appendix	467470.BQ.04.20-DS-C9	467470.BQ.04.20-DS-C9Calculations
E)		
C4 Clanage Road (Appendix E)	467470 BO 04 20-DS-C4	_

Table 27: Calculations and associated drawing number for the proposed drainage options of the development areas

9. Pollution Control & Water Quality

- 9.1 Due to the diverse nature of the developments covered in this drainage strategy, each site has been assessed independently.
- 9.2 SuDS have been promoted where possible as recommended on the National Planning Policy Framework and the North Somerset Sustainable Drainage Developer Guide as one of the most appropriate methods to provide the adequate water treatment before the discharge to the environment.
- 9.3 The Simple Index Approach, in line with Section 26.7.1 of the CIRIA C753 SuDS Manual 2015, has been undertaken for the developments classified as medium pollution hazard and mitigation measures have been consulted to the environmental regulator for the higher risk sites to ensure effective pollution control. The process and results are presented in appendix F.
- 9.4 Pollution hazards were identified and measures proposed in accordance to relevant legislation and best practices. Measures proposed for each site have been outlined in their correspondent sections of this report. This includes dry swales, bioretention areas, filter drains, ditches with check dams, detention basins and Class 1 bypass separator that has been sized to fully treat the more frequent flows.
- 9.5 Refer to Appendix F for details about pollution control and water quality.

10. General Recommendations and Missing Information

- Existing drainage system to be surveyed (CCTV, connectivity and levels)
- Topographical survey is recommended to be undertaken.
- Due to lack of gradient in the existing ditches, pumping might be required.
- Existing watercourses to which discharge is proposed should be surveyed to assess conditions and capacity.
- Outfalls should be monitored on a regular basis and only clear and uncontaminated water should be discharged from site. Outfalls will be equipped with shut-off valves to stop water flow in case any contamination event occurs.

APPENDICES

APPENDIX A

North Somerset Levels Internal Drainage Board (IDB) Drainage Advice and Pollution Mitigation Measures, Analysis of Portbury Ditch Water Levels

North Somerset Levels Internal Drainage Board Pre-application Response No. 2

Response to emails 20/3/2018

Email dated 13 April 2018 from Dario de Frutos Subtil

Compounds:

There are two main compounds to discharge to IDB watercourses: sheepway compound and the portubury 100 compound. The design of the compounds is still on progress and the only available information we have at the moment is that both construction compounds will be used for storage of materials (sleepers, troughing, spoil, ballast and track formation), welfare facilities and parking. Heavy vehicles will be using the compounds such as dumpers, excavators, dozers and lorries.

NSLIDB response:

The Board expects that all compounds and in particular any culverting to be removed post construction and as a minimum returned to their pre-development condition. If included in a remedial landscape scheme the watercourses should not be planted with anything other than a standard grass seed mix to prevent erosion. Any other vegetation should be left to colonise naturally.

Note that the Board requires that any open watercourses within the compounds should be fully culverted for the duration of the works, min 750mm dia (subject to final approval on receipt of detailed proposals) and all to be removed on completion to prevent construction runoff from entering the watercourse.

Measures to minimise and control the risk of contaminated runoff from the compounds should be implemented as part of site set-up. The main risks in term of water pollution hazard and how they will be mitigated below:

Sediments:

Filter drains will be proposed as the conveyance system for most part of the compounds. The flows from the filter drains will be then directed to ditches located around the perimeter of the compounds that will also allow sedimentation. Additionally, catchpits with sumps will be also promoted to capture the silt.

NSLIDB Comment:

That seems a reasonable approach, the outfall should be monitored on a regular basis and only clear and uncontaminated water should be discharged from site. This should be the driving factor for the design of the onsite features and additional measure introduced if required throughout the construction period.

Detention basins will be proposed as the most downstream before the discharge (at the greenfield runoff peak) to the watercourses to provide water storage but also a secondary water treatment (sedimentation and pollution removal).

Storage materials areas should be under cover to prevent wash down.

NSLIDB Comment:
Agree that basins at final outfall points are essential. All basins and discharge points should have means of shutting off outlets in case of spillage etc. Discharge rate liable to be academic – outfalls will almost certainly be submerged owing to lack of gradients in local ditch network and getting the water away will be the challenge. It may be found necessary to pump in order to maintain satisfactory ground conditions within the compounds. We comment elsewhere on the suitability of the offsite ditches to convey the compound drainage.

Fuel and oil:

For the areas of fuel and oil handling, oil separators will be provided to remove hydrocarbons from high-risk areas of runoff. In addition, penstock chambers will be proposed downstream of the oil separators and at other locations of the network to enable shut down of the surface water drainage network in case of a spill occurs. *NSLIDB Agreed*

Water from wash down areas:

Wash down areas should be isolated and appropriate water treatment to be provided as required. *NSLIDB Agreed*

Haul roads

The main pollution hazard for the haul roads is likely to be silt.

The runoff generated is currently proposed to be conveyed in ditches with checkdams to capture the sediment. The accumulated sediment will need to be digged and disposed periodically. As runoff peaks are going to be attenuated at greenfield peak, the removal of contaminants through settling, adsorption will be enhanced.

NSIDB response:

As mentioned above any discharge from the site should be clear and uncontaminated. A survey of silt levels in receiving watercourses should be undertaken prior to works commencing onsite. Any silt that does end up in adjacent watercourses should be disposed of post construction by the main contractor.

Email from Dave Bellamy dated 10 April 2018

I made a note during the meeting in February that the discharge into the Portbury Ditch Main river from the Portishead car park could be unattenuated. Is that still correct?

NSLIDB response:

Only discharge from the actual platform and station building can be discharged unattenuated, all other areas including parking, should be discharged at greenfield rates and volumes.

Email from Gloria Rigual Muñoz dated 12 April 2018

I'm writing to you regarding the ditch D4 that crosses the proposed location for Portbury Hundred Construction Compound. I wanted to ask you if this ditch could be culverted to allow for the construction of the compound above it.

Also, referring to Dave's email early this week, if you could come back to us as soon as possible with your preferred discharge points and the greenfield runoff rates, that would be really helpful for us. For now, we're assuming a minimum discharge rate of 5 I/s since controlling flow at lower discharge can be technically unfeasible.

NSLIDB response:

As discussed above the Board would require any open watercourses within compounds should be culverted to prevent contamination by construction run-off. Therefore we wouldn't have any issues with the culverting of ditch D4.

The Board believes that with modern vortex flow controls flows can be restricted to 2.5 l/s without an unnecessary risk of blockages.

Email from Dave Bellamy dated 5 April 2018

We are currently looking at the Drainage Strategy for the reinstatement of the railway between Bristol and Portishead. At the meeting I attended on 8th April it was stated that haul road and construction compound drainage could discharge to the local rhyne network at greenfield run-off rate. For a lot of these areas, we are calculating very low rates (0.6-0.9I/s) and I am wondering if there is a practical minimum rate that we can use in our design to reduce storage requirements?

Also, could you please let me know typical maximum and minimum water levels for the area between the M5 and Portishead?

NSLIDB response:

As discussed above flow control structures should be set to a minimum of 2.5 l/s.

With regard to discharge points our marked up plans associated with our official consultation response may help. They will be sent under separate cover.

All of the watercourses, outside of those maintained by the IDB, in the area are in need of maintenance to bring them into a suitable condition to discharge into. This should include works to ensure a drainage route to an IDB maintained watercourse or main river. Localised pumping maybe required to ensure a suitable contractors compound if land raising is not undertaken.

The Board do not have any records of water levels in the area.

The requirement for any compensatory flood storage will be an EA requirement and consultation should be had with them in this regard.

NSLIDB Draft Meeting Notes 8th February 2018

Comments:

It is important to refer to the marked up drawings which we supplied and which were displayed at the meeting. They clarify many of the points made in the minutes.

Note 1. Should read - The IDB currently have about a 4m width for clearing the cut which is barely adequate and involves the machine slightly overhanging the railway fence

Note 5 – Sheepway Low Loader Access

Back in 2007 the Board had a great deal of difficulty sorting out the low loader / machine access arrangement off Sheepway and in the end a practical trial was carried out with our low loader before the alignments for the fencing and gates etc were finalised. The final arrangement has turned out to be satisfactory but the Board never did receive as built drawings. The only drawings the Board have on file are for a number of (unsatisfactory) previous draft proposals. Please send us a copy of the basic survey on which your current proposal drawing is based and we will mark this up as requested.

Note 6 – Culvert Headwalls

Attached is a suggested sketch arrangement SK 1 which might allow open watercourse clearance without a need to work inside the railway fence, whilst still permitting access to the headwalls without leaving railway property. Comments invited.

Note 9 – Temporary Culvert Sizes

All temporary culverts to be a minimum of 750mm (subject to final approval on receipt of detailed proposals)

Note 12 - Port of Bristol owns land and ditch north of railway and need to be involved in this point.

Also attached is out high level tracking plan. When detailed fencing and compound drawings have been produced we will be able to mark up our tracking requirements.

Phillips, Becky/BRS

From:	Vasilyev, Kostya/UKS
Sent:	18 January 2017 13:36
То:	Lillie, Penny/UKS
Cc:	Cooper, Robert/UKS; Bird, Robert/UKS
Subject:	RE: Portishead -tide locked level
Attachments:	Scanned from a Xerox Multifunction Printer.pdf

Penny

Thank you for your enquiry.

Following the location of points on the scan sent to me and Robert Bird on 16/01/2017 13:13 by Robert Cooper, I can say that the water levels for the 25 year and 50 year events (climate change scenario) are as follows:

The **left point** as per the scan referenced above (please also find it attached) (near the drain , the location is to the south of Harbour Road):

50 year event: 7.05m 25 year event: 4.85m

The levels are the same for both pre-development and post development situation for each of the return periods listed above.

It looks like the water stays within the ditch or is not overtopping the planned ground levels (in post development situation).

There is no water level information in the model for the **right point** (to the north of Phoenix Road).

In order to provide some estimate for this point we looked at the downstream end of this drain (at its confluence with the Portbury? Drain, the location is to the east of Newfoundland Way, see the red star on the map below). These levels will provide a very conservative approximation of levels at the right point on the scan provided. Taking this information from the downstream end of this drain allows us to estimate levels further upstream of this drain as this drain is not represented in a model.

The downstream side of the brook that flows by the right point:

50 year event: 7.06m (post development situation) 7.05m (pre-development situation)

25 year event:

5.24m (both pre and post development situation)

It looks like the water stays within the ditch or is not overtopping the planned ground levels (in post development situation).

Hope it helps.

Please let us know if there are more questions.

Many thanks.

Kind regards



Kostya

Konstantin Vasilyev BSc MSc C.WEM CSci CEnv MCIWEM Water Engineer Customer Support Manager – Flood Modeller Suite T +44 (0) 1793 81 2479 D +44 (0) 1793 81 6438

CH2M Burderop Park Swindon Wiltshire SN4 0QD UK www.ch2m.com | LinkedIn | Twitter | Facebook

Flood Modeller Suite – trusted by 25,000 users worldwide www.floodmodeller.com | LinkedIn | Twitter | Facebook

From: Lillie, Penny/UKS
Sent: 17 January 2017 10:48
To: Bird, Robert/UKS <Robert.Bird@ch2m.com>
Cc: Vasilyev, Kostya/UKS <Kostya.Vasilyev@ch2m.com>; Cooper, Robert/UKS <Robert.Cooper@ch2m.com>
Subject: RE: Portishead -tide locked level

Hi Robert B

Do you know when we will get information for our work. I need to update Client. thanks

Penny Lillie Project Engineer

Direct +44 (0)1793 816671 Mobile +44 (0)7547 190959

CH2M Burderop Park, Swindon, UK SN4 0QD www.ch2m.com

From: Cooper, Robert/UKS Sent: 17 January 2017 09:00 To: Bird, Robert/UKS <<u>Robert.Bird@ch2m.com</u>>; Lillie, Penny/UKS <<u>Penny.Lillie@ch2m.com</u>> Cc: Vasilyev, Kostya/UKS <<u>Kostya.Vasilyev@ch2m.com</u>> Subject: RE: Portishead -tide locked level

Robert,

The hydrographs would also be useful to input into Micro Drainage.

Regards

Robert Cooper Senior Engineer D +44 01793816260

CH2M

Burderop Park Swindon Wilts SN4 0QD www.ch2m.com | LinkedIn | Twitter | Facebook

From: Cooper, Robert/UKS Sent: 16 January 2017 13:13 To: Bird, Robert/UKS <<u>Robert.Bird@ch2m.com</u>>; Lillie, Penny/UKS <<u>Penny.Lillie@ch2m.com</u>> Cc: Vasilyev, Kostya/UKS <<u>Kostya.Vasilyev@ch2m.com</u>> Subject: RE: Portishead -tide locked level

Robert,

Please refer to attached mark-up showing outfall location.

I trust this is clear.

Regards

Robert Cooper Senior Engineer D +44 01793816260

CH2M Burderop Park Swindon Wilts SN4 0QD www.ch2m.com | LinkedIn | Twitter | Facebook

From: Bird, Robert/UKS
Sent: 13 January 2017 17:59
To: Lillie, Penny/UKS <<u>Penny.Lillie@ch2m.com</u>>
Cc: Cooper, Robert/UKS <<u>Robert.Cooper@ch2m.com</u>>; Vasilyev, Kostya/UKS <<u>Kostya.Vasilyev@ch2m.com</u>>
Subject: RE: Portishead -tide locked level

Penny

Please can you send a sketch showing outfall location(s) - or describe with words if easier..... I will then consult Kostya to review coastal model results.

We have coastal flood model results for the 25 year and 50 year events but not the 30 year event – so we may have to work with the 50-year event?

regards

Robert

From: Lillie, Penny/UKS
Sent: 12 January 2017 10:45
To: Bird, Robert/UKS <<u>Robert.Bird@ch2m.com</u>>
Cc: Cooper, Robert/UKS <<u>Robert.Cooper@ch2m.com</u>>
Subject: Portishead -tide locked level

Happy New Year Robert

Following our meeting in Dec, we have now received guidance from the local council (NSC) for drainage design.

They have said we need to demonstrate the drainage system maintains a 1 in 30 year capacity with climate change capacity under tide locked conditions.

Just wondering if you could provide guidance on the tide locked level? From my notes at our Dec meeting a level of 7.9m for 200 return was mentioned?

regards

Penny Lillie Project Engineer

Direct +44 (0)1793 816671 Mobile +44 (0)7547 190959

Linfoot, Andrew/BRS

Patrick Goodey <patrick.goodey@bristol.gov.uk></patrick.goodey@bristol.gov.uk>
27 June 2018 16:37
Abigail Hall; 'Agriodima, Margarita/EXT'
[EXTERNAL] RE: Metrowest inquiry - runoff rate from a temporary compound to the

Hi both,

If this site is draining directly into the River Avon then an unrestricted discharge is fine - this is likely to need approval from the EA via the environmental permit. You also need to make a reasonable consideration of tide locking.

The proposal to pump is not preferred – are you able to drain the site via gravity?

Also note that some areas around Clanage Road is a known are of high risk from surface water flooding so your drainage strategy/FRA must address this. The below screenshot of <u>http://maps.bristol.gov.uk/bfrm/</u> shows the risk area. We have many recent records of flooding here that verify the mapped risk.



I hope that helps, let me know if you have any more questions

Thanks Patrick

Patrick Goodey Flood Risk Manager Tel: 0117 922 3206 Mob: 07557 203 443

Bristol City Council has developed its Local Flood Risk Management Strategy. The final report can be viewed via <u>www.bristol.gov.uk/floodstrategy</u>

From: Abigail Hall
Sent: 27 June 2018 15:26
To: 'Agriodima, Margarita/EXT'
Cc: Patrick Goodey
Subject: RE: Metrowest inquiry - runoff rate from a temporary compound to the Avon

Hi Patrick,

I'm not sure what to respond to this one, they have been asking for a response today. I think they are preparing an FRA for the works.

My initial thoughts were to let it go unrestricted into the Avon, but our discharge zones map indicates that it will be in the Ashton Gate area and discharge rates should be limited.

Thanks, Abi

From: Agriodima, Margarita/EXT [mailto:Margarita.Agriodima@jacobs.com]
Sent: 25 June 2018 11:55
To: Abigail Hall
Cc: Bellamy, Dave/EXT; Reshef, Imri/EXT
Subject: Metrowest inquiry - runoff rate from a temporary compound to the Avon

Hello,

We are preparing the drainage strategy for the temporary construction compounds for Metrowest project. Could you please confirm us if the discharge rate to the Avon should be restricted to the greenfield runoff rate for the temporary site? The design life of the temporary site is 1-2 years.

This concerns a temporary compound (Clanage Road) where there is no presence of any existing drainage system and we are proposing to temporarily pump the runoff from the compound.

Kind Regards,

Margarita Agriodima, MEng GMICE Jacobs Graduate Water Engineer | Environment Maritime Resilience + 44(0)1392340965 + 44(0)7534676287 mobile margarita.agriodima@jacobs.com

Ash House, Falcon Road Sowton, Exeter EX27LB United Kingdom www.jacobs.com

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Linfoot, Andrew/BRS

From:	Reshef, Imri/EXT
Sent:	25 June 2018 12:37
То:	developmentcontrol@nslidb.org.uk; alsopengineer@gmail.com
Cc:	Fabisiak, Magda/BRS; Agriodima, Margarita/EXT; Bellamy, Dave/EXT; Linfoot,
	Andrew/BRS
Subject:	FW: [EXTERNAL] Re: MetroWest - query about ditch D4
Attachments:	NSLIDB Metrowest pre-application response 2.pdf; NSLIDB response to Metrowest
	Stage 2 Consultation.pdf; SK 1 culvert headwall sketch.pdf; NSLIDB Metro West mark up Dec 2017.zip; Keeching Route for The Cut & The Moat.pdf

Simon/Dan,

Following the correspondence from April, can you please confirm that it is possible to discharge the runoff water from Portbury Hundred compound to the existing D4 culvert crossing A369 (discharge rate will be in greenfield runoff rates as detailed in the Drainage Strategy Report). Please see the plan below with red arrow showing the proposed connection.



Kind regards,

Imri Reshef | Jacobs | Assistant Water Engineer | Environment Maritime Resilience | +44.1392.340.974 DD | +44 1392.444.252 office | Imri.Reshef@jacobs.com | www.jacobs.com From: Simon Bunn [mailto:developmentcontrol@nslidb.org.uk]
Sent: 20 April 2018 16:29
To: Rigual Munoz, Gloria/EXT <<u>Gloria.RigualMunoz@jacobs.com</u>>; Bellamy, Dave/EXT <<u>Dave.Bellamy@jacobs.com</u>>; De Frutos Subtil, Dario/EXT <<u>Dario.deFrutosSubtil@ch2m.com</u>>
Cc: Giles Oliver <<u>theengineer@nslidb.org.uk</u>>; Linfoot, Andrew/BRS <<u>Andrew.Linfoot@jacobs.com</u>>; Fabisiak,
Magda/BRS <<u>Magda.Fabisiak@jacobs.com</u>>; Dan Alsop Chartered Engineer <<u>alsopengineer@gmail.com</u>>; Jennifer
Devereux <<u>Jennifer.Devereux@n-somerset.gov.uk</u>>

Subject: RE: [EXTERNAL] Re: MetroWest - query about ditch D4

Gloria/Dave/Dario,

Please find attached our response (no 2) to various queries that I have pulled together into one document.

If you have any further questions, please do not hesitate to ask.

Kind regards,

Simon

Simon Bunn Development Control Officer

North Somerset Levels IDB

The Cider House The Grange Business Park Hewish Weston-super-Mare N. Somerset BS24 6RR

Tel: 01934 833388

Email: developmentcontrol@nslidb.org.uk

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From: Rigual Munoz, Gloria/EXT [mailto:Gloria.RigualMunoz@jacobs.com]
Sent: 18 April 2018 11:57
To: Dan Alsop Chartered Engineer <<u>alsopengineer@gmail.com</u>>
Cc: Simon Bunn <<u>developmentcontrol@nslidb.org.uk</u>>; Giles Oliver <<u>theengineer@nslidb.org.uk</u>>; Bellamy,

Dave/EXT <<u>Dave.Bellamy@jacobs.com</u>>; Linfoot, Andrew/BRS <<u>Andrew.Linfoot@jacobs.com</u>>; Fabisiak, Magda/BRS <<u>Magda.Fabisiak@jacobs.com</u>>

Subject: RE: [EXTERNAL] Re: MetroWest - query about ditch D4

Hi Dan,

Your queries have been passed to the Bristol team, in charge of gathering that information.

Thank you.

Kind regards, Gloria

From: Dan Alsop Chartered Engineer [mailto:alsopengineer@gmail.com]
Sent: 17 April 2018 16:57
To: Rigual Munoz, Gloria/EXT <<u>Gloria.RigualMunoz@ch2m.com</u>>
Cc: Simon BUNN <<u>developmentcontrol@nslidb.org.uk</u>>; Giles OLIVER <<u>theengineer@nslidb.org.uk</u>>
Subject: [EXTERNAL] Re: MetroWest - query about ditch D4

Dear Gloria,

We are trying to sort out responses to the multiple queries your team has recently sent us. As they are mostly interdependent I will be routing all my answers via Simon Bunn.

One trouble is that we are still waiting for the info we were promised at the meeting held on 8th Feb, viz, details of the proposed fencing, especially around Portishead Station adjacent to the IDB watercourse, a basic survey of the existing Sheepway access point as we cannot tell from the drawings supplied whether what is proposed will be adequate, and a list of key contacts with who does what. If you could chivvy those along we will be able to get back to you sooner.

Sorry I can't be more helpful at the moment. Regards,

Dan Alsop

From: <u>Rigual Munoz, Gloria/EXT</u> Sent: Thursday, April 12, 2018 4:18 PM To: <u>alsopengineer@gmail.com</u> Cc: <u>Bellamy, Dave/EXT</u>; <u>De Frutos Subtil, Dario/EXT</u>; <u>Agriodima, Margarita/EXT</u>; <u>Reshef, Imri/EXT</u>; <u>theengineer@nslidb.org.uk</u>; <u>developmentcontrol@nslidb.org.uk</u> Subject: MetroWest - query about ditch D4

Hi Dan,

I'm writing to you regarding the ditch D4 that crosses the proposed location for Portbury Hundred Construction Compound. I wanted to ask you if this ditch could be culverted to allow for the construction of the compound above it.

Also, referring to Dave's email early this week, if you could come back to us as soon as possible with your preferred discharge points and the greenfield runoff rates, that would be really helpful for us. For now, we're assuming a minimum discharge rate of 5 l/s since controlling flow at lower discharge can be technically unfeasible.

Thank you.

Kind regards,

Gloria Rigual Muñoz | Jacobs | Graduate Water Engineer | Environment Maritime Resilience | +44.1392.340.971 DD | +44.1392.444.252 office | gloria.rigualmunoz@jacobs.com | www.jacobs.com

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From:	Agriodima, Margarita/EXT
To:	"Jake.Faucitt@networkrail.co.uk"
Cc:	Bellamy, Dave/EXT; Linfoot, Andrew/BRS
Subject:	RE: Metrowest - Discharge volume from Ham Green Compound
Date:	29 June 2018 10:19:00
Attachments:	Hydrograph for Ham Green Compound.pdf

Hi Jake,

I am contacting you regarding the drainage strategy of Metrowest since I would like to inform you about the discharge volume to the silt trap from the Network Railway drainage system for the C9-Ham Green Compound.

The total volume will discharge after approximately 19 hours at 2.5l/s discharge rate to the silt trap. Please see the attached hydrograph.

Please let me know if you require any more information.

Kind Regards,

Margarita Agriodima, MEng GMICE Jacobs Graduate Water Engineer | Environment Maritime Resilience + 44(0)1392340965 + 44(0)7534676287 mobile margarita.agriodima@jacobs.com

Ash House, Falcon Road Sowton, Exeter EX27LB United Kingdom www.jacobs.com

APPENDIX B

Portishead Station Drainage Strategy Drawings and Calculations

NOTES

KEY

23/05/2018 First Issue

Rev By Chkd Apprvd Date

Project

Drawing

Drawn by: IR

Checked by: -

Approved by: -

Drawing No.

Drawing Scale: AS SHOWN

- year return period plus climate change allowance. 4. All dimensions are in meters unless noted
- otherwise. 5. The indicative layout based on available OS or topographical survey.



NOTES

- 1. This drawing should be read in conjunction with the Drainage Strategy Report.Drainage system design based on 1:30 year
- return period plus climate change allowance.
- Exceedance flow design based on 1:100 year return period plus climate change allowance. 4. All dimensions are in meters unless noted
- otherwise. 5. The indicative layout based on available OS
- or topographical survey. 6. Outfalls should be monitored on a regular
- basis and equipped with shut-off valves. 7. Tide-lock level of 5.29mAOD has been
- considered during the drainage design. 8. Proposed drainage strategy for Cat A.1 based on collecting the runoff water through permeable pavement (concrete blocks) on the parking bays. The runoff will be attenuated within 300 mm height of clean stone reservoir beneath the parking bays and the footpath. From the gravel reservoir the water will be discharged into a swale. The proposed swale includes check-dams to control the flow rate and use the gravel storage for attenuation.

KEY	
Catchment Area 1 (CAT A.1)	
Catchment Area 2 (CAT A.2)	
Catchment Area 3 (CAT A.3)	
Catchment Area 4 (CAT A.4)	
Proposed drainage pipeline	
 Proposed MH/Catchpit 	
Proposed Gravel Storage	
Proposed Linear Drainage Channel	
Proposed Filter Drain	
Proposed Swale with Filter Drain	
Exceedance Route	
	PROPOSED CATCH-PIT WITH FLOW CONTROL TO LIMIT DISCHARGE RATE TO 2.5 //s
Drawing PORTISHEAD STATION DRAINAGE STRATEGY CAT A.1 Sheet 2 of 3 Drawn by: IR Date: 23/05/2018 Date: -	This drawing is to be read in conjunction with all relevant
Approved by: _ Date: - Drawing No. Revision	 Architects, Engineers and Specialist Manufacturer's drawings and specifications. If in doubt please consult the Engineer.
467470.BQ.04.20-DS-PORTISHEAD	This map is reproduced from Ordnance Survey® material by Halcrow on behalf of North Somerset Council with the permission of the Controller of Her Majesty's Stationery Office, @ Crown copyright.
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PROPOSED DROPPED KERB

TO ALLOW EXCEEDANCE FLOW

Drawing Scale: AS SHOWN



NOTES

- 1. This drawing should be read in conjunction with the Drainage Strategy Report.
- 2. Drainage system design based on 1:30 year return period plus climate change allowance.
- 3. Exceedance flow design based on 1:100 year return period plus climate change
- allowance. 4. All dimensions are in meters unless noted otherwise.
- 5. The indicative layout based on available OS or topographical survey.
- 6. Outfalls should be monitored on a regular basis and equipped with shut-off valves.
- 7. Tide-lock level of 5.29mAOD has been considered during the drainage design.
- 8. Proposed drainage strategy for the car-park (Cat A.4) is based on linear drainage channel to collect the runoff. The runoff will be treated through filter media and Bio-mat crates and will be attenuate within 300mm height of Geo-cellulare crates which will be located beneath the parking bays.





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	R	AND GULLIES TO COLLECT HW RUNOFF
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		= 107.74m
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\backslash \land \land		EXCEEDANCE
$\langle \langle \rangle \rangle$		VOLUME OF 1 CAT A.3 WITH
		RATE OF 35.7
	\backslash	$\langle \rangle$
		∲107.53m
		RUPUSED FLOW CONTROL HAMBER TO ALLOW MAX. ISCHARGE OF 35 //s FROM CAT A.3
		TO EXISTING HW DRAINAGE
	AVAILABLE	CAPACITY
	$\langle /$	
Warehouse		
This drawing is to be read in conjunction with all relevant		
Architects, Engineers and Specialist Manufacturer's		// AV
Engineer.		//%///
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Date 2	29/05/2	2018 1	L8:58			Designe	d by D	D04813	36			Dcair	
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PN	Length	Fall	Slope I	<u>Netw</u> « -	Indica ⁻	tes pipe o	pie id capacity k	y < flor n	HYD	DIA	Section	. Туре	Auto
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PN 51.000 51.001	Length (m) 2.000 54.000	Fall (m) 0.004 0.108	Slope I (1:X) 500.0 500.0	<u>.Area</u> (ha) 0.156 0.000	Indica [*] T.E. (mins) 5.00 0.00	Base Flow (1/s 0.	<u>k</u> (mm) (0 0.600	y < flor n 0.040	• • • • • • • • • • • • • • • • • • •	DIA (mm) 100 1000	Section Pipe/Cc 1:4	Type onduit Swale	Auto Desig
PN 51.000 51.001 52.000	Length (m) 2.000 54.000 2.000	Fall (m) 0.004 0.108 0.004	Slope I (1:X) 500.0 500.0 500.0	<pre></pre>	Indica T.E. (mins) 5.00 0.00 5.00	Base Flow (1/s 0. 0.	k k (mm) 0 0.600 0 0.600	y < flow n 0.040	HYD SECT 4 \=/ ○	DIA (mm) 1000 1000	Section Pipe/Cc 1:4 Pipe/Cc	Type nduit Swale nduit	Auto Desig
PN 51.000 51.001 52.000 51.002	Length (m) 2.000 54.000 2.000 54.000	Fall (m) 0.004 0.108 0.004 0.108	Slope I (1:X) 500.0 500.0 500.0	<pre>. Area (ha) 0.156 0.000 0.176 0.000</pre>	Indica T.E. (mins) 5.00 0.00 5.00 0.00	Base Flow (1/s 0. 0. 0. 0.	k k (mm) 0 0.600 0 0.600 0	y < flow n 0.040	HYD SECT 4 \=/ 0 4 \=/	DIA (mm) 1000 1000 1000	Section Pipe/Cc 1:4 Pipe/Cc 1:4	n Type onduit Swale onduit Swale	Auto Desig:
PN \$1.000 \$1.001 \$2.000 \$1.002 \$3.000	Length (m) 2.000 54.000 2.000 54.000 2.000	Fall (m) 0.004 0.108 0.004 0.108 0.004	Slope I (1:X) 500.0 500.0 500.0 500.0	<pre>. Area (ha) 0.156 0.000 0.176 0.000 0.157</pre>	Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00	Base Base Flow (1/s 0. 0. 0. 0. 0.	k k (mm) 0 0.600 0 0.600 0 0.600	y < flow n 0.040 0.040	HYD SECT $4 \downarrow = /$ 0 $4 \downarrow = /$ 0	DIA (mm) 1000 1000 1000 1000	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc	n Type onduit Swale onduit Swale onduit	Auto Desig: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PN \$1.000 \$1.001 \$2.000 \$1.002 \$3.000	Length (m) 2.000 54.000 2.000 54.000 2.000	Fall (m) 0.004 0.108 0.004 0.108 0.004	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0	<pre>«Area (ha) 0.156 0.000 0.176 0.000 0.157</pre>	Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u>	Base Base Flow (1/s 0. 0. 0. 0. 0. 0. 0. 0.	k k (mm) 0 0.600 0 0.600 0 0.600 0 0.600	y < flow n 0.040 0.040 0 ble	HYD SECT 4 \=/ 0 4 \=/ 0	DIA (mm) 1000 1000 1000 1000	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc	onduit Swale onduit Swale onduit	Auto Desig: 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
PN 51.000 51.001 52.000 51.002 53.000	Length (m) 2.000 54.000 2.000 54.000 2.000	Fall (m) 0.004 0.108 0.004 0.108 0.004 Rain (mm/hr)	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 T.C.) (mins)	<pre></pre>	Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> C E I.An (ha)	tes pipe α Base Flow (1/s 0. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	ble 10 k k) (mm) 0 0.600 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0 0 0.600 0	y < flor n 0.040 0.040 0.040 0 ble Foul Ad 1/s)	HYD SECT 4 \=/ 0 4 \=/ 0 d Flow (1/s)	DIA (mm) 1000 1000 1000 1000 1000 Vel (m/s)	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc Cap (1/s)	Type onduit Swale onduit Swale onduit Flow (1/s)	Auto Desig
PN \$1.000 \$1.001 \$2.000 \$1.002 \$3.000	Length (m) 2.000 54.000 2.000 54.000 2.000 PN S1.000	Fall (m) 0.004 0.108 0.004 0.108 0.004 Rain (mm/hr)	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 T.C.) (mins) 0 5.10	<pre></pre>	Indica Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> (ha) 0.1	tes pipe α Base Flow (1/s 0. 0. 0. 0. 0. 0. 156	bie bie k k) (mm) 0 0.6000 0 0.6000 0 0 0.6000 0 0 0.6000 0 0 0.6000 0 0 0.6000 0 0 0.6000 0 0 0.6000 0 .ts Ta .ts Ta .ise E .1/s) (0.0 0.0	y < flor n 0.040 0.040 0.040 ble Foul Ad 1/s)	HYD SECT 4 \=/ 0 4 \=/ 0 d Flow (1/s) 0.0	DIA (mm) 1000 1000 1000 1000 1000 vel (m/s) 0.34	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc Cap (l/s) 2.7«	Type onduit Swale onduit Swale onduit Flow (l/s) 21.1	Auto Design
PN 51.000 51.001 52.000 51.002 53.000	Length (m) 2.000 54.000 54.000 2.000 2.000 PN \$1.000 \$1.001	Fall (m) 0.004 0.108 0.004 0.108 0.004 Rain (mm/hr) 50.00	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 500.0 T.C.) (mins) 0 5.10 0 8.66	<pre>. Area (ha) 0.156 0.000 0.176 0.000 0.157 US/II) (m) 0.6.604 6 6.600</pre>	Indica Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> Netwo 1 0.1 0.01	tes pipe of Base Flow (1/s 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	ble 10 k (mm) 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0.0 0.0	y < flow n 0.040 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.00000 0.00000 0.00000000	HYD SECT 4 \=/ 0 4 \=/ 0 4 \=/ 0 0 0 0 0.0 0.0	DIA (mm) 1000 1000 1000 1000 1000 1000 0.00 (m/s) 0.34 0.25	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc L:4 Pipe/Cc Cap (1/s) 2.7« 60.6	Type onduit Swale onduit Swale onduit Flow (1/s) 21.1 21.1	Auto Desig: 0 0 0 0 0
PN 51.000 51.001 52.000 51.002 53.000	Length (m) 2.000 54.000 54.000 2.000 2.000 81.000 \$1.001 \$2.000	Fall (m) 0.004 0.108 0.004 0.108 0.004 Rain (mm/hr) 50.00 50.00	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 500.0 T.C.) (mins) 0 5.10 0 8.66	<pre>. Area (ha) 0.156 0.000 0.176 0.000 0.157 US/II) (m) 0.6.604 6 6.600 0.6.496</pre>	Indica Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> Netwo 0.1 0.1 0.1 0.1	tes pipe of Base Flow (1/s 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	ble 10 k (mm) 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0.0 0.0 0.0 0.0 0.0 0.0	y < flow n 0.040 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.00000 0.00000 0.00000000	HYD SECT 4 \=/ 0 4 \=/ 0 4 \=/ 0 0 0 0 0.0 0.0 0.0	DIA (mm) 1000 1000 1000 1000 1000 1000 0.34 0.34 0.34	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc Cap (1/s) 2.7« 60.6 2.7«	Type onduit Swale onduit Swale onduit Flow (1/s) 21.1 21.1 23.8	Auto Desig 0 0 0 0
PN \$1.000 \$2.000 \$1.002 \$3.000	Length (m) 2.000 54.000 54.000 2.000 2.000 81.000 \$1.002	Fall (m) 0.004 0.108 0.004 0.108 0.004 Rain (mm/hr) 50.00 50.00	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 500.0 T.C. (mins) 0 5.10 0 5.10 0 5.10	<pre></pre>	Indica Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> C E I.An (ha) 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	tes pipe (Base Flow (1/s 0. 0. 0. 0. 0. 1.56 1.56 1.76 3.32	pie ic k (mm) 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0.0 0.0 0.0 0.0 0.0 0.0	y < flow n 0.040 0.040 0 ble Foul Ad 1/s) 0.0 0.0 0.0 0.0	HYD SECT 4 \=/ 0 4 \=/ 0 4 \=/ 0 0 0 0 0 0.0 0.0 0.0 0.0	DIA (mm) 1000 1000 1000 1000 1000 1000 0.34 0.34 0.34 0.34	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc 2:7 Cap (1/s) 2.7 60.6 2.7 60.6	Type onduit Swale onduit Swale onduit Flow (1/s) 21.1 21.1 23.8 45.0	Auto Design ê ê
PN \$1.000 \$2.000 \$1.002 \$3.000	Length (m) 2.000 54.000 54.000 2.000 2.000 2.000 S1.001 S2.000 S1.002 S3.000	Fall (m) 0.004 0.108 0.004 0.108 0.004 Kain (mm/hr) 50.00 50.00 50.00	Slope I (1:X) 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 500.0 5.10 0 5.10 0 5.10 0 12.23 0 5.10	<pre></pre>	Indica Indica T.E. (mins) 5.00 0.00 5.00 0.00 5.00 <u>Netwo</u> 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	ssign 1a tes pipe Base 0. Flow (1/s 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 10. 0. rea Σ 156 176 1332 157	ble 10 k (mm) 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0 0.600 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	y < flow n 0.040 0.040 0 ble Foul Ad 1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	HYD SECT 4 \=/ 0 4 \=/ 0 4 \=/ 0 4 \=/ 0 0 0 0 0 0.0 0.0 0.0 0.0 0.0	DIA (mm) 1000 1000 1000 1000 1000 1000 1000 1	Section Pipe/Cc 1:4 Pipe/Cc 1:4 Pipe/Cc Cap (1/s) 2.7« 60.6 2.7« 60.6 2.7«	Type onduit Swale onduit Swale onduit Flow (1/s) 21.1 21.1 23.8 45.0 21.3	Auto Design

CH2M												Page	2
Ash Ho	ouse												
Falcor	n Road											y	4
Exeter EX2 7LB												Micr	Jun
Date 2	29/05/	2018 1	18:58			Design	ied by	DD048	3136			Drai	nane
File Portisnead Catchment I.MDX Checked by											Ciul	lage	
XP Sol	AP SOLUCIONS NETWORK 2017.1.2												
Network Design Table for Storm													
PN	Length (m)	Fall (m)	Slope 1 (1:X)	(ha)	T.E. (mins)	Base Flow (1	k /s) (mu	: n m)	HYD SECT	DIA (mm)	Sectior	п Туре	Auto Design
s1.003	54.000	0.108	500.0	0.000	0.00		0.0	0.04	40 4 \=/	1000	1:4	Swale	•
S4.000	2.000	0.004	500.0	0.110	5.00		0.0 0.6	500	0	100	Pipe/Co	onduit	۵
S1.004	54.000	0.108	500.0	0.000	0.00		0.0	0.04	40 4 \=/	1000	1:4	Swale	۵
S5.000	2.000	0.004	500.0	0.106	5.00		0.0 0.6	500	0	100	Pipe/Co	onduit	0
S1.005 S1.006	54.000 5.000	0.108 0.025	500.0 200.0	0.000 0.000	0.00		0.0 0.0 0.6	0.04	40 4 \=/ o	1000 225	1:4 Pipe/Co	Swale onduit	0
					<u>Netwo</u>	rk Res	ults :	<u> Table</u>					
	PN	Rain	тC	IIS/TI	. 5: ТА1	rea Σ	Base	Foul	Add Flow	Vel	Can	Flow	
		(mm/hr) (mins) (m)	(ha)) Flow	v (1/s)	(1/s)	(1/s)	(m/s)	(1/s)	(1/s)	
	s1.003	50.0	0 15.7	9 6.384	0.4	189	0.0	0.0	0.0	0.25	60.6«	66.2	
	S4.000	50.0	0 5.1	0 6.280	0.1	110	0.0	0.0	0.0	0.34	2.7«	14.9	
	S1.004	50.0	0 19.3	6 6.276	0.5	599	0.0	0.0	0.0	0.25	60.6«	81.1	
	S5.000	50.0	0 5.1	0 6.172	0.1	106	0.0	0.0	0.0	0.34	2.7«	14.4	
	S1.005 S1.006	50.0 50.0	0 22.9 0 23.0	2 6.168 2 6.060	0.7	705 705	0.0	0.0	0.0	0.25 0.92	60.6« 36.6«	95.5 95.5	
l				C	01982-	2017 X	.P Solı	utions					

CH2M				Page 3							
Ash House											
Falcon Road				4							
Exeter EX2 7LB				1 mm							
$D_{2} = 20/05/2018 + 19.59$		agianad by DD	010126	— Micro							
File Pertichered Catebrant 1 MDV Checked by											
File Portishead Catchment 1.MDX Checked by											
XP Solutions Network 2017.1.2											
30 year Return Period S	Summary of (Critical Resul	lts by Maximu	m Level (Rank 1)							
for Storm											
	Simu	<u>lation Criteria</u>									
Areal Reduct	ion Factor 1.	00 Additional	Flow - % of Tot	al Flow 0.000							
HOL SL	art (mins)	0 MADD Fa	Thist Coeff	iecient 0 800							
Manhole Headloss Coef	f (Global) 0.	500 Flow per Pers	son per Day (1/p	er/day) 0.000							
Foul Sewage per hec	tare (l/s) 0.	000		- ·							
Number of Input Hydrographs	0 Number of	f Offline Control	s 0 Number of T	ime/Area Diagrams 5							
Number of Online Controls	6 Number of 3	Storage Structure	s 5 Number of R	eal Time Controls 0							
	Syntheti	c Rainfall Detai	ls								
Rainfa	ll Model	FSR	Ratio R 0.350								
	Region Engla	nd and Wales Cv	(Summer) 0.750								
M5·	-60 (mm)	20.000 Cv	(Winter) 0.840								
Margin for	Flood Risk Wai	rning (mm) 300.0	DVD Status	OFF OFF							
	Allarysts	TS Status ON	INEILIA Status	Off							
	-										
Pro:	file(s)	0 00 100 100	Summer a	and Winter							
Duration(s)	(mins) 15,	30, 60, 120, 180, 1440 2160 2000	240, 360, 480, 4320 5760 7	600, 720, 200 8640							
	900,	1440, 2100, 2000	, 4320, 3700, 72	10080							
Return Period(s)	(years)			30, 100							
Climate Char	- nge (%)			40, 40							
US/MH	Return Climat	e First (X)	First (Y)	First (Z) Overflow							
PN Name Storm	Period Change	e Surcharge	Flood	Overflow Act.							
SI.000 SPPI 360 Winter	30 +40	30/15 Summer	100/60 Winter								
S2.000 SPP2 480 Winter	30 +40	 30/240 Summer 30/15 Summer 	100/60 Winter								
S1.002 SSW2 480 Winter	30 +40	% 100/180 Winter	100/180 Winter								
S3.000 SPP3 960 Winter	30 +40	% 30/15 Summer	100/120 Winter								
S1.003 SSW3 960 Winter	30 +40	% 100/240 Winter	100/240 Winter								
S4.000 SPP4 1440 Winter	30 +40	% 30/15 Summer	100/720 Winter								
S1.004 SSW4 1440 Winter	30 +40	% 100/720 Winter	100/720 Winter								
53.000 SPP3 2160 Winter	30 +40 30 ±40	م عن/15 Summer 2 100/960 Win+or	100/960 Winter								
S1.006 SOutlet 2160 Winter	30 +40	% 30/120 Summer	100/720 Winter								
	©1982-2)17 XP Solutio	ns								
	01002 2	SI DOIUCIO									

CH2M										Page 4
Ash Hous	se									
Falcon R	Road	d								4
Exeter	ΕX	x2 71.B								1 mm
Date 29/05/2018 18:58 Designed by DD048136										Micro
Date 297			.0.00		Desig		Y DD0401	50		Drainage
File Portishead Catchment 1.MDX Checked by										Brainacje
XP Solutions Network 2017.1.2										
<u>30 year</u>	: Re	<u>eturn P</u>	eriod	Summary c	o <u>f Crit</u>	<u>ical F</u>	Results 1	b <u>y Ma</u>	ximum Lev	<u>rel (Rank 1)</u>
					IOr	Storm				
			Water	Surcharged	Flooded			Pipe		
		US/MH	Level	Depth	Volume	Flow /	Overflow	Flow		Level
PI	N	Name	(m)	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	Exceeded
S1.0	000	SPP1	6.970	0.266	0.000	0.86		3.4	FLOOD RISK	18
S1.0	001	SSW1	7.050	0.000	0.000	0.01		4.3	FLOOD	20
S2.0	000	SPP2	6.888	0.292	0.000	1.15		4.5	FLOOD RISK	21
S1.0	002	SSW2	6.884	-0.058	0.000	0.01		3.6	FLOOD RISK	15
S3.0	000	SPP3	6.798	0.310	0.000	0.67		2.6	FLOOD RISK	19
S1.0	003	SSW3	6.796	-0.038	0.000	0.01		3.5	FLOOD RISK	17
S4.0	000	SPP4	6.691	0.311	0.000	0.29		1.2	FLOOD RISK	10
S1.0	004	SSW4	6.690	-0.036	0.000	0.01		3.0	FLOOD RISK	8
S5.0	000	SPP5	6.593	0.321	0.000	0.24		1.0	FLOOD RISK	9
S1.0	005	SSW5	6.592	-0.026	0.000	0.01		2.9	FLOOD RISK	9
S1.0	006	SOutlet	6.495	0.210	0.000	0.09		2.5	FLOOD RISK	10
1										

CH2M								E	age 5		
Ash Hou	se							ſ			
Falcon	Road								4		
Exeter	EX2 -	7. B							m		
Date 29/05/2018 18:58 Designed by DD048136											
File Portishead Catchment 1 MDY Checked by											
File Portishead Catchment I.MDX Checked by											
XP Solutions Network 2017.1.2											
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)											
<u>tor Storm</u>											
				Simula	tion Crit	eria					
		Areal Reduct	ion Fact	cor 1.00	0 Addit	ional	Flow - % of Tot	al Flow O	.000		
		Hot St	art (mir	ıs)	0 M	ADD Fa	ctor * 10m³/ha	Storage 2	.000		
		Hot Start	Level (r	nm)	0		Inlet Coeff	iecient 0	.800		
1	Manhole H	leadloss Coef	f (Globa	al) 0.50	0 Flow pe	r Pers	on per Day (l/p	er/day) 0	.000		
	Foul Se	ewage per hec	tare (1/	(s) 0.00	0						
Number	of Input	Hydrographs	0 Nur	mber of	Offline C	ontrol	s 0 Number of T	ime/Area	Diagrams 5		
Numbe	r of Onl	ine Controls	6 Numbe	er of St	orage Str	ucture	s 5 Number of R	eal Time	Controls 0		
			_								
		Painfa	<u>Sy</u> Il Model	<u>nthetic</u>	Rainfall	Detail P	<u>estio</u> P 0 350				
		Kaliila.	Region	England	r and Wale	s Cv	(Summer) 0.750				
		M2-	-60 (mm)	<u> </u>	20.00	0 Cv	(Winter) 0.840				
		Margin for	Flood Ri	isk Warn	ing (mm)	300.0	DVD Status	OFF			
			Ar	י nalysis מת	S Status	Fine	Inertia Status	OFF			
				DI	S Status	011					
		Prot	file(s)	15 20	CO 100	100	Summer a	and Winte	r		
		Duration(S)	(mins)	15, 30 960, 1	440, 2160	, ⊥80, . 2880	- 4320, 5760, 73	200, 8640			
				300 , 1	110, 2100	, 2000	, 1020, 0,000, 12	1008)		
	Retur	n Period(s)	(years)					30, 10	С		
		Climate Char	nge (%)					40, 4	C		
	US/MH		Return	Climate	First	(X)	First (Y)	First (Z) Overflow		
PN	Name	Storm	Period	Change	Surcha	rge	FTOOD	Overilow	ACT.		
S1.000	SPP1	180 Winter	100	+40%	30/15 \$	Summer	100/60 Winter				
S1.001	SSW1	360 Winter	100	+40%	30/240 \$	Summer	30/120 Summer				
S2.000	SPP2	720 Winter	100	+40%	30/15 \$	Summer	100/60 Winter				
S1.002	SSW2	600 Winter	100	+40%	100/180	Vinter	100/180 Winter				
S1 003	SCM3	1440 Winter	100	+4U종 +4N위	3U/13 1 100/240 T	vuuuner Ninter	100/240 Winter				
S4.000	SPP4	2160 Winter	100	+40%	30/15 \$	Summer	100/720 Winter				
S1.004	SSW4	2160 Winter	100	+40%	100/720 0	Vinter	100/720 Winter				
S5.000	SPP5	2880 Winter	100	+40%	30/15 \$	Summer	100/960 Winter				
S1.005	SSW5	2880 Winter	100	+40%	100/960 0	Vinter	100/960 Winter				
S1.006	SOutlet	2880 Winter	100	+40%	30/120 \$	Summer	100/720 Winter				
			@1 (202 201	7 VD 0-	1,,+	22				
			019	902 - 201	LI AP SO	IUC10	0115				

CH2M									Page 6
Ash House									
Falcon Road									4
Exeter EX2	7LB								Micco
Date 29/05/2									
File Portishead Catchment 1.MDX Checked by									Urainage
XP Solutions Network 2017.1.2									
100 year Paturn Pariod Summary of Critical Pacults by Maximum Layal (Park 1)									
<u>100 year net</u>		<u>rrou o</u>	<u>ununury</u> or	for St	orm	<u>.54105 D</u>	<u>y 1107</u>		
				<u>101 00</u>	<u>, , , , , , , , , , , , , , , , , , , </u>				
		Water	Surcharged	Flooded			Pipe		
	US/MH	Level	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(1/s)	Status	Exceeded
S1.000	SPP1	7.064	0.360	13.782	1.59		6.3	FLOOD	18
S1.001	SSW1	7.051	0.001	1.114	0.01		5.5	FLOOD	20
S2.000	SPP2	6.960	0.364	17.982	1.90		7.5	FLOOD	21
S1.002	SSW2	6.957	0.015	14.853	0.01		3.9	FLOOD	15
S3.000	SPP3	6.856	0.368	22.329	0.98		3.8	FLOOD	19
S1.003	SSW3	6.855	0.021	20.948	0.01		3.5	FLOOD	17
S4.000	SPP4	6.741	0.361	14.781	0.46		1.8	FLOOD	10
S1.004	SSW4	6.740	0.014	14.433	0.01		3.2	FLOOD	8
\$5.000	SPP5	6.631	0.359	12.853	0.35		1.4	FLOOD	9
S1.005	SSW5	6.631	0.013	12.818	0.01		3.3	FLOOD	9
S1.006	SOutlet	6.527	0.242	17.030	0.10		2.6	FLOOD	10

CH2M Hill		Page 1
Ash House		
Falcon Road Sowton		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 13:52	Designed by IR065829	Desinado
File	Checked by	Diamaye
Micro Drainage	Network 2017.1.2	•

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	0	150	S1	7.500	6.100	1.250	Open Manhole	1200
S1.001	0	225	s2	7.000	5.572	1.203	Open Manhole	1200
S1.002	0	225	s3	7.710	5.305	2.180	Open Manhole	1200
S1.003	0	225	S4	8.230	5.038	2.967	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	45.000	99.3	S2	7.000	5.647	1.203	Open Manhole	1200
S1.001	45.000	168.5	S3	7.710	5.305	2.180	Open Manhole	1200
S1.002	45.000	168.5	S4	8.230	5.038	2.967	Open Manhole	1200
S1.003	45.000	164.8	S	8.900	4.765	3.910	Open Manhole	0

CH2M Hill		Page 2
Ash House		
Falcon Road Sowton		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 13:52	Designed by IR065829	Desinado
File	Checked by	Diamaye
Micro Drainage	Network 2017.1.2	•

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	_	_	100	0.078	0.078	0.078
1.001	-	-	100	0.078	0.078	0.078
1.002	-	-	100	0.079	0.079	0.079
1.003	-	-	100	0.078	0.078	0.078
				Total	Total	Total
				0.313	0.313	0.313

CH2M Hill	Page 3										
Ash House											
Falcon Road Sowton											
Exeter EX2 7LB	Micco										
Date 22/05/2018 13:52 Designed by IR065829											
File Checked by Didilidy											
Micro Drainage	Network 2017.1.2										
Summary Wizard of 15 m	ninute 1 year Summer I+0% for Storm										
Sin Areal Reduction Factor Hot Start (mins) Hot Start Level (mm) Manhole Headloss Coeff (Global) (Foul Sewage per hectare (1/s)	<pre>mulation Criteria 1.000 Additional Flow - % of Total Flow 0.000 0 MADD Factor * 10m³/ha Storage 2.000 0 Inlet Coefficcient 0.800 0.500 Flow per Person per Day (1/per/day) 0.000 0.000</pre>										
Number of Input Hydrographs 0 Number Number of Online Controls 0 Number of	of Offline Controls 0 Number of Time/Area Diagrams 0 f Storage Structures 0 Number of Real Time Controls 0										
Synthe	etic Rainfall Details										
Rainfall Model	FSR Ratio R 0.350										
Region Eng M5-60 (mm)	gland and Wales Cv (Summer) 0.750										
	20.000 00 (Wincer, 0.010										
Margin for Flood Risk V Analys	Warning (mm) 300.0 DVD Status OFF sis Timestep Fine Inertia Status OFF DTS Status ON										
Profile(s)	Summer and Winter										
Duration(s) (mins) 15,	30, 60, 120, 180, 240, 360, 480, 600, 720,										
	960, 1440										
Return Period(s) (years)	1, 2, 5, 30										
Climate Change (%)	0, 0, 0, 0										
Water Surd	charged Flooded Pipe										
PN Name Rank (m)	(m) (m ³) Cap. (1/s) (1/s) Status										
S1 000 S1 64 6 197	-0.053 0.000 0.69 11.9 0*										
S1.000 S1 64 5.197 S1.001 S2 64 5.688	-0.109 0.000 0.51 19.4 OK										
S1.002 S3 64 5.446	-0.084 0.000 0.69 26.3 OK										
S1.003 S4 64 5.201	-0.062 0.000 0.84 32.4 OK										

								Page 4	
Sow	ton							Ly	
7LB								Micro	
18 13	3:52		Desi	gned by	7 IR065	829		Drainago	
			Chec	Checked by					
е			Netw	ork 201	7.1.2				
mmar	y Wiza	ard of	15 minut	e 2 yea	r Summ	er I+0%	for S	torm	
Areal Hot Headlo wage Hydr	l Reduc Hot S t Start per he cograph	tion Fa tart (m Level ff (Glc ctare (s 0 Num	Simulat: actor 1.000 ains) 0 (mm) 0 abal) 0.500 1/s) 0.000	ion Crite Addit: Mi Flow per	eria lonal Fl ADD Fact r Person ontrols	ow - % of or * 10m³ Inlet C per Day 0 Number 0 Number	Total /ha Sto oeffied (l/per, of Time	Flow 0.000 prage 2.000 cient 0.800 /day) 0.000 e/Area Diagrams 0	
ine (Control	s O Nun	ber of Stor	rage Stru	ictures	0 Number	oi Rea.	I Time Controls 0	
	Rainf	all Mod	Synthetic R el	ainfall FS	Details R R	atio R O	350		
	Rainin	Regi	on England	and Wale	s Cv (Si	ummer) 0.	750		
	M	5-60 (mi	m)	20.00	0 Cv (W	inter) 0.	840		
Marc	rin for	Flood	Risk Warnir	na (mm) -	300.0	DVD Sta	tus OF	ਜ	
	J= 101	11000	Analysis Ti	.mestep	Fine In	ertia Sta	tus OF	F	
			DTS	Status	ON				
5	Pr	ofile(s)	co 100	100 01	Summ	ner and	Winter	
Dura	ation(s) (mins) 15, 30,	60, 120,	180, 24	10, 360, 4	80, 60 96	0, 720, 0, 1440	
n Per	ciod(s)	(years)				1, 2	, 5, 30	
Clin	nate Ch	ange (%)				Ο,	0, 0, 0	
S/MH	Storm	Water Level	Surcharged Depth	Flooded Volume	Flow /	Overflow	Pipe Flow		
Name	Rank	(m)	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	
S1	52	6.217	-0.033	0.000	0.89		15.4	OK	
S2	52	5.709	-0.088	0.000	0.66		25.0	OK	
S3	52	5.476	-0.054	0.000	0.88		33.7	OK	
C 4	5.2	5 200	0 017	0 000	1 0 4		20 0	CUDCUADCED	
	/LB 18 1: e mmar Area: Hot Headlo ewage : Hydr .ine (C Marg Dura cn Per Clir S/MH Name S1	<pre>/LB 18 13:52 e mmary Wizz Areal Reduct Hot Start Headloss Coe ewage per he Hydrograph ine Control Rainfa Margin for Pr Duration (s) Climate Ch S/MH Storm Name Rank S1 52</pre>	<pre>/LB 18 13:52 e mmary Wizard of Areal Reduction Fa Hot Start Level Headloss Coeff (Glc ewage per hectare (Hydrographs 0 N ine Controls 0 Nun Rainfall Mode Regio M5-60 (m Margin for Flood Profile(s Duration(s) (mins cn Period(s) (years Climate Change (% Water IS/MH Storm Level Name Rank (m) S1 52 6.217</pre>	7LB 18 13:52 18 13:52 Desi Check e Netw mmary Wizard of 15 minute Areal Reduction Factor 1.000 Hot Start (mins) 0 Hot Start Level (mm) 0 Headloss Coeff (Global) 0.500 Ewage per hectare (1/s) 0.000 Hydrographs 0 Number of Of Line Controls 0 Number of Stor Synthetic R Rainfall Model Region England M5-60 (mm) Margin for Flood Risk Warnir Analysis Ti DTS Profile(s) Duration(s) (mins) 15, 30, Check Water Surcharged IS/MH Storm Level Depth Name Rank (m) (m) S1 52	7LB 18 13:52 18 13:52 Designed by Checked by e Network 201 mmary Wizard of 15 minute 2 yea Simulation Crite Areal Reduction Factor 1.000 Hot Start (mins) 0 Hot Start Level (mm) 0 Headloss Coeff (Global) 0.500 Flow per ewage per hectare (1/s) Ewage per hectare (1/s) 0.000 Hydrographs 0 Number of Offline Co Co Line Controls 0 Number of Storage Struct Synthetic Rainfall Rainfall Model FS Region England and Wale M5-60 (mm) Margin for Flood Risk Warning (mm) 3 Analysis Timestep DTS Status Profile(s) Duration(s) (mins) 15, 30, 60, 120, Climate Change (%) Water Surcharged Flooded VATER Depth Volume Name Rank (m) (m) (m³) S1 52 6.217 -0.033 0.000	7LB 18 13:52 Designed by IR065 Checked by e Network 2017.1.2 mmary Wizard of 15 minute 2 year Summed Areal Reduction Factor 1.000 Additional Fl Hot Start (mins) 0 Hot Start Level (mm) 0 Headloss Coeff (Global) 0.500 Flow per Person ewage per hectare (1/s) 0.000 : Hydrographs 0 Number of Offline Controls .ine Controls 0 Number of Storage Structures Synthetic Rainfall Details Rainfall Model FSR Region England and Wales Cv (St M5-60 (mm) 20.000 cv (W: Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep Fine In DTS Status ON Profile(s) Duration(s) (mins) 15, 30, 60, 120, 180, 24 Ch Period(s) (years) Climate Change (%) Water Surcharged Flooded (S/MH Storm Level Depth Volume Flow / Name Rank (m) (m) (m) (m³) S1 52 6.217 -0.033	7LB 18 13:52 Designed by IR065829 18 13:52 Designed by IR065829 Checked by e Network 2017.1.2 mmary Wizard of 15 minute 2 year Summer I+0% Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Hot Start (mins) 0 MADD Factor * 10m³ Hot Start Level (mm) 0 Inlet C Besigned by IR065829 Checked by emmary Wizard of 15 minute 2 year Summer I+0% Mathematical Criteria Areal Reduction Factor 1.000 Additional Flow - % of Hot Start Level (mm) 0 Inlet C Beading Criteria Areal Reduction Factor 1.000 Additional Flow - % of Mathematical Box Colspan="2">Mathematical Science Colspan="2">Number Colspan="2">Inlet C Beading Criteria Areal Reduction Factor 1.000 Additional Flow - % of Mathematical Box Colspan="2">Inlet C Beading Criteria Areal Reduction For Colspan="2">Synthetic Rainfall Details Ratio R 0. Region England and Wales Cv (Summer) 0. Mathematical Criteris	7LB 18 13:52 Designed by IR065829 Checked by e Network 2017.1.2 mmary Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Ministry Wizard of 15 minute 2 year Summer I+0% for S: Water Surcharged Flood Risk Warning (mm) 300.0 Number of Status OF Margin for Flood Risk Warning (mm) 300.0 DVD Status OF Margin for Flood Risk Warning (mm) 300.0 DVD Status OF Margin for Flood Risk Warning (mm) 300.0 DVD Status OF Margin for Flood Risk Warning (mm) 300.0 Monistry Status ON Profile(s) Summer and	

CH2M Hill									Page 5
Ash House									
Falcon Road	Sow	ton							L.
Exeter EX2	7LB								Micco
Date 22/05/20	018 1	3:52		Desi	gned by	/ IR065	5829		Desinargo
File				Chec	ked by				Diamage
Micro Drainage Network 2017.1.2									
MICTO Drainag Si Manhole Foul S Number of Inpu Number of On	Area Area Hoi Headlo Sewage t Hydn line (y Wiza l Reduc Hot S t Start oss Coe per he rograph Control Rainfa M gin for	ard of tion Fa tart (r Level ff (Glo ectare s 0 Nu all Mod Regi 5-60 (m	<u>Simulat</u> actor 1.000 nins) 0 (mm) 0 obal) 0.500 (1/s) 0.000 Number of Stor <u>Synthetic R</u> el on England m) Risk Warnir Analysis Ti DTS	ion Crite Addit: Addit: Flow per ffline Co cage Stru and Male 20.00 ng (mm) 3 imestep Status	r Summ eria onal Fl ADD Fact c Persor ontrols actures Details R R. S Cv (S 0 Cv (W 00.0 Fine Ir ON	er I+0% cow - % of cor * 10m ³ Inlet C n per Day 0 Number 0 Number atio R 0 ummer) 0.3 inter) 0.3 DVD Sta nertia Sta	for S Total /ha St oeffie (l/per of Tim of Rea 350 750 340 tus OF tus OF	torm Flow 0.000 orage 2.000 cient 0.800 /day) 0.000 Me/Area Diagrams 0 ll Time Controls 0 'F 'F
Retu	Dura Irn Pei Clir	Pr ation(s riod(s) mate Ch	ofile(s)) (mins (years ange (S	5) 5) 15, 30, 5) 8)	60, 120,	180, 24	Summ 40, 360, 4	ner and 80, 60 96 1, 2 0,	Winter 10, 720, 50, 1440 2, 5, 30 0, 0, 0
	TTC /MT	0 to	Water	Surcharged	Flooded	F 1 /	0 f1	Pipe	
PN	Name	Bank	(m)	Deptn (m)	(m ³)	Elow /	(1/s)	$f_{1/s}$	Status
\$1.000 \$1.001 \$1.002 \$1.003	\$1 \$2 \$3 \$4	88 88 88	6.324 5.745 5.617 5.372	0.074 -0.052 0.087 0.109	0.000 0.000 0.000 0.000	1.04 0.81 0.96 1.19		18.1 30.9 36.7 45.9	SURCHARGED OK SURCHARGED SURCHARGED
			(©1982-2017	XP Sol	utions	3		

CH2M Hill		Page 6							
Ash House									
Falcon Road Sowton		4							
Exeter EX2 7LB		m							
Date 22/05/2018 13:52	- Micio								
File	Drainage								
Micro Drainage	Network 2017.1.2								
Summary Wizard of 15 minute 30 year Summer I+0% for Storm Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.350 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.000 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF DTS Status DTS Status ON									
Profile(s Duration(s) (mins Return Period(s) (years Climate Change (% Water US/MH Storm Level) Summer and) 15, 30, 60, 120, 180, 240, 360, 480, 600 960) 1, 2,) 0, 0 Surcharged Flooded Pipe Depth Volume Flow / Overflow Flow	Winter), 720,), 1440 5, 30), 0, 0							
PN Name Rank (m)	(m) (m ³) Cap. (l/s) (l/s)	Status							
\$1.000 \$1 76 6.838 \$1.001 \$2 76 6.510 \$1.002 \$3 76 6.293 \$1.003 \$4 76 5.823	0.588 0.000 1.19 20.6 0.713 0.000 0.88 33.4 0.763 0.000 1.29 49.3 0.560 0.000 1.69 65.0	SURCHARGED SURCHARGED SURCHARGED							
c	1982-2017 XP Solutions								

CH2M Hill		Page 1
Ash House		
Falcon Road Sowton		L
Exeter EX2 7LB		Micco
Date 22/05/2018 15:27	Designed by IR065829	Desinado
File PORTISHEAD-CAT2.MDX	Checked by	Diamage
Micro Drainage	Network 2017.1.2	

Existing Network Details for Storm

- Indicates pipe length does not match coordinates

PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)	
1.000	30.000	0.200	150.0	0.064	3.00	0.0	0.600	0	225	Pipe/Conduit
1.001	33.269	0.227	146.6	0.074	3.00	0.0	0.600	0	225	Pipe/Conduit
2.000	40.000#	0.400	100.0	0.085	3.00	0.0	0.600	0	225	Pipe/Conduit
1.002	1.000#	0.010	100.0	0.000	3.00	0.0	0.600	0	225	Pipe/Conduit
1.003	72.000#	0.460	156.5	0.166	3.00	0.0	0.600	0	225	Pipe/Conduit
1.004	45.000#	0.300	150.0	0.109	3.00	0.0	0.600	0	225	Pipe/Conduit

Network Results Table

PN	US/IL	Σ I.Area	Σ Base	Vel	Cap
	(m)	(ha)	Flow (l/s)	(m/s)	(1/s)
1.000	6.050	0.064	0.0	1.07	42.4
1.001	5.850	0.138		1.08	42.9
2.000	6.200	0.085	0.0	1.31	52.0
1.002	5.620	0.223	0.0	1.31	52.0
1.003	5.610	0.389	0.0	1.04	41.5
1.004	5.150	0.498	0.0	1.07	42.4

CH2M Hill	Page 2
Ash House	
Falcon Road Sowton	<u> </u>
Exeter EX2 7LB	Micro
Date 22/05/2018 15:27	Designed by IR065829
File PORTISHEAD-CAT2.MDX	Checked by
Micro Drainage	Network 2017.1.2
Area	a Summary for Storm
Pipe PIMP PIMP P	PIMP Gross Imp. Pipe Total
Number Type Name ((%) Area (ha) Area (ha) (ha)
1.000	100 0.064 0.064 0.064
1.001	100 0.074 0.074 0.074
2.000	100 0.085 0.085 0.085
1.002	100 0.000 0.000 0.000
1.003	100 <mark>0.166</mark> 0.166 0.166
1.004	100 0.109 0.109 0.109
	Total Total Total
	0.498 0.498 0.498
Simulati	ion Criteria for Storm
Volumetric Duroff Cooff	0.750 Additional Eleve % of motal Eleve 40.000
Areal Reduction Factor	1 000 MADD Factor \star 10m ³ /ba Storage 2 000
Hot Start (mins)	0 Inlet Coefficient 0.800
Hot Start Level (mm)	0 Flow per Person per Day (1/per/day) 0.000
Manhole Headloss Coeff (Global)	0.500 Run Time (mins) 60
Foul Sewage per hectare (l/s)	0.000 Output Interval (mins) 1
Number of Input Hydrographs 0 Number Number of Online Controls 1 Number of	er of Offline Controls O Number of Time/Area Diagrams of Storage Structures 2 Number of Real Time Controls
Synthet	etic Rainfall Details
Rainfall Model	FSR Profile Type Summer
Recuri Period (years) Region Engli	land and Wales Cv (Winter) 0.40
M5-60 (mm)	20.000 Storm Duration (mins) 30
Ratio R	0.350
	0.0017 WD.0.1.4
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CH2M Hill		Page 3
Ash House		
Falcon Road Sowton		4
Exeter EX2 7LB		m
Date 22/05/2018 15:27	Designed by IR065829	MICIO
File PORTISHEAD-CAT2.MDX	Checked by	Urainage
Micro Drainage	Network 2017.1.2	
Storage	Structures for Storm	
Tank or Pond	Manhole: 6, DS/PN: 1.002	
Inve	ert Level (m) 5.620	
Depth (m) Are	ea (m ²) Depth (m) Area (m ²)	
0.000	150.0 0.150 150.0	
Tank or Pond	Manhole: 8, DS/PN: 1.004	
Inve	ert Level (m) 5.150	
Depth (m) Are	ea (m²) Depth (m) Area (m²)	
0.000	60.0 0.150 60.0	
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CH2M Hill				Page 4
Ash House				
Falcon Road Sowt	ton			L.
Exeter EX2 7LB				Micco
Date 22/05/2018 15	5 : 27	Designed by	IR065829	
File PORTISHEAD-CA	AT2.MDX	Checked by		Drainage
Micro Drainage		Network 2017	7.1.2	
<u>30 year Return Pe</u>	eriod Summary	of Critical Res	sults by Maximum Outf	low (Rank 1)
		for Storm		
		Cimulation Critor		
Areal	Reduction Facto	r 1.000 Additio	<u>.14</u> nal Flow - % of Total Flo	w 40.000
111001	Hot Start (mins) 0 MAD	D Factor * 10m³/ha Storag	je 2.000
Hot	Start Level (mm) 0	Inlet Coeffiecier	nt 0.800
Manhole Headlo	ss Coeff (Global	0.500 Flow per	Person per Day (l/per/day	7) 0.000
FOUL Sewage	per nectare (1/s	0.000		
Number of Input Hydr	ographs 0 Numl	er of Offline Con	trols 0 Number of Time/A	rea Diagrams O
Number of Online C	Controls 1 Number	of Storage Struc	tures 2 Number of Real T	ime Controls 0
	Svr	thetic Bainfall D	etails	
	Rainfall Model	FSR	Ratio R 0.350	
	Region	England and Wales	Cv (Summer) 0.750	
	M5-60 (mm)	20.000	Cv (Winter) 0.840	
Marc	in for Flood Ris	k Warning (mm) 30	0.0 DVD Status OFF	
narg	Ana	lysis Timestep F	'ine Inertia Status OFF	
		DTS Status	ON	
	Profile(s)		Summer and Wi	nter
Dura	tion(s) (mins)	15, 30, 60, 120, 3	180, 240, 360, 480, 600,	720,
			960,	1440
Return Per	riod(s) (years)		1, 2, 5, 10, 30,	100
CIII	lace change (%)		0, 0, 0, 0, 0,	0, 0
				Water
US/MH	Return Clim	ate First (X)	First (Y) First (Z) Over	rflow Level
PN Name Sto:	rm Period Chai	ige Surcharge	Flood Overflow A	CC. (M)
1.000 1 15 Sur	mmer 30	+0% 10/15 Summer		6.552
1.001 2 15 Sur	mmer 30	+0% 5/15 Summer		6.434
2.000 5 15 Sur 1 002 6 60 Wi	mmer 30	+0% 100/15 Summer +0% 5/30 Winter		6.3/8
1.002 8 80 WI	mmer 30	+0% 5/30 Winter +0% 5/15 Summer		5.973
1.004 8 60 Win	nter 30	+0% 1/15 Summer		5.732
	0	- 1 - 1		
те/ м і	Surcharged Flo	ume Flow / Overf	ripe low Flow Le	vel
PN Name	(m) (1	(1/s) Cap. (1/s)	s) (1/s) Status Exc	eeded
1.000	1 0.277 0	.000 0.74	29.1 SURCHARGED	
	∠	.000 0.93	61.5 SURCHARGED 46.0 OK	
1.002	6 0.203 0	.000 1.00	30.0 SURCHARGED	
1				

CH2M Hill		Page 5
Ash House		
Falcon Road Sowton		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 15:27	Designed by IR065829	Desinado
File PORTISHEAD-CAT2.MDX	Checked by	Diamage
Micro Drainage	Network 2017.1.2	

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	7 8	0.138 0.357	0.000	1.02 1.19		41.2 48.1	SURCHARGED SURCHARGED	

CH2M Hill		Page 1
Ash House		
Falcon Road Sowton		L
Exeter EX2 7LB		Micco
Date 22/05/2018 15:29	Designed by IR065829	Desinado
File PORTISHEAD-CAT2.MDX	Checked by	Diamaye
Micro Drainage	Network 2017.1.2	

Existing Network Details for Storm

- Indicates pipe length does not match coordinates

PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)	
1.000	30.000	0.200	150.0	0.064	3.00	0.0	0.600	0	225	Pipe/Conduit
1.001	33.269	0.227	146.6	0.074	3.00	0.0	0.600	0	225	Pipe/Conduit
2.000	40.000#	0.400	100.0	0.085	3.00	0.0	0.600	0	225	Pipe/Conduit
1.002	1.000#	0.010	100.0	0.000	3.00	0.0	0.600	0	225	Pipe/Conduit
1.003	72.000#	0.460	156.5	0.166	3.00	0.0	0.600	0	225	Pipe/Conduit
1.004	45.000#	0.300	150.0	0.109	3.00	0.0	0.600	0	225	Pipe/Conduit

Network Results Table

PN	US/IL	Σ I.Area	Σ Base	Vel	Cap
	(m)	(ha)	Flow (l/s)	(m/s)	(1/s)
1.000	6.050	0.064	0.0	1.07	42.4
1.001	5.850	0.138		1.08	42.9
2.000	6.200	0.085	0.0	1.31	52.0
1.002	5.620	0.223	0.0	1.31	52.0
1.003	5.610	0.389	0.0	1.04	41.5
1.004	5.150	0.498	0.0	1.07	42.4

CH2M Hill	Page 2									
Ash House										
Falcon Road Sowton	L'									
Exeter EX2 7LB	Micro	m								
Date 22/05/2018 15:29	Designed by IR065829									
File PORTISHEAD-CAT2.MDX	Checked by	ge								
Micro Drainage	Network 2017.1.2									
Area Summary for Storm										
Pipe PIMP PIMP P	PIMP Gross Imp. Pipe Total									
Number Type Name ((%) Area (ha) Area (ha) (ha)									
1.000	100 0.064 0.064 0.064									
1.001 1	100 0.074 0.074 0.074									
2.000 :	100 0.085 0.085 0.085									
1.002 2	100 0.000 0.000 0.000									
1.003 2	100 0.166 0.166 0.166									
1.004 1	100 0.109 0.109 0.109									
	Total Total Total									
	0.498 0.498 0.498									
Simulati	ion Criteria for Storm									
Volumetric Pupoff Cooff (0.750 Additional Flow - % of Total Flow 40.000									
Areal Reduction Factor	1.000 MADD Factor $* 10m^3/ha$ Storage 2.000									
Hot Start (mins)	0 Inlet Coefficient 0.800									
Hot Start Level (mm)	0 Flow per Person per Day (1/per/day) 0.000									
Manhole Headloss Coeff (Global) (0.500 Run Time (mins) 60									
Foul Sewage per hectare (l/s) (0.000 Output Interval (mins) 1									
Number of Input Hydrographs 0 Number Number of Online Controls 1 Number o	r of Offline Controls O Number of Time/Area Diagram of Storage Structures 2 Number of Real Time Control	s 0 s 0								
Synthet	tic Rainfall Details									
Rainfall Model	FSR Profile Type Summer									
Recurin Period (years) Region Englis	and and Wales Cv (Winter) 0.840									
M5-60 (mm)	20.000 Storm Duration (mins) 30									
Ratio R	0.350									
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CH2M Hill		Page 3								
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Ash House										
Falcon Road Sowton		4								
Exeter EX2 7LB		m								
Date 22/05/2018 15:29	Designed by IR065829	MICIO								
File PORTISHEAD-CAT2.MDX	Checked by	Urainage								
Micro Drainage	Network 2017.1.2									
Storage	Structures for Storm									
Tank or Pond	Manhole: 6, DS/PN: 1.002									
Invert Level (m) 5.620										
Depth (m) Area (m²) Depth (m) Area (m²)										
0.000	150.0 0.150 150.0									
Tank or Pond	Manhole: 8, DS/PN: 1.004									
Invert Level (m) 5.150										
Depth (m) Area (m²) Depth (m) Area (m²)										
0.000	60.0 0.150 60.0									
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CH2M Hill	Page 4										
Ash House											
Falcon Road Sowton	4										
Exeter EX2 7LB	Mission										
Date 22/05/2018 15:29	Designed by IR065829										
File PORTISHEAD-CAT2 MDX											
Micro Draipage	Network 2017 1 2										
	NCCWOIR ZOI/.I.Z										
Summary of Critical Result	ts by Maximum Outflow (Rank 1) for Storm										
s	Simulation Criteria										
Areal Reduction Factor	1.000 Additional Flow - % of Total Flow 40.000										
Hot Start (mins)	Hot Start (mins) 0 MADD Factor * 10m ³ /ha Storage 2.000										
Hot Start Level (mm)	U Inlet Coefficient U.800										
Foul Sewage per hectare (1/s)	0.000 Flow per Person per bay (1/per/day) 0.000										
Number of Input Hydrographs 0 Number	er of Offline Controls 0 Number of Time/Area Diagrams 0										
Number of Online Controls 1 Number	of Storage Structures 2 Number of Real Time Controls 0										
Sunt	hetic Rainfall Details										
Rainfall Model	FSR Ratio R 0.350										
Region E	ngland and Wales Cv (Summer) 0.750										
M5-60 (mm)	20.000 Cv (Winter) 0.840										
Margin for Flood Bisk	Warning (mm) 300 0 DVD Status OFF										
Anal	ysis Timestep Fine Inertia Status OFF										
	DTS Status ON										
Profile(s) Summer and Winter											
Duration(s) (mins) 15	5, 30, 60, 120, 180, 240, 360, 480, 600, 720,										
	960, 1440										
Return Period(s) (years)	1, 2, 5, 10, 30, 100										
Climate change (%)											
US/MH Beturn Clima	Water The First (X) First (Z) Overflow Level										
PN Name Storm Period Chang	e Surcharge Flood Overflow Act. (m)										
1.000 1 15 Summer 100 +(0% 10/15 Summer 6.978										
2.000 5 15 Summer 100 +0	0% 100/15 Summer 6.618										
1.002 6 60 Winter 100 +4	0% 5/30 Winter 6.239										
1.003 7 15 Summer 100 +0	0% 5/15 Summer 6.130										
1.004 8 60 Winter 100 +0	0% 1/15 Summer 5.858										
Surcharged Floor	ded Pipe										
US/MH Depth Volu	me Flow / Overflow Flow Level										
PN Name (m) (m ³) Cap. (l/s) (l/s) Status Exceeded										
1.001 2 0.727 0.0	000 1.90 76.6 SURCHARGED										
2.000 5 0.193 0.0	000 1.19 58.8 SURCHARGED										
1.002 6 0.394 0.0											
1.003 7 0.295 0.0	000 1.11 34.6 SURCHARGED										

CH2M Hill								Page 5
Ash House								
Falcon Road	Sowto	on						4
Exeter EX2	71.B							~~~
Date 22/05/20	18 15	• 2 9	Т	Designe	d by TR	165829)	MICLO
File PORTISHE		,29 T2 MDY		- hecked	hy	00021		Drainage
Micro Drainad		12.107		Jotwork	· 2017 1	2		3
MICIO DIAIMAG	6		1	NECWOIN	2017.1	• 2		
Summar	y of (Critical R	esults	by Max	imum Out	flow	(Rank 1)	for Storm
	US/MH	Surcharged Depth	Flooded Volume	Flow /	Overflow	Pipe Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(1/s)	Status	Exceeded
1.004	8	0.483	0.000	1.30		52.5	SURCHARGED	
			<u>a1000 (</u>	0017				
			©1982-2	ZUI/ XE	Solutio	ons		

CH2M		Page 1
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 18/05/2018 16:42	Designed by DD048136	Desinado
File Porstishead Station - Ca	Checked by	Diamaye
XP Solutions	Network 2017.1.2	
STORM SEWER DESIGN	by the Modified Rational Method	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Ba Flow	ase (1/s)	k (mm)	n	HY SEC	D CT	DIA (mm)	Section Type	Auto Design
		• •			. ,							. ,		2
S1.000	15.402	0.100	154.0	0.034	5.00		0.0	0.600			0	150	Pipe/Conduit	8
S1.001	18.201	0.300	60.7	0.048	0.00		0.0	0.600			0	150	Pipe/Conduit	ē
S1.002	20.065	0.400	50.2	0.047	0.00		0.0		0.040	4 \	=/	1000	1:4 Swale	
S1.003	20.093	0.300	67.0	0.035	0.00		0.0		0.040	4 \	=/	1000	1:4 Swale	
S1.004	20.020	0.550	36.4	0.073	0.00		0.0		0.040	4 \	=/	1000	1:4 Swale	ē
S1.005	20.753	0.250	83.0	0.035	0.00		0.0		0.040	4 \	=/	1000	1:4 Swale	6
S1.006	15.035	0.090	167.1	0.000	0.00		0.0	0.600			0	225	Pipe/Conduit	ē

Network Results Table

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(1/s)	(m/s)	(l/s)	(l/s)
~1 ~~~			c				0.0			
SI.000	50.00	5.32	6.800	0.034	0.0	0.0	0.0	0.81	14.3	4.6
S1.001	50.00	5.55	6.650	0.082	0.0	0.0	0.0	1.29	22.9	11.2
S1.002	50.00	5.97	7.550	0.129	0.0	0.0	0.0	0.80	191.3	17.5
S1.003	50.00	6.46	7.150	0.164	0.0	0.0	0.0	0.69	165.5	22.2
S1.004	50.00	6.81	6.850	0.237	0.0	0.0	0.0	0.94	224.5	32.1
S1.005	50.00	7.37	6.300	0.273	0.0	0.0	0.0	0.62	148.7	36.9
S1.006	50.00	7.62	4.850	0.273	0.0	0.0	0.0	1.01	40.1	36.9

CH2M									Page	e 2
Ash Hous	e									
Falcon R	oad								4	~
Exeter	EX2 7	LB							Mi	Jun
Date 18/	05/201	8 16:42		De	signed	l by DD	048136			
File Por	stishe	ad Static	on – Ca	1 Ch	ecked	by			DIG	anaye
XP Solut	ions			Ne	twork	2017.1	.2			
<u>30 year</u>	Retur	n Period	Summar	ry of C	ritica	l Resu	lts by	Maximum	Level (F	Rank 1)
				f	or Sto	rm				
				Simul	ation Ci	riteria				
		Areal Reduc	tion Fac	ctor 1.00	00 Ado	ditional	Flow -	% of Total	Flow 0.00	0
		Hot S	tart (m:	ins) (mm)	0	MADD F	actor *	10m ³ /ha Sto	orage 2.00	0
Ма	nhole H	eadloss Coe	ff (Glo	(mm) bal) 0.50	0 DO Flow	per Per	son per	Dav (l/per/	/dav) 0.00	0
	Foul Se	wage per he	ctare (1	l/s) 0.00	00	1	1	1 1 .	1,	
Number	f Trout	Undrograph	G () NT-	umbor of	Offlig	Contra	10 0 10	bor of Tim	o/Aros Dis	aroma 0
Number o Number	of Onl:	hydrograpn ine Control	s 0 Ni s 6 Numl	umber of ber of St	torage S	tructure	is 0 Nun es 6 Nun	nber of lime nber of Real	e/Area Dia l Time Con	grams U trols O
					2					
		Dainf	Sil Modo	Synthetic	c Rainfa	ll Detai	<u>lls</u>	0 0 250		
		Kailli	Regio	⊥ n Englan	d and W	ales Cv	(Summer) 0.750		
		M	5-60 (mm	.)	20	.000 Cv	(Winter) 0.840		
		Margin for	Flood	Diele Mann	ing (mm		DUP	Status OF	P	
		Margin ior	F1000 I	Analysis	Timeste	p Fine	Inertia	Status OFI Status OFI	F	
				נס	CS Statu	s ON				
		Pro	ofile(s)					Summer and	d Winter	
		Duration(s)	(mins)	15, 30	0, 60, 1	20, 180	, 240, 3	60, 480, 60	0, 720,	
				960, 1	1440, 21	.60, 288	0, 4320,	5760, 7200), 8640, 10080	
	Returr	n Period(s)	(years)						30	
		Climate Cha	ange (%)						40	
										Water
	US/MH	a .	Return	Climate	First	(X) F	'irst (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surch	arge	Flood	Overflow	Act.	(m)
S1.000	SFD1	120 Winter	30	+40%	30/15 \$	Summer				8.120
S1.001	SFD2	120 Winter	30	+40%	30/15 \$	Summer				8.102
S1.002 S1.003	SSW1 SSW2	15 Winter 15 Winter	30 30	+40% +40%						7.434
s1.004	SSW3	15 Winter	30	+40%						7.157
S1.005	SSW4	30 Summer	30	+40%	20/15					6.616
S1.006	SOUTIET	30 Winter	30	+40%	30/15 \$	summer				6.389
		Sur	charged	Flooded	F lart (0	Pipe		T acc- 1	
	PN	Name	(m)	(m ³)	Cap.	(1/s)	(1/s)	Status	Exceeded	
	a1 000	0751			• •				-	
	51.000	SFDI	1.170	0.000	0.30		3.9	FLOOD RISK		
			©1	982-20	17 XP	Soluti	ons			

CH2M		Page 3
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 18/05/2018 16:42	Designed by DD048136	Desinado
File Porstishead Station - Ca	Checked by	Diamaye
XP Solutions	Network 2017.1.2	
30 year Return Period Summary of	f Critical Results by Maximum Leve	el (Rank 1)
	for Storm	

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	SFD2	1.302	0.000	0.44		9.4	FLOOD RISK	
S1.002	SSW1	-0.079	0.000	0.02		22.7	FLOOD RISK	
S1.003	SSW2	-0.066	0.000	0.04		32.7	FLOOD RISK	
S1.004	SSW3	-0.043	0.000	0.05		58.3	FLOOD RISK	
S1.005	SSW4	-0.034	0.000	0.08		66.6	FLOOD RISK	
S1.006	SOutlet	1.314	0.000	1.01		35.7	FLOOD RISK	

CH2M Hill									Page 1
Ash House									
Falcon Roa	id Sow	ton							L
Exeter E	X2 7LB								Micco
Date 23/05	6/2018 2	2:40		Desi	gned by	IR0658	29		
File PORTI	SHEAD-C	AT3-1008	RP.MDX	Chec	ked by				Drainacje
Micro Drai	nage			Netw	ork 201	7.1.2			
Micro Drai Summan Manho Fou Number of I Number of	nage ry of Cr Area Ho ole Headl al Sewage Input Hyd: Online of Mar	l Reducti Hot Sta t Start L oss Coeff per hect rographs Controls Rainfal M5-6 gin for F	Results on Factor rt (mins) evel (mm) (Global) are (1/s) 0 Number 6 Number 6 Number 1 Model Region E 60 (mm) Clood Risk Anal	Netwo by Max Simulati 1.000 0 0.500 0.000 er of Of of Stor hetic Ra ngland a : Warning	ork 201 imum Fl on Crite Additi MA Flow per fline Con age Struc ainfall E FSR and Wales 20.000 g (mm) 30 mestep 1	7.1.2 <u>ria</u> onal Flow DD Factor Person p ntrols 0 ctures 6 <u>Petails</u> Rat Cv (Sum Cv (Win 00.0 Fine Iner	.ume (1 v - % of c * 10m Inlet o ber Day Number Number io R 0. mer) 0. ter) 0. ter) 0. DVD Statestia Statestia	Rank 1) for f Total Flo '/ha Storag Coeffiecien (1/per/day of Time/Ar of Real Ti .350 .750 .840 atus OFF atus OFF	or Storm w 0.000 e 2.000 t 0.800) 0.000 rea Diagrams 0 me Controls 0
F	Dur Return Pe Clin	Prof ation(s) riod(s) (mate Chan	ile(s) (mins) 1 years) ge (%)	DTS ;	Status	ON 180, 240	Sum , 360,	mer and Wir 480, 600, 7 960, 1 30, 40,	nter 220, 440 100 40
PN	US/MH Name	Storm	Return C Period (limate Change	First (X) Fi	.rst (Y) Flood	First (Z) Overflow
S1.000 S1.001 S1.002 S1.003 S1.004 S1.005 S1.006 S0	SFD1 60 SFD2 60 SSW1 60 SSW2 60 SSW3 60 SSW4 60 Outlet 6	00 Winter 00 Winter 00 Winter 00 Winter 00 Winter 00 Winter	30 30 30 30 30 30 30 100	+40% +40% +40% +40% +40% +40% +40%	30/15 Sun 30/15 Sun 30/15 Sun	mer mer mer 100/	15 Summ	ner	
		Water Su	urcharged	Flooded	1		Pipe		
PN	US/MH Name	Level (m)	Depth (m)	Volume (m ³)	Flow /	Overflow	Flow	Status	Level
EN		()	(20)	(Sup.	(1)3)	(-, -, -,	Julus	LACCELEU
S1.000	SFD1	8.092	1.142	0.000	0.12		1.6	FLOOD RISK	
S1.001	SFD2	8.085	1.285	0.000	0.18		3.9	FLOOD RISK	
s1.002	SSW1 SSW2	7.396	-0.108	0.000	0.01		0.2 7.8	FLOOD RISK	
				0.0017					
			©198	2-2017	XP Sol	utions			

CH2M Hill		Page 2
Ash House		
Falcon Road Sowton		L.
Exeter EX2 7LB		Micco
Date 23/05/2018 22:40	Designed by IR065829	Desinado
File PORTISHEAD-CAT3-100RP.MDX	Checked by	Diamaye
Micro Drainage	Network 2017.1.2	•

Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (1/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.004	SSW3	7.104	-0.096	0.000	0.01		11.3	FLOOD RISK	
S1.005	SSW4	6.557	-0.093	0.000	0.02		13.0	FLOOD RISK	
S1.006	SOutlet	6.414	1.339	14.008	1.01		35.7	FLOOD	8

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CH2M Hill										Page 1
Ash House										
Falcon Road	d Sowton									4
Exeter EX	(2 7LB									m
Date 16/05/	/2018 17:0	5		Desi	gned b	y IR0658	29			MILLO
File Portis	shead-Cat4	a-1-30	.SRCX	Chec	ked bv	-				Urainage
Micro Drair	age			Sour	ce Con	t.rol 201	7.1.2			
	Summar	y of R	esults	for 3	30 year	Return	Perio	d (+40	1응)	
			Half I)rain Ti	.me : 625	minutes.				
	Storm	Max	Max	Max	1	lax M	lax	Max	Stat	tus
	Event	Level	Depth I	nfiltra	tion Cor	ntrol Σ Ou	tflow	Volume		
		(m)	(m)	(1/s)) (1	L/s) (1	./s)	(m³)		
15	min Summer	6.587	0.137		0.0	0.5	0.5	16.3		ОК
30	min Summer	6.617	0.167		0.0	0.5	0.5	21.7		O K
60	min Summer	6.647	0.197		0.0	0.6	0.6	27.2		O K
120	min Summer	6.676	0.226		0.0	0.6	0.6	32.5		O K
180	min Summer	6.690	0.240		0.0	0.6	0.6	35.1		O K
240	min Summer	6.698	0.248		0.0	0.6	0.6	36.6		0 K
360	min Summer	6.707	0.257		0.0	0.6	0.6	38.0	Flood	Risk
480	min Summer	6.709	0.259		0.0	0.6	0.6	38.4	Flood	Risk
600	min Summer	6./10	0.260		0.0	0.6	0.6	38.6	Flood	Risk
120	min Summer	6.709	0.259		0.0	0.6	0.6	38.6	Flood	Risk
1440	min Summer	6 701	0.250		0.0	0.6	0.0	36.9	Flood	RISK
2160	min Summer	6 687	0.231		0.0	0.0	0.0	34 4	rioou	0 K
2880	min Summer	6.673	0.223		0.0	0.6	0.6	32.0		0 K
4320	min Summer	6.649	0.199		0.0	0.6	0.6	27.6		ΟK
5760	min Summer	6.629	0.179		0.0	0.5	0.5	23.8		O K
7200	min Summer	6.612	0.162		0.0	0.5	0.5	20.7		O K
8640	min Summer	6.597	0.147		0.0	0.5	0.5	18.1		O K
		Stor	n	Bain	Flooded	Discharg	- Time	-Poak		
		Event	-	(mm/hr)	Volume	Volume	(mi	ins)		
				()	(m ³)	(m ³)	,	,		
	1	5 min c	lummor '	101 754	0 0	16	2	26		
	1	.) IIIII 3 20 min 9	Summer.	67 708	0.0	22	5	20		
	F	50 min S	Summer	43 136	0.0	22.	5 7	70		
	12	20 min S	Summer	26.651	0.0	35.	, 6	128		
	18	30 min S	Summer	19.868	0.0	39.	8	186		
	24	10 min S	Summer	16.054	0.0	42.	9	244		
	36	50 min S	Summer	11.891	0.0	47.	7	362		
	48	30 min S	Summer	9.596	0.0	51.	4	446		
	60)0 min S	Summer	8.121	0.0	54.	4	502		
	72	20 min S	Summer	7.083	0.0	56.	9	564		
	96	50 min S	Summer	5.703	0.0	61.	1	694		
	144	U min S	Summer	4.198	0.0	67.	4	970		
	216	ou min S	Summer	3.085	0.0	74.	5	1702		
	∠88 //30	oo min S O min S	Summer	2.4// 1 816	0.0	19.	ר ר	1/92 2596		
	576	50 min S	Summer	1.456	0.0	93	2	3352		
1							_			

7200 min Summer

8640 min Summer 1.067

1.227

0.0

0.0

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98.0

102.2

4112

CH2M Hill										Page 2
Ash House										
Falcon Road	Sowton									L
Exeter EX	2 7LB									Micco
Date 16/05/	2018 17:05	5		Desi	gned	by IRO	65829			
File Portis	head-Cat4a	a-1-30	.SRCX	Chec	ked b	У				Digitige
Micro Drain	age			Sour	ce Co	ntrol	2017.1	L.2		
	Summary	y of R	esults	for 3	0 yea	r Retu	rn Per	riod	(+40	20)
	Storm	Max	Max	Max	1	Max	Max		Max	Status
	Event	Level	Depth I	nfiltra	ation C	Control	Σ Outf	low	Volume	
		(m)	(m)	(1/s)	(l/s)	(1/s)	(m³)	
10080	min Summer	6.585	0.135		0.0	0.5		0.5	15.8	0 K
15	min Winter	6.599	0.149		0.0	0.5		0.5	18.4	O K
30	min Winter	6.632	0.182		0.0	0.5		0.5	24.4	O K
60	min Winter	6.666	0.216		0.0	0.6		0.6	30.6	O K
120	min Winter	6.699	0.249		0.0	0.6		0.6	36.7	O K
180	min Winter	6.716	0.266		0.0	0.7		0.7	39.8	Flood Risk
240	min Winter	6.726	0.276		0.0	0.7		0.7	41.6	Flood Risk
360	min Winter	6.737	0.287		0.0	0.7		0.7	43.6	Flood Risk
480	min Winter	6.741	0.291		0.0	0.7		0.7	44.3	Flood Risk
600	min Winter	6.741	0.291		0.0	0.7		0.7	44.4	Flood Risk
720	min Winter	6.740	0.290		0.0	0.7		0.7	44.2	Flood Risk
960	min Winter	6.738	0.288		0.0	0.7		0.7	43.7	Flood Risk
1440	min Winter	6.727	0.277		0.0	0.7		0.7	41.8	Flood Risk
2160	min Winter	6.707	0.257		0.0	0.6		0.6	38.0	Flood Risk
2880	min Winter	6.686	0.236		0.0	0.6		0.6	34.3	O K
4320	min Winter	6.650	0.200		0.0	0.6		0.6	27.8	O K
5760	min Winter	6.622	0.172		0.0	0.5		0.5	22.6	O K
7200	min Winter	6.599	0.149		0.0	0.5		0.5	18.4	O K
8640	min Winter	6.581	0.131		0.0	0.4		0.4	15.1	O K
		Stor	n	Rain	Flood	ed Disch	narge 1	'ime-	Peak	
		Event	:	(mm/hr)	Volum	e Vol	ume	(miı	ns)	
					(m³)	(m	3)			
	1008	30 min	Summer	0.948	0	.0 1	L05.8		5552	
	1	5 min	Winter 1	101.754	0	.0	18.8		26	

10000	111111	Summer	0.940	υ.	0	103.0	5552
15	min	Winter	101.754	0.	0	18.8	26
30	min	Winter	67.708	Ο.	0	25.2	40
60	min	Winter	43.136	Ο.	0	32.2	68
120	min	Winter	26.651	Ο.	0	39.9	126
180	min	Winter	19.868	Ο.	0	44.7	182
240	min	Winter	16.054	0.	0	48.1	240
360	min	Winter	11.891	Ο.	0	53.5	352
480	min	Winter	9.596	0.	0	57.6	462
600	min	Winter	8.121	0.	0	60.9	564
720	min	Winter	7.083	0.	0	63.8	590
960	min	Winter	5.703	0.	0	68.5	740
1440	min	Winter	4.198	0.	0	75.3	1046
2160	min	Winter	3.085	0.	0	83.3	1496
2880	min	Winter	2.477	0.	0	89.1	1932
4320	min	Winter	1.816	0.	0	97.9	2736
5760	min	Winter	1.456	0.	0	104.5	3520
7200	min	Winter	1.227	0.	0	110.0	4264
8640	min	Winter	1.067	0.	0	114.6	5016
		©19	82-2017	XP Sc	olut	cions	

CH2M Hill						Page 3
Ash House						
Falcon Road Sowton						4
Exeter EX2 7LB						Mirro
Date 16/05/2018 17:05		De	esigned by	y IR065829	9	Desipado
File Portishead-Cat4a-	-1-30.SRC	CX CP	necked by			Diamage
Micro Drainage		Sc	ource Cont	trol 2017	.1.2	
Summary	of Resul	ts for	: 30 year	Return Pe	eriod (+40	<u>%)</u>
Sharm.			Man	Mass		Ototuo
Event	Max M Level De	ax pth Inf	Max iltration (Max Control Σ O	Max Max Matflow Volum	ne Status
	(m) (i	m)	(l/s)	(l/s) ((1/s) (m ³))
10080 min Wintor	- 6 566 O	116	0 0	0 4	0 4 12	3 0 12
	0.000 0.	110	0.0	0.4	0.4 12	.5 0 K
	Storm	Rai	n Flooded	Discharge	Time-Peak	
	Evenc	(11111) 1	(m ³)	(m ³)	(mins)	
10080	min Winte	er 0.9	948 0.0	118.7	5752	
	©1	982-20)17 XP Sol	lutions		

CH2M Hill	Page 4
Ash House	
Falcon Road Sowton	L.
Exeter EX2 7LB	Micco
Date 16/05/2018 17:05	Designed by IR065829
File Portishead-Cat4a-1-30.SRCX	Checked by
Micro Drainage	Source Control 2017.1.2
Ra	infall Details
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40
Tin	ne Area Diagram
Tota	al Area (ha) 0.090
Time (mins) Area Ti From: To: (ha) Fro	me (mins) Area Time (mins) Area om: To: (ha) From: To: (ha)
0 4 0.030	4 8 0.030 8 12 0.030
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CH2M Hill		Page 5
Ash House		
Falcon Road Sowton		4
Exeter EX2 7LB		Micro
Date 16/05/2018 17:05	Designed by IR065829	
File Portishead-Cat4a-1-30.SRCX	Checked by	Diamage
Micro Drainage	Source Control 2017.1.2	
	Model Details	
Storage is C	Online Cover Level (m) 7.000	
Porous	Car Park Structure	
Infiltration Coefficient Base Membrane Percolation Max Percolation Safety Po Invert Lev	(m/hr) 0.00000 Width (m) (mm/hr) 1000 Length (m) n (1/s) 53.3 Slope (1:X) Factor 2.0 Depression Storage (mm) prosity 0.95 Evaporation (mm/day) vel (m) 6.450 Cap Volume Depth (m)	4.0 48.0 500.0 2 1 0.300
Orifi	ce Outflow Control	
Diameter (m) 0.025 Discharg	re Coefficient 0.600 Invert Level (m) 6.4	150
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CH2M Hill												Page 1
Ash House												
Falcon Road	Sowton											4
Eveter EX	2 71.B											1 mm
Date 16/05/	2018 17.0	6		Des	aigned		Micro					
Date 10/03/	2010 17.0	V Ob	signed	Drainage								
File Portis	nead-Cat4	a-1-1	UU.SRC	x cne	ескеа	Υα			1 0			
Micro Drain	age	Sou	Source Control 2017.1.2									
	Summary of Results for 100 year Return Period (+40%)											
Half Drain Time · 636 minutes												
			narr			000	minuce					
	Storm	Max	Max	Ma: Trafilta	x	Ma	ax Faci T	Max	1	Max	Stat	tus
	Evenc	(m)	(m)	(1/		(1)		(1/a	TOM	(m ³)		
		(111)	(111)	(1)	3)	(1)	, 3)	(1/3	,	(111)		
15	min Summer	6.615	0.165		0.0		0.5		0.5	21.3		ОК
30	min Summer	6.655	0.205		0.0		0.6		0.6	28.6		ОК
60	min Summer	6.696	0.246		0.0		0.6		0.6	36.1		O K
120	min Summer	6.736	0.286		0.0		0.7		0.7	43.3	Flood	Risk
180	min Summer	6.755	0.305		0.0		0.7		0.7	46.8	Flood	Risk
240	min Summer	6.767	0.317		0.0		0.7		0.7	48.8	Flood	Risk
360	min Summer	6.782	0.332		0.0		0.7		0.7	50.9	Flood	Risk
480	min Summer	6.787	0.337		0.0		0.7		0.7	51.5	Flood	Risk
600	min Summer	6.788	0.338		0.0		0.7		0.7	51.5	Flood	Risk
720	min Summer	6./8/	0.337		0.0		0.7		0.7	51.4	Flood	Risk
960	min Summer	6.783	0.333		0.0		0.7		0.7	JI.U	Flood	Risk
2160	min Summer	6 751	0.320		0.0		0.7		0.7	49.3	Flood	RISK
2880	min Summer	6 733	0.301		0.0		0.7		0.7	40.1 12 9	Flood	Diek
4320	min Summer	6 702	0.203		0.0		0.7		0.7	37 2	Flood	Risk
5760	min Summer	6.676	0.226		0.0		0.6		0.6	32.4	1 1000	0 K
7200	min Summer	6.654	0.204		0.0		0.6		0.6	28.4		0 K
8640	min Summer	6.635	0.185		0.0		0.5		0.5	25.0		ΟK
		Stor	m	Rain	Floo	ded	Discha	rge '	Time-	-Peak		
		Even	t	(mm/hr) Volu	ume	Volum	ne	(mi	ns)		
					(m ³	•)	(m³)					
	1	5 min	Summer	131.85	1	0.0	22	1.9		26		
	3	0 min	Summer	88.56	6	0.0	2	9.5		41		
	6	0 min	Summer	56.71	3	0.0	3'	7.9		70		
	12	0 min	Summer	35.00	4	0.0	4	6.9		128		
	18	0 min	Summer	25.97	3	0.0	52	2.2		186		
	24	0 min	Summer	20.87	/	0.0	51	6.U		246		
	36	o min	Summer	10.30	D 1	0.0	ю. С	1.8 6.2		362		
	40	0 min	Summor	10 10	1 2	0.0	61	0.2 0.9		480 530		
	00 70	0 min	Summer	- 0 . 40. 9 . 0.1	2	0.0	0: 7	2.8		594		
	96	0 min	Summer	7.24	- 1	0.0	7	7.7		720		
	144	0 min	Summer	5.28	4	0.0	8.	3.3		988		
	216	0 min	Summer	3.84	8	0.0	92	2.8		1408		
	288	0 min	Summer	3.06	8	0.0	98	8.6		1820		
	432	0 min	Summer	2.22	6	0.0	10	7.2		2604		
	576	0 min	Summer	1.77	1	0.0	113	3.6		3400		
	720	0 min	Summer	1.48	3	0.0	118	8.8		4176		
	864	0 min	Summer	1.28	4	0.0	123	3.3		4920		
			©19	82-201	.7 XP	Sol	utions	S				

CH2M Hill									Page 2			
Ash House												
Falcon Road Sowton									4			
Exeter EX2 7LB									Jun			
Date 16/05/2018 17:06)		Desi	Designed by IR065829								
File Portishead-Cat4a	-1-1(0.SRC	X Chec	Checked by								
Micro Drainage			Sour	Source Control 2017.1 2								
Summary	of R	esults	for 10)0 yea	r Reti	ırn P	erio	d (+40)응)			
Storm	Max	Max	Max		Max	Ma	x	Max	Status			
Event	Level	Depth (m)	Infiltra	tion Co	ontrol	Σ Out	flow	Volume				
	(m)	(m)	(1/5))	(1/5)	(1)	5)	(m-)				
10080 min Summer	6.620	0.170		0.0	0.5		0.5	22.2	O K			
15 min Winter	6.630	0.180		0.0	0.5		0.5	24.0	O K			
30 min Winter	6.674	0.224		0.0	0.6		0.6	32.2	ОК			
60 min Winter	6.721	0.271		0.0	0.7		0.7	40.7	Flood Risk			
120 min Winter	6./68	0.318		0.0	0.7		0.7	48.9	Flood Risk			
180 min Winter	6.803	0.353		0.0	1.0		1.0	53.0	Flood Risk			
240 min Winter 260 min Winter	7.000	0.550		0.0	1.0		1.0	55.2	FLOOD			
180 min Winter	7.002	0.552		0.0	1 0		1 0	57.8	FLOOD			
600 min Winter	7.003	0.553		0.0	1.0		1.0	57.7	FLOOD			
720 min Winter	7.003	0.553		0.0	1.0		1.0	57.7	FLOOD			
960 min Winter	7.002	0.552		0.0	1.0		1.0	57.2	FLOOD			
1440 min Winter	7.000	0.550		0.0	1.0		1.0	55.2	FLOOD			
2160 min Winter	6.786	0.336		0.0	0.7		0.7	51.4	Flood Risk			
2880 min Winter	6.754	0.304		0.0	0.7		0.7	46.7	Flood Risk			
4320 min Winter	6.709	0.259		0.0	0.6		0.6	38.4	Flood Risk			
5760 min Winter	6.672	0.222		0.0	0.6		0.6	31.8	O K			
7200 min Winter	6.643	0.193		0.0	0.6		0.6	26.4	O K			
8640 min Winter	6.619	0.169		0.0	0.5		0.5	22.0	O K			
	Stor	m	Rain	Floode	d Disc	harge	Time	-Peak				
	Even	t	(mm/hr)	Volume	e Vol	Lume	(mi	ns)				
				(m³)	(m	n³)	•					
1000	0 min	Summor	1 1 2 7	\cap	0	127 2		5648				
1	5 min	Winter	131.851	0	0	24.5		26				
3	0 min	Winter	88.566	0.	0	33.0		40				
6	0 min	Winter	56.713	0.	0	42.5		68				
12	0 min	Winter	35.004	0.	0	52.5		126				
18	0 min	Winter	25.973	Ο.	0	58.5		184				
24	0 min	Winter	20.877	0.	4	62.7		240				
36	0 min	Winter	15.365	2.	4	69.3		352				
48	0 min	Winter	12.341	З.	1	74.2		458				
60	0 min	Winter	10.402	З.	0	78.2		546				
72	0 min	Winter	9.042	3.	0	81.5		572				
96	0 min	Winter	7.241	2.	4	87.0		724				
144	0 min	Winter	5.284	0.	5	91.2		1026				
216	U min	Winter	3.848	0.	U	1104.0		1516				
288	U min	Winter	3.068	Ο.	U	110.6		T 9 6 0				

4320 min Winter

7200 min Winter

4320 min Winter 2.228 5760 min Winter 1.771

8640 min Winter 1.284

2.226

1.483

0.0

0.0

0.0

0.0

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120.2

127.3

133.2

138.3

2776

3584

4336

CH2M Hill									Page 3	
Ash House										
Falcon Road	Sowton								4	
Exeter EX2	7LB								Micco	m
Date 16/05/20	018 17:06			Desi	gned by	IR065829)			-
File Portishe	ead-Cat4a-	-1-100.	SRCX	Chec	ked by				Uldille	lige
Micro Drainac	ge			Sour	ce Cont	rol 2017.	1.2			
	Summary	of Resu	ilts :	for 10	0 year	Return P	eriod	(+40%)	_	
									.	
	Storm	Max	Max Depth	Ma Trifilt	ax ration C	Max I	Max utflow N	Max	Status	
	270.00	(m)	(m)	(1/	/s)	(1/s) (1/s)	(m ³)		
10000		6 500				0.5	0 5			
10080	min Winter	6.599	0.149		0.0	0.5	0.5	18.4	ОК	
		Storm		Rain	Flooded	Discharge	Time-Pe	ak		
		Event	(:	mm/hr)	Volume	Volume	(mins)			
					(m³)	(m³)				
	10080	min Wir	nter	1.137	0.0	142.7	58	48		
			©1982	-2017	XP Sol	utions				

CH2M Hill	Page 4
Ash House	
Falcon Road Sowton	L.
Exeter EX2 7LB	Micro
Date 16/05/2018 17:06	Designed by IR065829
File Portishead-Cat4a-1-100.SRCX	Checked by
Micro Drainage	Source Control 2017.1.2
<u>Ra</u>	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40
Tin	ne Area Diagram
Tot	al Area (ha) 0.090
Time (mins) Area T. From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)
0 4 0.030	4 8 0.030 8 12 0.030
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CH2M Hill		Page 5
Ash House		
Falcon Road Sowton		L.
Exeter EX2 7LB		Micco
Date 16/05/2018 17:06	Designed by IR065829	Desinado
File Portishead-Cat4a-1-100.SRCX	Checked by	Diamaye
Micro Drainage	Source Control 2017.1.2	
1	Model Details	
Storage is O	nline Cover Level (m) 7.000	
Porous	Car Park Structure	
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	(m/hr) 0.00000 Width (m) (mm/hr) 1000 Length (m) n (1/s) 53.3 Slope (1:X) Factor 2.0 Depression Storage (mm) prosity 0.95 Evaporation (mm/day) rel (m) 6.450 Cap Volume Depth (m)	4.0 48.0 500.0 2 1 0.300
Orific	ce Outflow Control	
	e coefficient o.ooo invert hever (my o.o	
01000	2017 VD Solutions	
©1982·	-2017 XP Solutions	



CH2M Hill											Page 1		
Ash House													
Falcon Road	Sowton										4		
Exeter EX	2 7LB										Y	m	
Date 16/05/	2018 17:0	0		Desi	aned	bv IRC	6582	9			MICIO		
File Portis	head-Cat4	- h-1-3	0 SRCS	Chec	rked b	V		-			Uraina	IQ6	
Micro Drain			0.01(02	Sour		<u>ntrol</u>	2017	1 2					
MICIO DIAIN	aye			5001		IICLOI	2017	• 1 • 2					
Summary of Results for 30 year Return Period (+40%)													
	Half Drain Time : 804 minutes.												
Half Drain Time : 804 minutes.													
	Storm	Max	Max	Max		Max	Ma	x	Max	Stat	cus		
	Event	Level	Depth	Infiltra	tion C	ontrol	Σ Out	flow	Volume				
		(m)	(m)	(1/s))	(1/s)	(1/	s)	(m³)				
15	min Summer	6.571	0.121		0.0	0.4		0.4	19.5		ОК		
30	min Summer	6.602	0.152		0.0	0.5		0.5	26.1		ΟK		
60	min Summer	6.636	0.186		0.0	0.5		0.5	33.1		ОК		
120	min Summer	6.669	0.219		0.0	0.6		0.6	40.0		O K		
180	min Summer	6.686	0.236		0.0	0.6		0.6	43.6		ΟK		
240	min Summer	6.697	0.247		0.0	0.6		0.6	45.9		ΟK		
360	min Summer	6.710	0.260		0.0	0.6		0.6	48.5	Flood	Risk		
480	min Summer	6.716	0.266		0.0	0.7		0.7	49.7	Flood	Risk		
600	min Summer	6.718	0.268		0.0	0.7		0.7	50.2	Flood	Risk		
720	min Summer	6.719	0.269		0.0	0.7		0.7	50.5	Flood	Risk		
960	min Summer	6.720	0.270		0.0	0.7		0.7	50.6	Flood	Risk		
1440	min Summer	6./1/	0.267		0.0	0.7		0.7	50.1	Flood	Risk		
2100	min Summor	6 696	0.237		0.0	0.0		0.0	40.1	riood	ALSK O K		
4320	min Summer	6 673	0.240		0.0	0.0		0.0	40.9		OK		
5760	min Summer	6 653	0.223		0.0	0.0		0.0	36.7		0 K		
7200	min Summer	6.636	0.186		0.0	0.5		0.5	33.1		0 K		
8640	min Summer	6.621	0.171		0.0	0.5		0.5	30.0		ОК		
		Stor	m	Rain	Floode	d Discl	harge	Time	-Peak				
		Even	t	(mm/hr)	Volum	e Vol	ume	(mi	ns)				
					(m³)	(m	1 ³)						
	1	5 min	Summer	101.754	0.	. 0	19.8		26				
	3	0 min	Summer	67.708	0.	. 0	26.3		41				
	6	0 min	Summer	43.136	0.	. 0	34.5		70				
	12	0 min	Summer	26.651	0.	. 0	42.9		128				
	18	0 min	Summer	19.868	0.	. U	48.0		188				
	24	0 min	Summer	11 001	0.	. U	51.8		246				
	36 ^ 0	0 min	Summor	0 506 TT.091	0.	0	57.7 62 1		204 420				
	40 60	0 min	Summer	8 121	0.	0	65 7		564				
	72	0 min	Summer	7.083	0.	.0	68.6		616				
	96	0 min	Summer	5.703	0.	.0	72.8		740				
	144	0 min	Summer	4.198	0.	0	76.0		1004				
	216	0 min	Summer	3.085	0.	. 0	90.2		1416				
	288	0 min	Summer	2.477	0.	0	96.6		1824				
	432	0 min	Summer	1.816	0.	0	106.1		2640				

0.0

0.0

0.0

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113.3

119.3

124.4

3416

4184

4936

5760 min Summer 1.456

1.227

1.067

7200 min Summer

8640 min Summer

CH2M Hill						Page 2
Ash House						
Falcon Road Sowton						4
Exeter EX2 7LB						Mirco
Date 16/05/2018 17:00	0	Desi	gned by	IR06582	9	MILIU
File Portishead-Cat4	b-1-30 SRC	X Chec	ked by			Urainage
Micro Drainage	<u> </u>	Sour	ce Cont	rol 2017	1 2	
Micio Diainage		50u1	Ce COIIC	101 2017	• 1 • 2	
Cummo ra	L of Dogul	to for 2	0	Doturn D	oriod (+)	100)
Summary	y oi kesui	15 101 3	U year	Return P	erioa (+*	100)
Storm	Max Max	Max	м	lax Ma	ax Max	s Status
Event	Level Dept	h Infiltra	ation Con	trol Σ Out	flow Volu	me
	(m) (m)	(1/s) (1	/s) (1/	(m³)
10080 min Summer	6.608 0.15	8	0.0	0.5	0.5 27	.3 ОК
15 min Winter	6.583 0.13	3	0.0	0.5	0.5 22	.0 ОК
30 min Winter	6.618 0.16	8	0.0	0.5	0.5 29	.4 ОК
60 min Winter	6.656 0.20	6	0.0	0.6	0.6 37	.3 ОК
120 min Winter	6.694 0.24	4	0.0	0.6	0.6 45	.2 ОК
180 min Winter	6.714 0.26	4	0.0	0.7	0.7 49	.4 Flood Risk
240 min Winter	6.726 0.27	6	0.0	0.7	0.7 52	.0 Flood Risk
360 min Winter	6.742 0.29	2	0.0	0.7	0.7 55	.3 Flood Risk
480 min Winter	6.750 0.30	0	0.0	0.7	0.7 56	.9 Flood Risk
600 min Winter	6.754 0.30	4	0.0	0.7	0.7 57	.7 Flood Risk
720 min Winter	6.755 0.30	5	0.0	0.7	0.7 57	.9 Flood Risk
960 min Winter	6.754 0.30	4	0.0	0.7	0.7 57	.8 Flood Risk
1440 min Winter	6.749 0.29	9	0.0	0.7	0.7 56	.8 Flood Risk
2160 min Winter	6.734 0.28	4	0.0	0.7	0.7 53	7 Flood Risk
2880 min Winter	6.717 0.26	7	0.0	0.7	0.7 50	0 Flood Risk
4320 min Winter	6 683 0 23	3	0 0	0 6	0 6 42	9 O.K
5760 min Winter	6 654 0 20	<u>с</u>	0.0	0.6	0.6 36	9 O.K
7200 min Winter	6 630 0 18	0	0.0	0.5	0 5 31	9 O.K
8640 min Winter	6.610 0.16	0	0.0	0.5	0.5 27	.7 OK
	0.010 0.10	0	0.0	0.0	0.0 27	.,
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
	276110	(,	(m ³)	(m ³)	(
1008	30 min Summe	er 0.948	0.0	128.8	5664	
1	L5 min Winte	r 101.754	0.0	22.3	26	
3	30 min Winte	er 67.708	0.0	29.2	40	
6	50 min Winte	er 43.136	0.0	38.7	68	
1						

30	min Winter	67.708	0.0	29.2	40
60	min Winter	43.136	0.0	38.7	68
120	min Winter	26.651	0.0	48.1	126
180	min Winter	19.868	0.0	53.9	184
240	min Winter	16.054	0.0	58.2	242
360	min Winter	11.891	0.0	64.7	356
480	min Winter	9.596	0.0	69.6	468
600	min Winter	8.121	0.0	73.4	576
720	min Winter	7.083	0.0	76.3	680
960	min Winter	5.703	0.0	79.9	772
1440	min Winter	4.198	0.0	82.7	1078
2160	min Winter	3.085	0.0	101.2	1536
2880	min Winter	2.477	0.0	108.3	1972
4320	min Winter	1.816	0.0	119.0	2816
5760	min Winter	1.456	0.0	127.2	3632
7200	min Winter	1.227	0.0	133.8	4400
8640	min Winter	1.067	0.0	139.6	5192
	©198	2-2017 XP	Solutio	ons	

CH2M Hill						Page 3
Ash House						
Falcon Road Sowton						Y.
Exeter EX2 7LB						Micco
Date 16/05/2018 17:00		Desi	gned by	IR065829)	Desinado
File Portishead-Cat4b	-1-30.SRCX	Chec	ked by			Digitige
Micro Drainage		Sour	ce Cont	rol 2017.	1.2	
Summary	of Results	for 3	0 year	Return Pe	eriod (+40)응)
Storm	Mar Mar	м		Mon	Mou Mo	. Status
Event	Level Depth	Infilt	ax ration C	ontrol Σ O	max Ma utflow Volu	me
	(m) (m)	(1	/s)	(1/s) (1/s) (m ³	3)
10000 min Mintor	~ C 502 0 142		0 0	0 5	0 5 2/	1.2 0.12
10080 min winter	0.595 0.145		0.0	0.5	0.5 24	4.2 O K
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(111)	(111)		
10080) min Winter	0.948	0.0	144.6	5952	
	©198	2-2017	XP Sol	utions		

CH2M Hill	Page 4
Ash House	
Falcon Road Sowton	L.
Exeter EX2 7LB	Micco
Date 16/05/2018 17:00	Designed by IR065829
File Portishead-Cat4b-1-30.SRCX	Checked by
Micro Drainage	Source Control 2017.1.2
<u>Ra</u>	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40
Ti	me Area Diagram
Tot	al Area (ha) 0.110
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)
0 4 0.037	4 8 0.037 8 12 0.037
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CH2M Hill		Page 5								
Ash House										
Falcon Road Sowton		4								
Exeter EX2 7LB		Micco								
Date 16/05/2018 17:00	Designed by IR065829									
File Portishead-Cat4b-1-30.SRCX	Checked by	Drainage								
Micro Drainage	Source Control 2017.1.2									
	Model Details									
Storage is Unline Cover Level (m) 7.000										
Porous Car Park Structure										
Infiltration Coefficient Base Membrane Percolation Max Percolation Safety Po Invert Lev	(m/hr)0.00000Width (m)(mm/hr)1000Length (m)h(1/s)61.1Slope (1:X)Factor2.0Depression Storage (mm)orosity0.95Evaporation (mm/day)vel (m)6.450Cap Volume Depth (m)	8.0 27.5 500.0 5 1 0.300								
Orifi	ce Outflow Control									
Diameter (m) 0.025 Discharg	re Coefficient 0.600 Invert Level (m) 6.4	150								
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CH2M Hill												Page 1
Ash House												
Falcon Road	Sowton											4
Eveter EX	2 71.B											1 mm
Date 16/05/	2018 17.0	6		Des	aigned	hv	TPOG	5820				Micro
Date 10/03/	2010 17.0	- 1 1	00 000	V Ob	signed	l Dy	11(00,	5025				Drainage
File Portis	nead-Cat4	a-1-1	UU.SRC	x cne	ескеа	Υα			1 0			
Micro Drain	age			Sou	arce (Cont	rol 20	017.	1.2			
	Summary	of R	esults	s for	100 y	ear	Retur	n Pe	erio	d (+40)응)	
	Half Drain Time · 636 minutes											
	hall Diath line . 050 minutes.											
	Storm	Max	Max	Ma: Trafilta	x	Ma	ax Faci T	Max	1	Max	Stat	tus
	Evenc	(m)	(m)	(1/		(1)		(1/a	TOM	(m ³)		
		(111)	(111)	(1)	3)	(1)	, 3)	(1/3	,	(111)		
15	min Summer	6.615	0.165		0.0		0.5		0.5	21.3		ОК
30	min Summer	6.655	0.205		0.0		0.6		0.6	28.6		ОК
60	min Summer	6.696	0.246		0.0		0.6		0.6	36.1		O K
120	min Summer	6.736	0.286		0.0		0.7		0.7	43.3	Flood	Risk
180	min Summer	6.755	0.305		0.0		0.7		0.7	46.8	Flood	Risk
240	min Summer	6.767	0.317		0.0		0.7		0.7	48.8	Flood	Risk
360	min Summer	6.782	0.332		0.0		0.7		0.7	50.9	Flood	Risk
480	min Summer	6.787	0.337		0.0		0.7		0.7	51.5	Flood	Risk
600	min Summer	6.788	0.338		0.0		0.7		0.7	51.5	Flood	Risk
720	min Summer	6./8/	0.337		0.0		0.7		0.7	51.4	Flood	Risk
960	min Summer	6.783	0.333		0.0		0.7		0.7	JI.U	Flood	Risk
2160	min Summer	6 751	0.320		0.0		0.7		0.7	49.3	Flood	RISK
2880	min Summer	6 733	0.301		0.0		0.7		0.7	40.1 12 9	Flood	Diek
4320	min Summer	6 702	0.203		0.0		0.7		0.7	37 2	Flood	Risk
5760	min Summer	6.676	0.226		0.0		0.6		0.6	32.4	1 1000	0 K
7200	min Summer	6.654	0.204		0.0		0.6		0.6	28.4		0 K
8640	min Summer	6.635	0.185		0.0		0.5		0.5	25.0		ΟK
		Stor	m	Rain	Floo	ded	Discha	rge '	Fime -	-Peak		
		Even	t	(mm/hr) Volu	ume	Volum	ne	(mi	ns)		
					(m ³	•)	(m³)					
	1	5 min	Summer	131.85	1	0.0	22	1.9		26		
	3	0 min	Summer	88.56	6	0.0	2	9.5		41		
	6	0 min	Summer	56.71	3	0.0	3'	7.9		70		
	12	0 min	Summer	35.00	4	0.0	4	6.9		128		
	18	0 min	Summer	25.97	3	0.0	52	2.2		186		
	24	0 min	Summer	20.87	/	0.0	51	6.U		246		
	36	o min	Summer	10.30	D 1	0.0	ю. С	1.8 6.2		362		
	40	0 min	Summor	10 10	1 2	0.0	61	0.2 0.9		480 530		
	00 70	0 min	Summer	- 0 . 40. 9 . 0.1	2	0.0	0: 7	2.8		594		
	96	0 min	Summer	7.24	- 1	0.0	7	7.7		720		
	144	0 min	Summer	5.28	4	0.0	8.	3.3		988		
	216	0 min	Summer	3.84	8	0.0	92	2.8		1408		
	288	0 min	Summer	3.06	8	0.0	98	8.6		1820		
	432	0 min	Summer	2.22	6	0.0	10	7.2		2604		
	576	0 min	Summer	1.77	1	0.0	113	3.6		3400		
	720	0 min	Summer	1.48	3	0.0	118	8.8		4176		
	864	0 min	Summer	1.28	4	0.0	123	3.3		4920		
			©19	82-201	.7 XP	Sol	utions	S				

CH2M Hill									Page 2
Ash House									
Falcon Road Sowton									4
Exeter EX2 7LB									Jun
Date 16/05/2018 17:06)		Desi	qned k	v IRO	65829)		MICIO
File Portishead-Cat4a	-1-1(0.SRC	X Chec	ked by	7				Urainage
Micro Drainage			Sour	ce Cor	trol	2017	1.2		
Summary	of R	esults	for 10)0 yea	r Reti	ırn P	erio	d (+40)응)
Storm	Max	Max	Max		Max	Ma	x	Max	Status
Event	Level	Depth (m)	Infiltra	tion Co	ontrol	Σ Out	flow	Volume	
	(m)	(m)	(1/5))	(1/5)	(1)	5)	(m-)	
10080 min Summer	6.620	0.170		0.0	0.5		0.5	22.2	O K
15 min Winter	6.630	0.180		0.0	0.5		0.5	24.0	O K
30 min Winter	6.674	0.224		0.0	0.6		0.6	32.2	ОК
60 min Winter	6.721	0.271		0.0	0.7		0.7	40.7	Flood Risk
120 min Winter	6./68	0.318		0.0	0.7		0.7	48.9	Flood Risk
180 min Winter	6.803	0.353		0.0	1.0		1.0	53.0	Flood Risk
240 min Winter 260 min Winter	7.000	0.550		0.0	1.0		1.0	55.2	FLOOD
180 min Winter	7.002	0.552		0.0	1 0		1 0	57.8	FLOOD
600 min Winter	7.003	0.553		0.0	1.0		1.0	57.7	FLOOD
720 min Winter	7.003	0.553		0.0	1.0		1.0	57.7	FLOOD
960 min Winter	7.002	0.552		0.0	1.0		1.0	57.2	FLOOD
1440 min Winter	7.000	0.550		0.0	1.0		1.0	55.2	FLOOD
2160 min Winter	6.786	0.336		0.0	0.7		0.7	51.4	Flood Risk
2880 min Winter	6.754	0.304		0.0	0.7		0.7	46.7	Flood Risk
4320 min Winter	6.709	0.259		0.0	0.6		0.6	38.4	Flood Risk
5760 min Winter	6.672	0.222		0.0	0.6		0.6	31.8	O K
7200 min Winter	6.643	0.193		0.0	0.6		0.6	26.4	O K
8640 min Winter	6.619	0.169		0.0	0.5		0.5	22.0	ОК
	Stor	m	Rain	Floode	d Disc	harge	Time	-Peak	
	Even	t	(mm/hr)	Volume	e Vol	Lume	(mi	ns)	
				(m³)	(m	n³)	•		
1000	0 min	Summor	1 1 2 7	\cap	0	127 2		5648	
1	5 min	Winter	131.851	0	0	24.5		26	
3	0 min	Winter	88.566	0.	0	33.0		40	
6	0 min	Winter	56.713	0.	0	42.5		68	
12	0 min	Winter	35.004	0.	0	52.5		126	
18	0 min	Winter	25.973	Ο.	0	58.5		184	
24	0 min	Winter	20.877	0.	4	62.7		240	
36	0 min	Winter	15.365	2.	4	69.3		352	
48	0 min	Winter	12.341	З.	1	74.2		458	
60	0 min	Winter	10.402	З.	0	78.2		546	
72	0 min	Winter	9.042	3.	0	81.5		572	
96	0 min	Winter	7.241	2.	4	87.0		724	
144	0 min	Winter	5.284	0.	5	91.2		1026	
216	U min	Winter	3.848	0.	U	1104.0		1516	
288	U min	Winter	3.068	Ο.	U	110.6		T 9 6 0	

4320 min Winter

7200 min Winter

4320 min Winter 2.228 5760 min Winter 1.771

8640 min Winter 1.284

2.226

1.483

0.0

0.0

0.0

0.0

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120.2

127.3

133.2

138.3

2776

3584

4336

CH2M Hill									Page 3	
Ash House										
Falcon Road	Sowton								4	
Exeter EX2	7LB								Micco	m
Date 16/05/20	018 17:06			Desi	gned by	IR065829)			-
File Portishe	ead-Cat4a-	-1-100.	SRCX	Chec	ked by				Uldille	lige
Micro Drainac	ge			Sour	ce Cont	rol 2017.	1.2			
	Summary	of Resu	ilts :	for 10	0 year	Return P	eriod	(+40%)	_	
									.	
	Storm	Max	Max Depth	Ma Trifilt	ax ration C	Max I	Max utflow N	Max	Status	
	270.00	(m)	(m)	(1/	/s)	(1/s) (1/s)	(m ³)		
10000		6 500				0.5	0 5			
10080	min Winter	6.599	0.149		0.0	0.5	0.5	18.4	ОК	
		Storm		Rain	Flooded	Discharge	Time-Pe	ak		
		Event	(:	mm/hr)	Volume	Volume	(mins)			
					(m³)	(m³)				
	10080	min Wir	nter	1.137	0.0	142.7	58	48		
			©1982	-2017	XP Sol	utions				

CH2M Hill	Page 4
Ash House	
Falcon Road Sowton	L.
Exeter EX2 7LB	Micro
Date 16/05/2018 17:06	Designed by IR065829
File Portishead-Cat4a-1-100.SRCX	Checked by
Micro Drainage	Source Control 2017.1.2
<u>Ra</u>	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40
Tin	ne Area Diagram
Tot	al Area (ha) 0.090
Time (mins) Area T. From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)
0 4 0.030	4 8 0.030 8 12 0.030
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CH2M Hill		Page 5								
Ash House										
Falcon Road Sowton		L.								
Exeter EX2 7LB		Micco								
Date 16/05/2018 17:06	Designed by IR065829	Desinado								
File Portishead-Cat4a-1-100.SRCX	Checked by	Diamaye								
Micro Drainage	Source Control 2017.1.2									
1	Model Details									
Storage is O	Storage is Online Cover Level (m) 7.000									
Porous Car Park Structure										
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	(m/hr) 0.00000 Width (m) (mm/hr) 1000 Length (m) n (1/s) 53.3 Slope (1:X) Factor 2.0 Depression Storage (mm) prosity 0.95 Evaporation (mm/day) rel (m) 6.450 Cap Volume Depth (m)	4.0 48.0 500.0 2 1 0.300								
Orifice Outflow Control										
	e coefficient o.ooo invert hever (my o.o									
01000	2017 VD Solutions									
©1982·	-2017 XP Solutions									



CH2M Hill									Page 1
Ash House									
Falcon Road Sowt	on								4
Exeter EX2 7LB									m
Date 16/05/2018 17	.45		Desi	aned h	V TROP	5829			MICLO
File Portishead-Ca	+1c - 1 - 1(10 SDCX	Chec	ked by		0020			Drainage
Miana Drainaga		JU. SKCA	Caur	ved by	+ 20 1 2	017 1	2		_
MICIO Dialhage			Sour	ce con	LIOI Z	.01/.1	• 2		
Cum	aru of D		for 2	0	Dotur	n Dor	ind (+10	191	
<u></u>	aly ol r	esuits	101 5	o year	Retui	II FET	100 (+40	/ 0 /	
		Half D:	rain Ti	me : 71	4 minute	es.			
Storm	Max	Max	Max	:	Max	Max	Max	Stat	tus
Event	Level	Depth In	nfiltra	tion Co	ntrol Σ	Outflo	ow Volume		
	(m)	(m)	(l/s)) (1/s)	(l/s)	(m³)		
15 min Cum	or 6 621	0 171		0 0	0 7	0	7 27 0		0 P
30 min Sum	ler 6.649	0.199		0.0	0.8	0	.8 37.1		OK
60 min Sum	ner 6.678	0.228		0.0	0.9	0	.9 46.6		0 K
120 min Sumr	ner 6.706	0.256		0.0	0.9	0	.9 55.9	Flood	Risk
180 min Sumr	ner 6.721	0.271		0.0	1.0	1	.0 60.7	Flood	Risk
240 min Sumr	ner 6.729	0.279		0.0	1.0	1	.0 63.4	Flood	Risk
360 min Sumr	ner 6.738	0.288		0.0	1.0	1	.0 66.4	Flood	Risk
480 min Sumr	ner 6.741	0.291		0.0	1.0	1	.0 67.5	Flood	Risk
600 min Sumr	ner 6.742	0.292		0.0	1.0	1	.0 67.7	Flood	Risk
720 min Sumr	ner 6.742	0.292		0.0	1.0	1	.0 67.7	Flood	Risk
960 min Sumr	ner 6.741	0.291		0.0	1.0	1	.0 67.3	Flood	Risk
1440 min Sumr	ner 6.735	0.285		0.0	1.0	1	.0 65.3	Flood	Risk
2160 min Sumr	ner 6.723	0.273		0.0	1.0	1	.0 61.3	Flood	Risk
2880 min Sumr	ner 6./10	0.260		0.0	0.9	0	.9 57.2	Flood	KISK
4320 min Sum 5760 min Sum	ler 6.668	0.238		0.0	0.9	0	.9 49.7		OK
7200 min Sum	r 6 651	0.210		0.0	0.0	0	8 37 6		0 K 0 K
8640 min Sumr	ner 6.636	0.186		0.0	0.8	0	.8 32.8		O K
	Stor Even	n t (Rain mm/hr)	Flooded Volume (m³)	l Discha Volu (m³	arge Ti me)	me-Peak (mins)		
	15 min :	Summer 1	01.754	0.0) 2	28.7	26		
	30 min 3	Summer	67.708	0.0) 3	38.4	41		
	60 min 3	Summer	43.136	0.0) 4	19.1	70		
	120 min 3	Summer	26.651	0.0	6	50.8	128		
	180 min :	Summer	19.868	0.0	6	58.1	186		
	240 min 8	Summer	16.054	0.0	1 7	73.4	246		
	360 min 8	Summer	11.891	0.0	6	31.6	362		
	480 min :	Summer	9.596	0.0	8	37.9	480		
	000 min :	Summer	8.121	0.0		13.U	532		
	120 min 3	Summor	1.U03 5 702	0.0	1 10)/.5	294 720		
	1440 min 9	Summor	J./UJ / 100	0.0	1 LL	50	120		
	2160 min 9	Summer	3 N&2	0.0	, 11 1 1 1	 >7 ∩	140Q		
	2880 min (Summer	2.477	0.0	13	35.9	1820		
	4320 min :	Summer	1.816	0.0	14	19.3	2604		
	5760 min :	Summer	1.456	0.0	15	59.3	3400		

7200 min Summer

8640 min Summer

1.227

1.067

0.0

0.0

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167.6

174.7

4176

CH2M Hill							Page 2
Ash House							
Falcon Road Sowton							Y
Exeter EX2 7LB							Micco
Date 16/05/2018 17:45	5	Desig	gned by				
File Portishead-Cat40	c-1-100.SRC>	Checl	ked by				Diamage
Micro Drainage		Sour	ce Cont	rol 2017	.1.2		
Summary	y of Results	for 30) year	Return P	eriod	(+409	<u>}</u>
Storm	Max Max	Max	M Line Gra	lax M	ax	Max	Status
Event	(m) (m)	(1/~)	LION CON		triow \ /a)		
	(m) (m)	(1/5)	(1	./s) (1	/s)	(m°)	
10080 min Summer	6.624 0.174		0.0	0.7	0.7	28.7	0 K
15 min Winter	6.632 0.182		0.0	0.8	0.8	31.4	0 K
30 min Winter	6.663 0.213		0.0	0.8	0.8	41.8	ОК
60 min Winter	6.696 0.246		0.0	0.9	0.9	52.6	O K
120 min Winter	6.728 0.278		0.0	1.0	1.0	63.2	Flood Risk
180 min Winter	6.745 0.295		0.0	1.0	1.0	68.8	Flood Risk
240 min Winter	6.756 0.306		0.0	1.0	1.0	72.1	Flood Risk
360 min Winter	6.768 0.318		0.0	1.0	1.0	76.0	Flood Risk
480 min Winter	6.774 0.324		0.0	1.0	1.0	77.7	Flood Risk
600 min Winter	6.776 0.326		0.0	1.0	1.0	78.2	Flood Risk
720 min Winter	6.775 0.325		0.0	1.0	1.0	78.0	Flood Risk
960 min Winter	6.772 0.322		0.0	1.0	1.0	77.3	Flood Risk
1440 min Winter	6.763 0.313		0.0	1.0	1.0	74.5	Flood Risk
2160 min Winter	6.745 0.295		0.0	1.0	1.0	68.6	Flood Risk
2880 min Winter	6.726 0.276		0.0	1.0	1.0	62.4	Flood Risk
4320 min Winter	6.692 0.242		0.0	0.9	0.9	51.1	ОК
5760 min Winter	6.663 0.213		0.0	0.8	0.8	41.8	OK
/200 min Winter	6.640 0.190		0.0	0.8	0.8	34.1	OK
8640 min winter	0.021 0.171		0.0	0.7	0.7	21.1	U K
	Storm	Rain	Flooded	Discharge	Time-	Peak	
	Event	(mm/hr)	Volume (m³)	Volume (m³)	(mir	is)	

				(m³)	(m³)		
10080	min	Summer	0.948	0.0	180.9	5640	
15	min	Winter	101.754	0.0	32.2	26	
30	min	Winter	67.708	0.0	43.1	40	
60	min	Winter	43.136	0.0	55.1	68	
120	min	Winter	26.651	0.0	68.2	126	
180	min	Winter	19.868	0.0	76.4	184	
240	min	Winter	16.054	0.0	82.3	240	
360	min	Winter	11.891	0.0	91.5	354	
480	min	Winter	9.596	0.0	98.5	466	
600	min	Winter	8.121	0.0	104.2	572	
720	min	Winter	7.083	0.0	109.1	672	
960	min	Winter	5.703	0.0	117.1	760	
1440	min	Winter	4.198	0.0	126.3	1070	
2160	min	Winter	3.085	0.0	142.4	1520	
2880	min	Winter	2.477	0.0	152.4	1964	
4320	min	Winter	1.816	0.0	167.4	2808	
5760	min	Winter	1.456	0.0	178.7	3584	
7200	min	Winter	1.227	0.0	188.0	4336	
8640	min	Winter	1.067	0.0	196.0	5104	
		©198	32-2017	XP Solut	tions		

CH2M Hill									Page 3
Ash House									
Falcon Road	Sowton								L.
Exeter EX2 7	LB								Micco
Date 16/05/201	8 17:45			Desi	gned by	IR06582	9		Desinado
File Portishead-Cat4c-1-100.SRCX			Chec	ked by	Diamaye				
Micro Drainage	2			Sour	ce Cont	rol 2017	.1.2		
	Summary	of Res	sults	for 3	0 year	Return Pe	eriod (+40%)	
s	torm	Mav	Mav	M	əv	Max	Mav	Max	Status
E	vent	Level	Depth	Infilt	ration C	ontrol Σ C	utflow V	olume	blatus
		(m)	(m)	(1,	/s)	(l/s) (1/s)	(m³)	
10080 m	nin Winter	6 604	0 154		0 0	07	07	22 6	ΟK
100001	ain wincer	0.001	0.101		0.0	0.,	0.7	22.0	0 10
		Storm		Rain	Flooded	Discharge	Time-Pea	ak	
		lvenc	,	,, ,	(m ³)	(m ³)	(11113)		
	10000			0 0 4 0	0.0	202.0	F 0.	10	
	10080	min wi	nter	0.948	0.0	203.0	284	ŧU	
			<u>A1000</u>	0 0 0 1 7	VD C-1				
©1982-2017 XP Solutions									

CH2M Hill	Page 4								
Ash House									
Falcon Road Sowton	L.								
Exeter EX2 7LB	Micco								
Date 16/05/2018 17:45	Designed by IR065829								
File Portishead-Cat4c-1-100.SRCX	Checked by								
Micro Drainage	Source Control 2017.1.2								
Ra	infall Details								
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40								
Time Area Diagram									
Tot	al Area (ha) 0.154								
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)								
0 4 0.051	4 8 0.051 8 12 0.051								
©1982-2017 XP Solutions									
CH2M Hill		Page 5							
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Ash House									
Falcon Road Sowton		4							
Exeter EX2 7LB		m							
Date 16/05/2018 17:45	Designed by TR065829	MICLO							
File Portishead-Cat4c-1-100 SBCX	Checked by	Drainage							
Micro Drainage	Source Control 2017 1 2								
1	Model Details								
Storage is Online Cover Level (m) 7.000									
Porous	Car Park Structure								
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Pc Invert Lev	(m/hr) 0.00000 Width (m) mm/hr) 1000 Length (m) a (1/s) 96.4 Slope (1:X) Factor 2.0 Depression Storage (mm) prosity 0.95 Evaporation (mm/day) rel (m) 6.450 Cap Volume Depth (m)	4.0 86.8 500.0 2 1 0.300							
Orifi	ce Outflow Control								
Diameter (m) 0.030 Discharg	e Coefficient 0.600 Invert Level (m) 6.4	150							
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CH2M Hill					Page 1					
Ash House										
Falcon Road Sowton					4					
Exeter EX2 7LB					m					
$D_{2+e} = 16/05/2018 = 17.44$	Desic	med hi	7 TRA6582	0	MICLO					
Eile Derticheed Catte 1 100 CDCV Checked by										
File Portishead-cat4c-1-100.SRCX [Checked by										
Micro Drainage Source Control 2017.1.2										
Summary of Results for 100 year Return Period (+40%)										
Half	Drain Tim	e : 763	minutes.							
Storm Max Max	Max	м	ax Ma	ax Max	Status					
Event Level Depth	Infiltrat	ion Con	trol Σ Out	tflow Volum	e					
(m) (m)	(l/s)	(1	/s) (1,	/s) (m³)						
15 min Summer 6.648 0.198		0.0	0.8	0.8 36.	5 OK					
30 min Summer 6.685 0.235		0.0	0.9	0.9 49.	U UK					
120 min Summer 6 764 0 314		0.0	1.0	1.0 52.	7 Flood Risk					
180 min Summer 6 786 0 336		0.0	1 1	1 1 80	9 Flood Risk					
240 min Summer 6 800 0 350		0.0	1 1	1 1 84	5 Flood Risk					
360 min Summer 6.819 0.369		0.0	1.1	1.1 88.	7 Flood Risk					
480 min Summer 6.828 0.378		0.0	1.1	1.1 90.	3 Flood Risk					
600 min Summer 6.829 0.379		0.0	1.1	1.1 90.	6 Flood Risk					
720 min Summer 6.829 0.379		0.0	1.1	1.1 90.	4 Flood Risk					
960 min Summer 6.825 0.375		0.0	1.1	1.1 89.	8 Flood Risk					
1440 min Summer 6.812 0.362		0.0	1.1	1.1 87.	2 Flood Risk					
2160 min Summer 6.791 0.341		0.0	1.1	1.1 82.	2 Flood Risk					
2880 min Summer 6.772 0.322		0.0	1.0	1.0 77.	0 Flood Risk					
4320 min Summer 6.741 0.291		0.0	1.0	1.0 67.	5 Flood Risk					
5760 min Summer 6.716 0.266		0.0	0.9	0.9 59.	2 Flood Risk					
7200 min Summer 6.695 0.245		0.0	0.9	0.9 52.	2 OK					
8640 min Summer 6.6// 0.22/		0.0	0.9	0.9 46.	I OK					
Storm	Rain H	looded	Discharge	Time-Peak						
Event	(mm/hr)	Volume	Volume	(mins)						
		(m³)	(m³)							
15 min Summer	131.851	0 0	37 4	26						
30 min Summer	88.566	0.0	50.4	41						
60 min Summer	56.713	0.0	64.8	70						
120 min Summer	35.004	0.0	80.1	128						
180 min Summer	25.973	0.0	89.3	188						
240 min Summer	20.877	0.0	95.7	246						
360 min Summer	15.365	0.0	105.7	364						
480 min Summer	12.341	0.0	113.2	482						
600 min Summer	10.402	0.0	119.3	580						
720 min Summer	9.042	0.0	124.4	628						
960 min Summer	7.241	0.0	132.3	752						
1440 min Summer	5.284	0.0	156.9	1420						
2160 min Summer	3.848 3.069	0.0	160 7	1432 1010						
4320 min Summer	2 226	0.0	183 /	1040 2647						
5760 min Summer	1.771	0.0	194.2	3456						
7200 min Summer	1.483	0.0	203.2	4192						
8640 min Summer	1.284	0.0	210.8	4936						
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CH2M Hill							Page 2			
Ash House										
Falcon Road Sowton							4			
Exeter EX2 7LB							m			
Date 16/05/2018 17:44	1	Desi	Designed by IB065829							
File Portishead-Cat/	- 	Y Chec	Checked by INVUSUES							
Migro Drainago		Sour	co Con	trol 2	017 1 2					
MICIO DIallage		SOUL	ce con	LIOI Z	.017.1.2					
Summary of Posults for 100 year Poturn Poriod (+10%)										
Summary	OI RESULLS	5 101 10	JU year	Retu.	III Pelic	ia (+40	16)			
Storm	Max Max	Max	1	Max	Max	Max	Status			
Event	Level Depth	Infiltra	tion Co	ntrol Σ	2 Outflow	Volume				
	(m) (m)	(1/s)) (.	1/s)	(1/s)	(m³)				
10080 min Summer	6.660 0.210		0.0	0.8	0.8	40.8	ОК			
15 min Winter	6.661 0.211		0.0	0.8	0.8	41.1 55 1	U K			
50 min Winter	6.704 0.234		0.0	1 0	1.0	55.I	Flood Risk			
120 min Winter	6 799 0 349		0.0	1 1	1.0	09.0 91 2	Flood Risk			
120 min Winter	6 935 0 395		0.0	1 1	1 1	04.2	Flood Risk			
240 min Winter	6 865 0 415		0.0	1 2	1.1	91.5	Flood Risk			
360 min Winter	7 001 0 551		0.0	1 /	1.2	100 5	FLOOD			
480 min Winter	7 003 0 553		0.0	1 /	1.4	102.3	FLOOD			
600 min Winter	7.003 0.553		0.0	1.4	1.4	102.3	FLOOD			
720 min Winter	7 003 0 553		0.0	1 /	1.4	102.0	FLOOD			
960 min Winter	7 003 0 553		0.0	1 4	1 4	102.4	FLOOD			
1440 min Winter	6 952 0 502		0.0	1 3	1 3	99.2	Flood Bisk			
2160 min Winter	6.841 0.391		0.0	1.2	1.2	92.6	Flood Risk			
2880 min Winter	6.803 0.353		0.0	1.1	1.1	85.2	Flood Risk			
4320 min Winter	6.753 0.303		0.0	1.0	1.0	71.2	Flood Risk			
5760 min Winter	6.717 0.267		0.0	0.9	0.9	59.4	Flood Risk			
7200 min Winter	6.687 0.237		0.0	0.9	0.9	49.6	ОК			
8640 min Winter	6.663 0.213		0.0	0.8	0.8	41.5	ОК			
	Storm	Rain	Flooded	l Disch	arge Time	-Peak				
	Event	(mm/hr)	Volume	Volu	ıme (m:	ins)				
			(m³)	(m³	[•])					
1008	0 min Summer	1.137	0.0	2	17.5	5664				
1	5 min Winter	131.851	0.0		41.9	26				
3	0 min Winter	88.566	0.0		56.0	40				
6	0 min Winter	56.713	0.0		72.7	70				
12	0 min Winter	35.004	0.0		89.8	126				
18	0 min Winter	25.973	0.0	1	00.1	184				
24	U min Winter	20.877	0.0	1	07.3	242				
36	0 min Winter	15.365	1.6	. 1	18.5	354				
48	U min Winter	12.341	3.4	. 1	26.9	466				
60	o min Winter	10.402	3.8	1	33.1 20.2	572				
12	u min Winter	9.042	3.5	•	39.2	000				

145.8

148.1

178.0

189.1

205.6

217.8

227.8

236.5

752

1066

1540

1992

2856

3648

4464

5192

960 min Winter

1440 min Winter

2160 min Winter

2880 min Winter

4320 min Winter

5760 min Winter

7200 min Winter

8640 min Winter

7.241

5.284

3.848 3.068

2.226

1.771

1.483

1.284

2.8

0.0

0.0

0.0

0.0

0.0

0.0

0.0

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CH2M Hill									Page 3	
Ash House										
Falcon Road	Sowton								4	
Exeter EX2	7LB								Micco	m
Date 16/05/20	018 17:44		Ľ	esig	ned by	IR065829)			
File Portishe	ead-Cat4c-	-1-100.5	SRCX C	Check	ed by				Uldillo	iye
Micro Drainag	je		S	Sourc	e Cont	rol 2017.	.1.2			
	Summary	of Resul	lts fo	r 100) year	Return P	eriod	(+40%)		
	Storm	May	Mav	Mas	,	Mav	Max	Max	Status	
	Event	Level D	epth In	filtr	ation C	ontrol E O	utflow N	Volume	beacab	
		(m)	(m)	(1/s	5)	(l/s) (1/s)	(m³)		
10080	min Winter	6.642 0	.192		0.0	0.8	0.8	34.6	ОК	
		Storm	Ra	in 1	Flooded	Discharge	Time-Pe	ak		
		Event	(mm/	/hr)	Volume (m³)	Volume (m³)	(mins)			
	10080	min Wint	ter 1.	.137	0.0	244.0	59	52		
		C	1982-2	2017	XP Sol	utions				

CH2M Hill	Page 4								
Ash House									
Falcon Road Sowton	L.								
Exeter EX2 7LB	Mirco								
Date 16/05/2018 17:44	Designed by IR065829								
File Portishead-Cat4c-1-100.SRCX	Checked by								
Micro Drainage	Source Control 2017.1.2								
Ra	infall Details								
Rainfall ModelFSRWinter StormsYesReturn Period (years)100Cv (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000Shortest Storm (mins)15Ratio R0.350Longest Storm (mins)10080Summer StormsYesClimate Change %+40									
Tin	me Area Diagram								
Tot	al Area (ha) 0.154								
Time (mins) Area T. From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)								
0 4 0.051	4 8 0.051 8 12 0.051								
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CH2M Hill		Page 5							
Ash House									
Falcon Road Sowton		4							
Exeter EX2 7LB		- m							
Date 16/05/2018 17:44	Designed by IR065829	MICLO							
File Portishead-Cat4c-1-100.SRCX	Checked by	Drainage							
Micro Drainage	Source Control 2017.1.2								
Model Details									
Storage is Online Cover Level (m) 7.000									
Porous	Car Park Structure								
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	(m/hr) 0.00000 Width (m) mm/hr) 1000 Length (m) a (1/s) 96.4 Slope (1:X) Factor 2.0 Depression Storage (mm) prosity 0.95 Evaporation (mm/day) rel (m) 6.450 Cap Volume Depth (m)	4.0 86.8 500.0 2 1 0.300							
Orific	ce Outflow Control								
Diamotor (m) 0.020 Diacharg	a Coofficient 0 600 Invent Level (m) 6	150							
	e coefficient 0.000 invert hever (m) 0.	150							
@1000	2017 VD Colutions								
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APPENDIX C

Pill Station Drainage Strategy Drawings and Calculations



- PROPOSED CONNECTION TO EXISTING HW DRAINAGE SEWER **REFER TO NOTE 8** MAX. DISCHARGE FLOW RATE FROM CAR-PARK COMPOUND TO BE LIMITED TO 5 I/s

A

MONMOL.

THRO

4LON,

- PROPOSED Ø150mm PIPELINE

- PROPOSED ORIFICE OUTLET (Ø45mm) FROM POROUS LAYER INTO CATCH-PIT

> - PROPOSED GRAVEL STORAGE REFER TO NOTE 7

> > NPORTRD

SCALE 1:250 (A1) METRES SCALE 1:500 (A3)

20

15

	NOTES:
	 This drawing should be read in conjunction with the Drainage Strategy Report. Drainage system design based on 1:30 year return period plus climate change allowance. Exceedance flow design based on 1:100 year return period plus climate change allowance. All dimensions are in meters unless noted otherwise. The indicative layout is based on available OS or topographical surveys. Outfalls should be monitored on a regular basis and equipped with shut-off valves. Proposed car-park drainage system based on collecting the runoff water through permeable pavement (concrete bolcks) on the parking bays. The runoff water will be attenuated within 330mm height of clean stone reservoir layer before discharging into the HW drainage system. See Detail for further information. During detailed design, existing HW drainage system on Avon Road to be surveyed to ensure it has the capacity for receiving the discharge rate of the car-park runoff.
\sim \nearrow $/$ \sim	KEY
	NET. Proposed drainage pipeline Proposed MH/Catchpit Proposed porous reservoir Proposed vegetation Existing vegetation retained New footpath surface Image: Stress to be removed Image: Stress to be retained Image: Str
	A IR 23/05/2018 FOR INFORMATION
	Rev By Chkd Apprvd Date Description
	Drawing PILL STATION CAR-PARK DRAINAGE STRATEGY Sheet 1 of 2 Drawn by: IR Date: 23/05/2018 Checked by: Date: Approved by: Date: Drawing No. 467470.BQ.04.20-DS-Pill A
	Drawing Scale: As shown



$\overline{\langle}$	NO	TES:		
	 1. 2. 3. 4. 5. 6. 7. 8. 	This drawing the Drainage Drainage sys period plus of Exceedance of return period All dimensio otherwise. The indicative topographica Outfalls shou and equippe Proposed can collecting the pavement (c The runoff w height of clear discharging i See Detail fo During detail system on Av has the capa the car-park	g should be read in conjuncti e Strategy Report. tem design based on 1:30 ye limate change allowance. flow design based on 1:100 d plus climate change allowans are in meters unless note re layout is based on availab al surveys. ald be monitored on a regula d with shut-off valves. r-park drainage system base e runoff water through perm oncrete bolcks) on the parkit vater will be attenuated with an stone reservoir layer befor nto the HW drainage system or further information. led design, existing HW drain von Road to be surveyed to city for receiving the dischal runoff.	ion with ear return year ance. ed le OS or ar basis ed on neable ing bays. nin 330mm ore n. nage ensure it rge rate of
		KEY:	Proposed drainage pipeli Proposed MH/Catchpit Proposed porous reserved Proposed vegetation Existing vegetation retain New footpath surface Trees to be removed Trees to be retained Proposed trees Vehicle restraint barrier Proposed fence Existing kerb retained Proposed new kerb	ne bir ned
			DRAFT	
	A Rev CH	IR By Chkd App trcc Bath & North I Councils work	23/05/2018 FOR INFORMATION rvd Date Description Description De	R
	1 Th Tel - www	e Square Temple Qua +44 (0)117 910 2580 /.ch2m.com	iy Bristol BS1 6DG Fax +44 (0)117 910 2581	
	Proj	^{ect} POR (MI	Ch2/ TISHEAD BRANCH LINE ETROWEST PHASE 1)	
	Drav	ving		
		PILL S DRA	STATION CAR-PAF INAGE STRATEG Sheet 2 of 2	RK (
	Drav	vn by: IR cked bv:	D	ate: 23/05/2018 ate:
	Арр	roved by:	D	ate:
/	Drav		ח וום פח_חכ עו ח	Revision
	4			
	ura\	y uuait. A3 31101		

Drawing file path & name : \|EXTFPP01\Pro|\Transportation\Projects\MetroWest\100 Drawings\Pill Station\2018-04-12 copy of 467470.BQ.04.20-207 to 209 Rev H\ 467470.BQ.04.20-DR-PillD

CH2M										Page 1
Ash House										
Falcon Roa	d									4
Exeter E	X2 7LB									Micro
Date 16/04	/2018	14:0)4		Desi	Igned	by IRO	65829		
File 2018-04-16-Pill Station Checked by									Diamaye	
XP Solutio	ns				Soui	cce Co	ntrol	2017.1	.2	
	Sur	mmar	y of 1	Result	s for 3	30 yea	r Retu	rn Peri	Lod (+40	%)
				Half	Drain T	ime : c	95 minut	es.		
	Storm		Max	Max	Mor		Max	Маж	Max	Status
	Event		Level	Depth	Infiltr	ation (Control	Σ Outfl	ow Volume	Status
			(m)	(m)	(1/s	;)	(1/s)	(1/s)	(m ³)	
15	min Su	mmer	17 625	0 215		0 0	1 0	1	9 12 0	0 K
30	min Su	mmer	17.675	0.215		0.0	2.0	2	.0 15.6	0 K
60	min Su	mmer	17.704	0.284		0.0	2.2	2	.2 18.2	Flood Risk
120	min Su	mmer	17.716	0.296		0.0	2.2	2	.2 19.3	Flood Risk
180	min Su	mmer	17.715	0.295		0.0	2.2	2	.2 19.2	Flood Risk
240	min Su	mmer	17.709	0.289		0.0	2.2	2	.2 18.7	Flood Risk
360	min Su	mmer	17.695	0.275		0.0	2.1	2	.1 17.4	O K
480	min Su	mmer	17.680	0.260		0.0	2.1	2	.1 16.1	O K
600	min Su	mmer	17.667	0.247		0.0	2.0	2	.0 14.9	0 K
720	min Su	mmer	17.654	0.234		0.0	1.9	1	.9 13.7	0 K
960	min Su	mmer	17.631	0.211		0.0	1.8	1	.8 11.7	O K
1440	min Su	mmer	17.596	0.176		0.0	1.7	1	.7 8.6	O K
2160	min Su	mmer	17.561	0.141		0.0	1.5	1	.5 5.5	0 K
2880	min Su	mmer	17.536	0.116		0.0	1.3	1	.3 3.7	O K
4320	min Su	mmer	17.504	0.084		0.0	1.0	1	.0 1.9	0 K
5760	min Su	mmer	17.485	0.065		0.0	0.9	0	.9 1.2	0 K
7200	min Su	mmer	17.478	0.058		0.0	0.7	0	.7 0.9	0 K
8640	min Su	mmer	17.472	0.052		0.0	0.6	0	.6 0.8	0 K
			Stor	m	Rain	Floode	d Disch	arge Ti	me-Peak	
			Even	t	(mm/hr)	Volum (m³)	e Volu (m	ume (3)	mins)	
			15 min	Summer	101.754	0.	0	13.7	23	
			30 min	Summer	67.708	Ο.	0	18.4	36	

	Ever	nt	(mm/hr)	Volume	Volume	(mins)
				(m³)	(m³)	
15	min	Summer	101.754	0.0	13.7	23
30	min	Summer	67.708	0.0	18.4	36
60	min	Summer	43.136	0.0	23.6	62
120	min	Summer	26.651	0.0	29.3	96
180	min	Summer	19.868	0.0	32.8	130
240	min	Summer	16.054	0.0	35.4	164
360	min	Summer	11.891	0.0	39.3	234
480	min	Summer	9.596	0.0	42.3	300
600	min	Summer	8.121	0.0	44.7	366
720	min	Summer	7.083	0.0	46.8	432
960	min	Summer	5.703	0.0	50.1	558
1440	min	Summer	4.198	0.0	55.2	802
2160	min	Summer	3.085	0.0	60.5	1156
2880	min	Summer	2.477	0.0	64.5	1508
4320	min	Summer	1.816	0.0	70.3	2212
5760	min	Summer	1.456	0.0	74.5	2936
7200	min	Summer	1.227	0.0	77.8	3624
8640	min	Summer	1.067	0.0	80.5	4400
		©19	82-2017	XP Sol	utions	

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							Marcon
Date 16/04/2018 14:0	4	Desi	gned b	y IR0658	29		
File 2018-04-16-Pill	Station	Chec	ked bv	<u>~</u>			Urainage
XP Solutions		Sour	ce Con	trol 201	7.1.2		
		2041		0101 101			
Summary	v of Resu	lts for 3	80 vear	Return	Period	(+408	5)
	2		4			,	<u> </u>
Storm	Max Ma	ux Max	ĸ	Max	Max	Max	Status
Event	Level Dep	th Infiltr	ation C	ontrol Σ C	Outflow	Volume	
	(m) (n	1) (1/s	5)	(1/s) ((l/s)	(m³)	
10080 min Summer	17.469 0.0	49	0.0	0.6	0.6	0.7	0 K
15 min Winter	17.653 0.2	.33	0.0	1.9	1.9	13.7	O K
30 min Winter	17.698 0.2	78	0.0	2.1	2.1	17.7	O K
60 min Winter	17.734 0.3	314	0.0	2.3	2.3	20.9	Flood Risk
120 min Winter	17.748 0.3	28	0.0	2.3	2.3	22.1	Flood Risk
180 min Winter	17.744 0.3	324	0.0	2.3	2.3	21.8	Flood Risk
240 min Winter 360 min Winter	17 713 0 3	03	0.0	2.3	2.3	21.0	Flood Risk
480 min Winter	17 690 0 2	.93	0.0	2.2	2.2	17.0	O K
600 min Winter	17.670 0.2	250	0.0	2.0	2.0	15.2	O K
720 min Winter	17.651 0.2	31	0.0	1.9	1.9	13.5	0 K
960 min Winter	17.620 0.2	200	0.0	1.8	1.8	10.7	O K
1440 min Winter	17.575 0.1	.55	0.0	1.5	1.5	6.7	O K
2160 min Winter	17.532 0.1	.12	0.0	1.3	1.3	3.5	O K
2880 min Winter	17.505 0.0	85	0.0	1.1	1.1	2.0	O K
4320 min Winter	17.480 0.0	60	0.0	0.8	0.8	1.0	0 K
5760 min Winter	17.472 0.0	152	0.0	0.6	0.6	0.8	O K
/200 min Winter 8640 min Winter	17.466 0.0	146	0.0	0.5	0.5	0.6	O K O K
0040 MIII WINCEL	1/.405 0.0	45	0.0	0.5	0.5	0.5	0 K
	Storm	Rain	Floode	d Discharg	re Time-	Peak	
	Event	(nun/nr)	(m ³)	(m ³)	(m1	ns)	
			()	(
1008	30 min Summ	er 0.948	0.0	9 82.	8	5104	
	15 min Wint	er 101.754	0.0	U 15.	4	24	
	30 min Wint	er 6/.708	0.0	u 20.	/	36	
1.	20 min Wint	e_1 43.130 e_7 26 651	0.0	ບ ∠ຽ. ງ <u></u> ຊາ	9	0∠ 102	
1	30 min Wint	er 19.868	0.0) 36.	8	140	
24	40 min Wint	er 16.054	0.0) 39 .	7	178	
3	60 min Wint	er 11.891	0.0	0 44.	1	252	
48	80 min Wint	er 9.596	0.0	O 47.	5	322	
6	00 min Wint	er 8.121	0.0	D 50.	2	390	
72	20 min Wint	er 7.083	0.0	52.	5	456	
91	60 min Wint	er 5.703	0.0	J 56.	3	586	
	+∪ min Wint 60 min Win+	er 4.198	0.0	u 62. N 62	0	ŏ∠ŏ 1172	
221	80 min Wint	er 2.477	0.0) 72	5	1508	
433	20 min Wint	er 1.816	0.0	0 79.	1	2208	
57	60 min Wint	er 1.456	0.0	0 83.	9	2936	
720	00 min Wint	er 1.227	0.0	0 87.	7	3672	
86	40 min Wint	er 1.067	0.0	90.	9	4352	
	©	1982-2017	Y XP So	lutions			

CH2M									Page 3	
Ash House										
Falcon Road									Y.	
Exeter EX2 7LB									Micco	m
Date 16/04/2018 14	:04			Desi	gned by	IR06582	9			200
File 2018-04-16-Pi	.11 S	tation	1 	Chec	ked by				Uldill	dye
XP Solutions				Sour	ce Cont	rol 2017	.1.2			
Summ	ary (of Res	ults	for 3	0 year	Return P	eriod (+40%)		
Charmen .		Man	Mass		·	Mass	Mass	Mass	Chabura	
Event		Level	Depth	Infil	tration (Control Σ	Outflow '	Max Volume	Status	
		(m)	(m)	(1	/s)	(1/s)	(1/s)	(m ³)		
10000 min Mi		17 460	0 040		0 0	0 1	0 4	0 1	0 1/	
TOOSO WIN MT	nter	17.460	0.040		0.0	0.4	0.4	0.4	Οĸ	
		Storm		Rain	Flooded	Discharge	Time-Pea	ak		
		Event	(:	mm/hr)	Volume (m ³)	Volume (m ³)	(mins)			
					((
1	L0080	min Wir	nter	0.948	0.0	93.6	50	48		
			<u></u>	0017	VD 0-1					
			©1985	-ZUI/	XP SOL	utions				

CH2M	Page 4						
Ash House							
Falcon Road	L.						
Exeter EX2 7LB	Micro						
Date 16/04/2018 14:04	Designed by IR065829						
File 2018-04-16-Pill Station	Checked by						
XP Solutions	Source Control 2017.1.2						
Ra	infall Details						
Rainfall ModelFSRWinter StormsYesReturn Period (years)30Cv (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000Shortest Storm (mins)15Ratio R0.350Longest Storm (mins)10080Summer StormsYesClimate Change %+40							
Tir	me Area Diagram						
Tot	al Area (ha) 0.075						
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)						
0 4 0.025	4 8 0.025 8 12 0.025						
e1000	-2017 VP Solutions						
U1982-	-ZULI AF DULULIUIIS						

CH2M		Page 5
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 16/04/2018 14:04	Designed by IR065829	Desinado
File 2018-04-16-Pill Station	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	
1	Model Details	
Storage is Or	nline Cover Level (m) 18.000	
Porous	Car Park Structure	
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Pc Invert Lev	(m/hr)0.00000Width (m)mm/hr)1000Length (m)a (1/s)82.7Slope (1:X)Factor1.0Depression Storage (mm)orosity0.30Evaporation (mm/day)rel (m)17.420Cap Volume Depth (m)	9.3 32.0 200.0 2 3 0.330
Orific	ce Outflow Control	
Diamotor (m) 0.045 Discharge	Coofficient 0 600 Invert Level (m) 17	120
	Coefficient 0.000 invert level (m) i/.	120
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CH2M										Page 1
Ash House										
Falcon Roa	d							4		
Evotor F	 x2 7t.b									~~~
Data 16/04	$\frac{1}{2010}$	Deci	an od k	TD0	65000	0		— Micro		
Date 16/04	/2010 14:00	5		Desi	Ignea i	by IRU	10002	9		Drainage
File 2018-	04-16-Pill	Stat	ion	. Chec	cked by	/				Brainage
XP Solutio	ns			Sour	cce Cor	ntrol	2017	.1.2		
	Summary	of R	esults	s for 1	00 yea	r Reti	urn P	erio	d (+40	18)
			Half	Drain Ti	.me : 12	5 minu	tes.			
	Storm	May	Max	Mav		Maw	Ma	v	Max	Status
	Event	Level	Depth	Infiltr	ation C	ontrol	$\Sigma 011$	flow	Volume	blacus
		(m)	(m)	(1/s	;)	(1/s)	(1/	s)	(m ³)	
		. ,	. ,					- •	. ,	
15	min Summer 3	17.662	0.242		0.0	2.0		2.0	16.0	O K
30	min Summer 3	17.708	0.288		0.0	2.2		2.2	21.0	Flood Risk
60	min Summer 1	17.745	0.325		0.0	2.3		2.3	25.1	Flood Risk
120	min Summer 1	17.763	0.343		0.0	2.4		2.4	27.0	Flood Risk
180	min Summer 1	17.763	0.343		0.0	2.4		2.4	27.0	Flood Risk
240	min Summer .	17.757	0.337		0.0	2.4		2.4	26.4	Flood Risk
360	min Summer .	17.744 17.720	0.324		0.0	2.3		2.3	23.0	Flood Risk
400	min Summor	17 715	0.309		0.0	2.3		2.3	23.3	Flood Risk
720	min Summer	17.713	0.295		0.0	2.2		2.2	21.0	Flood Risk
960	min Summer	17.678	0.258		0.0	2.1		2.1	17.7	0 K
1440	min Summer 1	17.639	0.219		0.0	1.9		1.9	13.4	0 K
2160	min Summer 1	17.598	0.178		0.0	1.7		1.7	9.0	O K
2880	min Summer 3	17.568	0.148		0.0	1.5		1.5	6.2	O K
4320	min Summer 3	17.527	0.107		0.0	1.2		1.2	3.3	O K
5760	min Summer 3	17.502	0.082		0.0	1.0		1.0	1.9	O K
7200	min Summer 3	17.487	0.067		0.0	0.9		0.9	1.3	O K
8640	min Summer 1	17.479	0.059		0.0	0.8		0.8	1.0	0 K
		Stor	m	Rain	Floode	d Disch	harge	Time-	Peak	
		Even	t	(mm/hr)	Volume	Vol	ume	(mi)	ns)	
					(m³)	(m	1 ³)	-	-	
	1	5 min	Summer	131 851	0	า	17 R		24	
	21	0 min	Summer	88 566	0.	ן ר	1,.0 24 1		37	
	61	0 min	Summer	56.713	0.	-)	31.1		64	
	12	0 min	Summer	35.004	0.)	38.6		104	
	18	0 min	Summer	25.973	0.	C	43.0		136	
	24	0 min	Summer	20.877	0.	С	46.1		170	
	36	0 min	Summer	15.365	0.	C	50.8		240	
	48	0 min	Summer	12.341	0.	C	54.4		308	
	60	0 min	Summer	10.402	0.	C	57.3		376	
	72	0 min	Summer	9.042	0.	C	59.7		442	
	96	0 min	Summer	7.241	0.	C	63.7		570	
	144	0 min	Summer	5.284	0.	C	69.5		820	
	216	U min	Summer	3.848	0.	0	75.5		1176	
	288	u min 0 min	Summer	3.068	υ.	J	19.9		1532	
1	4321		Summer	2.220	υ.	J	00.I		2274	

5760 min Summer

7200 min Summer

8640 min Summer

2.226

1.771

1.284

1.483

90.5

93.9

96.7

0.0

0.0

0.0

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3672

4400

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							- Cm
Date 16/04/2018 14:00	6	Desid	med by	7 TR0658	32.9		- MICLO
File 2018 - 04 - 16 - Pill	Station	Check	ed by				Drainage
VP Solutions	Station	· CIICCI	Cont	-rol 201	7 1 2		
AF SOLUCIONS		50010	Le COIN	201 201	. / • 1 • 2		
Cummo mu	of Doculto	for 10	0	Dotum	Domiou		0.)
Summary	OI RESULLS	5 101 10	0 year	Recurn	Period	1 (740	<u>6)</u>
Storm	Max Max	Max		Max	Max	Max	Status
Event	Level Depth	Infiltra	tion Co	ntrol Σ (Outflow	Volume	
	(m) (m)	(1/s)) (1/s)	(l/s)	(m³)	
10080 min Summer	17.475 0.055		0.0	0.7	0.7	0.8	O K
15 min Winter 30 min Winter	17.081 0.261		0.0	2.1	2.1	18.1 23 9	U K Flood Risk
60 min Winter	17.780 0.360		0.0	2.5	2.5	23.5	Flood Risk
120 min Winter	17.807 0.387		0.0	2.6	2.6	31.1	Flood Risk
180 min Winter	17.806 0.386		0.0	2.5	2.5	30.9	Flood Risk
240 min Winter	17.795 0.375		0.0	2.5	2.5	30.1	Flood Risk
360 min Winter	17.771 0.351		0.0	2.4	2.4	27.8	Flood Risk
480 min Winter	17.748 0.328		0.0	2.3	2.3	25.4	Flood Risk
600 min Winter	17.727 0.307		0.0	2.3	2.3	23.1	Flood Risk
960 min Winter	17 672 0 252		0.0	2.2	2.2	20.9	PIODA RISK
1440 min Winter	17.620 0.200		0.0	1.8	1.8	11.4	O K
2160 min Winter	17.568 0.148		0.0	1.5	1.5	6.3	O K
2880 min Winter	17.533 0.113		0.0	1.3	1.3	3.7	O K
4320 min Winter	17.494 0.074		0.0	1.0	1.0	1.6	O K
5760 min Winter	17.479 0.059		0.0	0.8	0.8	1.0	O K
7200 min Winter	17.473 0.053		0.0	0.7	0.7	0.8	O K
8640 min Winter	17.468 0.048		0.0	0.6	0.6	0.6	ΟK
	Storm	Rain	Flooded	Dischar	qe Time-	Peak	
	Event	(mm/hr)	Volume	Volume	(mi	ns)	
			(m³)	(m³)			
1000		1 1 2 7	0 0	0.0	0	5040	
1008	5 min Summer	1.13/ 131 851	0.0	99 20	.0	24	
	30 min Winter	88.566	0.0	20	.1	37	
6	50 min Winter	56.713	0.0	34	.9	64	
12	0 min Winter	35.004	0.0	43	.3	114	
18	30 min Winter	25.973	0.0	48	.2	144	
24	10 min Winter	20.877	0.0	51	.7	184	
36	50 min Winter	15.365	0.0	57	.1	258	
48	0 min Winter	12.341	0.0	61 61	• 1 3	332 402	
72	20 min Winter	9.042	0.0	67	. J	470	
96	50 min Winter	7.241	0.0	71	.5	604	
144	0 min Winter	5.284	0.0	78	.1	854	
216	50 min Winter	3.848	0.0	84	.9	1200	
288	30 min Winter	3.068	0.0	89	.9	1536	
432	0 min Winter	2.226	0.0	97	.0	2212	
576	0 min Winter	1 483	0.0	102	.0	2004 3648	
864	10 min Winter	1.284	0.0	109	.3	4320	
	©19	82-2017	XP Sol	lutions			

CH2M									Page 3	
Ash House										
Falcon Road									Y.	
Exeter EX2	7LB								Micco	m
Date 16/04/2	018 14:06			Desi	gned by	IR06582	9		Desing	
File 2018-04	-16-Pill S	Station	•••	Chec	ked by				Uldillo	JUE
XP Solutions				Sour	ce Cont	rol 2017	.1.2			
	Summary of	of Resu	ults f	or 10	00 year	Return H	Period	(+40응)		
	Storm	Max	Max	м	ax	Max	Max	Max	Status	
	Event	Level	Depth	Infilt	tration (Control S	Outflow	Volume	blucub	
		(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)		
10080	min Winter	17.464	0.044		0.0	0.5	0.5	0.6	ОК	
		C+		Doin	Fleeded	Diesterre	m i P	- I -		
		Event	(m	m/hr)	Volume	Volume	(mins)	aĸ		
			、	,,	(m ³)	(m ³)	、 <i>,</i>			
	10090	min Mir	tor	1 1 2 7	0 0	112 0	10	02		
	10000	IIITII MATI	ILEI	1.13/	0.0	112.0	49	92		
			©1982-	-2017	XP Sol	utions				

CH2M	Page 4							
Ash House								
Falcon Road	L.							
Exeter EX2 7LB	Micco							
Date 16/04/2018 14:06	Designed by IR065829							
File 2018-04-16-Pill Station	Checked by							
XP Solutions	Source Control 2017.1.2							
Ra	infall Details							
Rainfall ModelFSRWinter StormsYesReturn Period (years)100Cv (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000Shortest Storm (mins)15Ratio R0.350Longest Storm (mins)10080Summer StormsYesClimate Change %+40								
Tir	me Area Diagram							
Tot	al Area (ha) 0.075							
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)							
0 4 0.025	4 8 0.025 8 12 0.025							
©1982-	-ZUL/ XP Solutions							

CH2M		Page 5
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 16/04/2018 14:06	Designed by IR065829	Desinareo
File 2018-04-16-Pill Station	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	-
1	Model Details	
Storage is Or	aline Cover Level (m) 18.000	
Porous	Car Park Structure	
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	(m/hr)0.00000Width (m)mm/hr)1000Length (m)a (1/s)101.6Slope (1:X)Factor1.0Depression Storage (mm)orosity0.30Evaporation (mm/day)rel (m)17.420Cap Volume Depth (m)	9.5 38.5 200.0 2 3 0.330
Orific	ce Outflow Control	
Diameter (m) 0.045 Discharge	Coefficient 0.600 invert Level (m) 1/.	420
e1000	2017 VD Solutions	
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CH2M										Page 1
Ash House										
Falcon Road										4
Exeter EX2	7 LE	3								Micco
Date 16/04/2	018	14:08			Desi	gned b	Desinard			
File 2018-04-16-Pill Station Checked by								Digitigu		
XP Solutions					Sour	ce Con	trol 201	17.1.2		
	Su	ummary	of Res	sults f	or 3	0 year	Return	Period	(+40%)	
			ŀ	Half Dra:	in Ti	me : 100) minutes			
	Stor	m	Max	Max	м	ax	Max	Max	Max	Status
	Ever	nt	Level	Depth I	nfilt	ration	Control X	E Outflow	Volume	
			(m)	(m)	(1	/s)	(l/s)	(l/s)	(m³)	
15	min	Summer	17.625	0.205		0.0	1.8	1.8	11.9	ОК
30	min	Summer	17.658	0.238		0.0	2.0	2.0	15.5	0 K
60	min	Summer	17.683	0.263		0.0	2.1	2.1	18.3	O K
120	min	Summer	17.693	0.273		0.0	2.1	2.1	19.4	O K
180	min	Summer	17.693	0.273		0.0	2.1	2.1	19.3	O K
240	min	Summer	17.688	0.268		0.0	2.1	2.1	18.8	O K
360	min	Summer	17.677	0.257		0.0	2.0	2.0	17.6	O K
480	min	Summer	17.665	0.245		0.0	2.0	2.0	16.3	O K
600	min	Summer	17.654	0.234		0.0	1.9	1.9	15.1	O K
720	min	Summer	17.643	0.223		0.0	1.9	1.9	13.9	O K
960	min	Summer	17.624	0.204		0.0	1.8	1.8	11.9	O K
1440	min	Summer	17.594	0.174		0.0	1.6	1.6	8.7	O K
2160	min	Summer	17.560	0.140		0.0	1.4	1.4	5.6	O K
2880	min	Summer	17.535	0.115		0.0	1.3	1.3	3.8	O K
4320	min	Summer	17.503	0.083		0.0	1.0	1.0	2.0	O K
5760	min	Summer	17.485	0.065		0.0	0.9	0.9	1.2	O K
7200	min	Summer	17.478	0.058		0.0	0.7	0.7	0.9	O K
8640	min	Summer	17.472	0.052		0.0	0.6	0.6	0.8	0 K
			Storm	Ra	ain	Flooded	Dischard	ge Time-P	eak	
			Event	(mm	/hr)	Volume (m³)	Volume (m³)	(mins	5)	
		15	min Sur	nmer 101	.754	0.0	13.	. 6	24	
		30	min Sur	nmer 67	708	0 0	18	З	36	

	Event	(mm/hr)	Volume (m³)	Volume (m³)	(mins)	
15	min Summ	er 101 754	0 0	13 6	24	
30	min Summ	r 67 708	0.0	18 3	36	
60	min Summ	er 43.136	0.0	23.5	62	
120	min Summ	er 26.651	0.0	29.2	98	
180	min Summ	er 19.868	0.0	32.7	132	
240	min Summ	er 16.054	0.0	35.2	166	
360	min Summ	er 11.891	0.0	39.1	234	
480	min Summ	er 9.596	0.0	42.1	302	
600	min Summ	er 8.121	0.0	44.5	368	
720	min Summ	er 7.083	0.0	46.5	434	
960	min Summ	er 5.703	0.0	49.9	560	
1440	min Summ	er 4.198	0.0	54.8	802	
2160	min Summ	er 3.085	0.0	60.1	1156	
2880	min Summ	er 2.477	0.0	64.0	1508	
4320	min Summ	er 1.816	0.0	69.5	2212	
5760	min Summ	er 1.456	0.0	73.5	2936	
7200	min Summ	er 1.227	0.0	76.6	3672	
8640	min Summ	er 1.067	0.0	79.1	4312	
	C	1982-2017	' XP Sol	utions		

CH2M							Page 2
Ash House							
Falcon Road							L.
Exeter EX2 7LB							Micco
Date 16/04/2018 14:0	8	Desi	gned b	y IR0658	329		Desipado
File 2018-04-16-Pill	Station	. Chec	ked by				Diamage
XP Solutions		Sour	ce Con	trol 201	17.1.2		
Summar	y of Result	s for 3	0 year	Return	Period	ી (+40%	5)
Storm	Max Max	Max	: 	Max	Max	Max	Status
Event	(m) (m)	Infiltra	ation Co	ontrol Σ (1/s)	Outflow (1/s)	(m ³)	
	(, (,	(1/3	,	(1/3/	(1/3)	(
10080 min Summer	17.468 0.048		0.0	0.6	0.6	0.7	O K
15 min Winter	17.640 0.220		0.0	1.9	1.9	13.6	0 K
30 min Winter	17.6// 0.25/		0.0	2.0	2.0	1/./	O K
120 min Winter	17,710,0.200		0.0	2.2	2.2	21.0	Flood Risk
180 min Winter	17 717 0 207		0.0	2.2	2.2	22.3 22 1	Flood Risk
240 min Winter	17 710 0 290		0.0	2.2	2.2	22.1	Flood Risk
360 min Winter	17.692 0.272		0.0	2.1	2.1	19.3	0 K
480 min Winter	17.674 0.254		0.0	2.0	2.0	17.3	0 K
600 min Winter	17.657 0.237		0.0	2.0	2.0	15.5	ΟK
720 min Winter	17.642 0.222		0.0	1.9	1.9	13.7	O K
960 min Winter	17.615 0.195		0.0	1.8	1.8	10.8	O K
1440 min Winter	17.574 0.154		0.0	1.5	1.5	6.7	O K
2160 min Winter	17.531 0.111		0.0	1.3	1.3	3.5	O K
2880 min Winter	17.504 0.084		0.0	1.1	1.1	2.0	O K
4320 min Winter	17.480 0.060		0.0	0.8	0.8	1.0	O K
5760 min Winter	17.472 0.052		0.0	0.6	0.6	0.8	OK
7200 min Winter 8640 min Winter	17 462 0 042		0.0	0.5	0.5	0.6	0 K
0040 mill wincer	17.102 0.012		0.0	0.0	0.5	0.0	0 11
						_	
	Storm	Rain	Flooded	d Dischar	ge Time-	-Peak	
	Event	(mm/nr)	(m ³)	(m ³)	e (m1	ns)	
			()	()			
100	80 min Summer	0.948	0.0) 81	.2	5008	
	15 min Winter	101.754	0.0) 15	.3	24	
	30 min Winter	6/./08	0.0	20	.6	36	
1	20 min Winter	26 651	0.0) 20	• 4 8	104	
1	80 min Winter	19.868	0.0) 36	.7	140	
2	40 min Winter	16.054	0.0) 39	.5	180	
3	60 min Winter	11.891	0.0) 43	.9	254	
4	80 min Winter	9.596	0.0) 47	.3	324	
6	00 min Winter	8.121	0.0	50	.0	392	
7:	20 min Winter	7.083	0.0) 52	.3	460	
9	60 min Winter	5.703	0.0) 56	.0	588	
	40 min Winter	4.198	0.0) 61	.6	828	
21	ou min Winter	3.085 2 177	0.0	ע 10 אין	α. 0	1509	
28	20 min Winter	2.4// 1 816	0.0	, 12) 79	.0	2204	
57	60 min Winter	1.456	0.0	, , , , , , , , , , , , , , , , , , , ,	.0	2912	
72	00 min Winter	1.227	0.0) 86	.6	3600	
86	40 min Winter	1.067	0.0) 89	.6	4400	
	©19	82-2017	XP So	lutions			

СН2М								Page 3	
Ash House									
Falcon Road								4	
Exeter EX2 7LB								Micco	m
Date 16/04/2018 14:08			Desi	qned by	IR06582	9		MILIU	
File 2018-04-16-Pill :	Station		Chec	ked by				Uraina	ige
XP Solutions			Sour	ce Cont	rol 2017	.1.2			
Summary	of Resu	ults	for 3	0 year	Return P	eriod (+40%)		
				-					
Storm	Max	Max	М	lax	Max	Max	Max	Status	
Event	Level	Depth	Infil	tration (Control S	Outflow	Volume		
	(m)	(m)	(1	/s)	(1/s)	(1/s)	(m³)		
10080 min Winter	17.459	0.039		0.0	0.4	0.4	0.4	ОК	
	Storm		Rain	Flooded	Discharge	Time-Pe	ak		
	Event	(n	mm/hr)	Volume	Volume	(mins)			
				(m ³)	(m°)				
10080	min Win	ter	0.948	0.0	92.1	51	36		
	((01982	-2017	XP Sol	utions				

СН2М	Page 4						
Ash House							
Falcon Road	L.						
Exeter EX2 7LB	Micro						
Date 16/04/2018 14:08	Designed by IR065829						
File 2018-04-16-Pill Station	Checked by						
XP Solutions	Source Control 2017.1.2						
Ra	infall Details						
Rainfall ModelFSRWinter StormsYesReturn Period (years)30Cv (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000Shortest Storm (mins)15Ratio R0.350Longest Storm (mins)10080Summer StormsYesClimate Change %+40							
Tin	ne Area Diagram						
Tota	al Area (ha) 0.075						
Time (mins) Area Ti From: To: (ha) Fro	me (mins) Area Time (mins) Area om: To: (ha) From: To: (ha)						
0 4 0.025	4 8 0.025 8 12 0.025						
©1982-	-2017 XP Solutions						

CH2M		Page 5					
Ash House							
Falcon Road		4					
Exeter EX2 7LB		Micco					
Date 16/04/2018 14:08	Designed by IR065829						
File 2018-04-16-Pill Station	Checked by	Drainage					
XP Solutions	Source Control 2017.1.2						
<u>I</u>	Model Details						
Storage is Or	Storage is Online Cover Level (m) 18.000						
Porous	Car Park Structure						
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Pc Invert Lev	(m/hr)0.00000Width (m)mm/hr)1000Length (m)n (l/s)101.6Slope (1:X)Factor1.0Depression Storage (mm)orosity0.30Evaporation (mm/day)rel (m)17.420Cap Volume Depth (m)	9.5 38.5 200.0 2 3 0.330					
Orific	ce Outflow Control						
Diameter (m) 0.045 Discharge	e Coefficient 0.600 invert Level (m) 1/	.420					
	2017 VD Colutting						
©1982-	-ZULI XP SOLUTIONS						



Ash House Falcon Road Exeter EX2 7LB Designed by IR065829 Checked by Date 16/04/2018 14:10 Designed by IR065829 Checked by Designed by IR065829 Designed by IR065829 File 2018-04-16-Pill Station Checked by Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Storm Max Max Max Max Max Max Status Yent I evel Depth Infiltration Control 2 Outflow Volume (m) (n) (1/s) (1/s) (1/s) (n) 15 min Summer 17.662 0.242 0.0 2.0 2.0 16.0 O K O min Summer 17.766 0.242 0.0 2.4 2.4 27.0 Flood Risk 10 min Summer 17.763 0.343 0.0 2.4 2.4 2.0 Flood Risk 10 min Summer 17.757 0.337 0.0 2.3 2.3 25.0 Flood Risk 20 min Summer 17.763 0.343 0.0 2.4 2.4 2.0 Flood Risk 20 min Summer 17.763 0.323 0.0 2.2 2.2 2.1 Flood Risk 20 min Summer 17.763 0.232 0.0 2.2 2.2 2.3	CH2M									Page 1		
Falcon Road Designed by IR065829 (hecked by XF Solutions Source Control 2017.1.2 Summary of Results for 100 year Return Period (+408). Return the second	Ash House											
Easter EX2 7 LB Designed by IR065829 Checked by File 2018-04-16-Pill Station Checked by Checked by Checked by XP Solutions Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Haf Drain Time : 125 minutes. File 2018-04-16-Pill Station Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Storm Max Max Max Max Status Storm Level Depth Infiltration Control E Outflow Volume (m) (n) (1/s) (1/s) (n) 0 0 15 min Summer 17.662 0.242 0.0 2.0 2.0 16.0 0 K 10 min Summer 17.763 0.343 0.0 2.4 2.4 2.7.0 Flood Risk 120 min Summer 17.753 0.343 0.0 2.4 2.4 2.6 Flood Risk 240 min Summer 17.750 0.325 0.0 2.3 2.3 2.3 Slood Risk 360 min Summer 17.763 0.328 0.0 2.2 2.2 2.1 Flood Risk 200 min Summer 17.750 0.328 0.0 2.3 2.3 2.3 Slood Risk 200 min S	Falcon Boad									4		
Lace is 2,22 / 125 Designed by IR065829 Checked by Microconstruction Summary of Results for 100 year Return Period (+40%) Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Max Max Max Status Storm Level Depth Infiltration Control 2 Outflow Volume (m) (m) (1/s) Max Max Status 15 min Summer 17.662 0.242 0.0 2.0 1.6 0 K 30 min Summer 17.763 0.325 0.0 2.2 2.2 1.0 Flood Risk 60 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 60 min Summer 17.7763 0.343 0.0 2.2 2.2 2.1 Flood Risk 60 min Summer 17.7763 0.343 0.0 2.2 2.2 2.1 Flood Risk 60 min Summer 17.775 0.337 0.0 2.2 2.2 2.1 Flood Risk 700 min Summer 17.776 0.337 0.0 2.2 2.2 2.1 Flood Risk 700 min Summer 17.776 0.325 0.0 2.2 2.2 2.1 Flood Risk 700 min Summer 17.778 0.30 0.0 2.1 <	Evotor EV2 71P										m	
Date 16/04/2018 14:10 Designed by TR065829 Checked by During transmission SIMPACT Solutions Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Half Drain Time : 125 minutes. Max Max Max Max Status Yean Level Depth Infiltration Control E Outflow Volume (m) (1/s) (1/s) (1/s) (m) 15 min Summer 17.762 0.242 0.0 2.0 16.0 0 K 30 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Plood Risk 160 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Plood Risk 300 min Summer 17.763 0.393 0.0 2.3 2.3 2.5 Plood Risk 400 min Summer 17.75 0.337 0.0 2.4 2.4 26.4 Plood Risk 600 min Summer 17.750 0.39 0.0 2.3 2.3 2.5 Plood Risk 600 min Summer 17.70 0.39 0.0 2.4 2.4 2.6 Plood Risk 600 min Summer 17.70 0.282 0.0 2.2	Execter EX2 /LB									— Micro	ĭ	
File 2018-04-16-Pill Station Checked by Dimmetry XP Solutions Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Yean Max Max Max Max Max Status Yean Level Depth Infiltration Control 2 Outflow Volume (m) (1/s) (1/s) (1/s) (m) 15 min Summer 17.768 0.288 0.0 2.2 2.10 0.6 0 K 30 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Plood Risk 120 min Summer 17.763 0.343 0.0 2.4 2.4 21.0 Plood Risk 400 min Summer 17.776 0.337 0.0 2.4 2.4 21.0 Plood Risk 240 min Summer 17.716 0.325 0.0 2.2 2.2 2.3 25.0 Plood Risk 400 min Summer 17.716 0.324 0.0 2.3 2.3 25.0 Plood Risk 600 min Summer 17.715 0.295 0.0 2.2 2.2 2.0.3 Plood Risk 720 min Summer 17.750 0.282 0.0 1.9 1.3.4 K	Date 16/04/2018 14:1	.0		Design	ed by	/ IRO	65829	9		Drain	апо	
XF Solutions Source Control 2017.1.2 Source Control 2017.1.2 Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Storm Max Max <th cols<="" td=""><td>File 2018-04-16-Pill</td><td>. Statio</td><td>n</td><td>Checke</td><td>d by</td><td></td><td></td><td></td><td></td><td>Digit</td><td>aye</td></th>	<td>File 2018-04-16-Pill</td> <td>. Statio</td> <td>n</td> <td>Checke</td> <td>d by</td> <td></td> <td></td> <td></td> <td></td> <td>Digit</td> <td>aye</td>	File 2018-04-16-Pill	. Statio	n	Checke	d by					Digit	aye
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 125 minutes. Storm Max	XP Solutions			Source	Cont	rol	2017	.1.2		· · · ·		
Summary of Results for 100 year Return Period (+40%) Figure												
Haft Drain Time : 125 minutes. Form Nax Status Form Nax Nax Nax Status Status Nax Nax Nax Status Numer 17.763 0.24 0.2 2.2 2.2 2.2 2.2 2.2 2.2 2.2 2.100 Risk Non min Summer 17.763 0.343 0.0 2.3 2.3 2.3 2.3 2.3 2.3 2.3 Picod Risk Non min Summer 17.743 0.00 2.2 2.2 <th colsp<="" td=""><td>Summary</td><td>y of Res</td><td>sults f</td><td>or 100</td><td>year</td><td>Retu</td><td>ırn P</td><td>erio</td><td>d (+40</td><td>18)</td><td></td></th>	<td>Summary</td> <td>y of Res</td> <td>sults f</td> <td>or 100</td> <td>year</td> <td>Retu</td> <td>ırn P</td> <td>erio</td> <td>d (+40</td> <td>18)</td> <td></td>	Summary	y of Res	sults f	or 100	year	Retu	ırn P	erio	d (+40	18)	
Storm Event Max (n) Max (n) Max (1/s) Max (n) Max (n) Max (n) Max (1/s) Max (1			Half Dra	ain Time	: 125	minut	tes.					
Storm Max Max<			IIGII DIC		• 120	million						
Event Level Pop (n) Infiltration (l/s) Control is 2 Outflow Volume (l/s) 15 min Summer 17.662 0.242 0.0 2.0 2.0 16.0 0 K 30 min Summer 17.763 0.325 0.0 2.23 2.22 21.0 Flood Risk 100 min Summer 17.763 0.334 0.0 2.44 2.70 Flood Risk 180 min Summer 17.763 0.334 0.0 2.44 2.4 27.0 Flood Risk 180 min Summer 17.773 0.337 0.0 2.44 2.4 26.4 Flood Risk 480 min Summer 17.774 0.325 0.0 2.23 2.3 25.0 Flood Risk 600 min Summer 17.774 0.325 0.0 2.21 2.2 21.8 Flood Risk 720 min Summer 17.712 0.255 0.0 2.21 2.2 2.2 21.8 Flood Risk 720 min Summer 17.702 0.216 0.1 1.9 13.4 0 K </td <td>Storm</td> <td>Max</td> <td>Max</td> <td>Max</td> <td>N</td> <td>ſax</td> <td>Ma</td> <td>x</td> <td>Max</td> <td>Status</td> <td></td>	Storm	Max	Max	Max	N	ſax	Ma	x	Max	Status		
(m)(m)(1/s)(1/s)(1/s)(m²)15 min Summer 17.6620.2420.02.02.016.00 K30 min Summer 17.7450.3250.02.32.325.1Flood Risk120 min Summer 17.7630.3430.02.42.427.0Flood Risk180 min Summer 17.7630.3370.02.42.427.0Flood Risk240 min Summer 17.7570.3370.02.42.426.4Flood Risk600 min Summer 17.7590.3370.02.32.323.5Flood Risk600 min Summer 17.7590.2950.02.22.221.8Flood Risk600 min Summer 17.7580.2820.02.22.221.8Flood Risk720 min Summer 17.7580.2950.02.12.117.70 K1440 min Summer 17.5680.1780.01.71.79.00 K280 min Summer 17.5690.1780.01.51.56.20 K280 min Summer 17.5600.1480.01.51.56.20 K5760 min Summer 17.4870.0670.00.90.91.90 K720 min Summer 17.4970.0590.01.01.00 K15 min Summer 17.4970.0590.00.81.00 K210 min Summer 17.4970.0590.00.48104160 min Summer 35.0040.038.6104120 min Summer 35.0040.038.6<	Event	Level D	epth In	filtrati	on Cor	itrol	Σ Out	flow	Volume			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		(m)	(m)	(1/s)	()	./s)	(1/	s)	(m³)			
30 min Summer 17.708 0.288 0.0 2.2 2.2 21.0 Flood Risk 60 min Summer 17.745 0.325 0.0 2.3 2.5 1 Flood Risk 120 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 180 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 240 min Summer 17.757 0.337 0.0 2.4 2.4 26.4 Flood Risk 360 min Summer 17.729 0.309 0.0 2.3 2.3 23.3 Flood Risk 480 min Summer 17.715 0.295 0.0 2.2 2.2 20.8 Flood Risk 600 min Summer 17.768 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 2160 min Summer 17.580 0.148 0.0 1.5 1.5 6.2 0 K 2180 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 7700 min Summer 17.487 0.067 0.0 1.9 1.9 1.3 0 K 7200 min Summer 17.487 0.067 0.0 0.9 1.3 0 K 7200 min Summer 17.49 0.059 0.0	15 min Summer	17.662 0	.242	0	. 0	2.0		2.0	16.0	ОК		
60 min Summer 17.745 0.325 0.0 2.3 2.3 25.1 Flood Risk 120 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 180 min Summer 17.753 0.337 0.0 2.4 2.4 27.0 Flood Risk 240 min Summer 17.744 0.324 0.0 2.3 2.3 25.0 Flood Risk 360 min Summer 17.749 0.309 0.0 2.3 2.3 25.0 Flood Risk 600 min Summer 17.729 0.309 0.0 2.3 2.3 25.0 Flood Risk 600 min Summer 17.729 0.309 0.0 2.2 2.2 21.8 Flood Risk 600 min Summer 17.720 0.282 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.638 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.586 0.178 0.0 1.7 1.7 9 K 2260 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 7200 min Summer 17.487 0.067 0.0 0.8 1.0 0 K 7200 min Summer 17.497 0.059 0.0 0.8 1.0 0 K 7200 min Summer 17.487 0.067 0.0 1.9	30 min Summer	17.708 0	.288	0	.0	2.2		2.2	21.0	Flood Risk		
120 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 180 min Summer 17.763 0.343 0.0 2.4 2.4 27.0 Flood Risk 240 min Summer 17.767 0.337 0.0 2.4 2.4 26.4 Flood Risk 360 min Summer 17.749 0.324 0.0 2.3 2.3 25.0 Flood Risk 480 min Summer 17.729 0.309 0.0 2.3 2.3 21.0 Flood Risk 600 min Summer 17.702 0.282 0.0 2.2 2.2 21.8 Flood Risk 720 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.598 0.178 0.0 1.7 1.7 9.0 0 K 2880 min Summer 17.592 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.8 0.8 1.0 0 K 7200 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 7200 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 60 min Summer 131.856 0.0	60 min Summer	17.745 0	.325	0	.0	2.3		2.3	25.1	Flood Risk		
180 min Summer 17.763 0.343 0.0 2.4 2.5 Flood Risk 360 min Summer 17.729 0.309 0.0 2.3 2.3 2.3 2.10 Risk 600 min Summer 17.702 0.282 0.0 2.2 2.2 2.0 3 Flood Risk 720 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.598 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 220 min Summer 17.527 0.107 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.8 1.0 0 K	120 min Summer	17.763 0	.343	0	.0	2.4		2.4	27.0	Flood Risk		
240 min Summer 17.757 0.337 0.0 2.4 2.4 2.6.4 Flood Risk 360 min Summer 17.729 0.309 0.0 2.3 2.3 25.0 Flood Risk 480 min Summer 17.715 0.295 0.0 2.2 2.2 21.8 Flood Risk 720 min Summer 17.702 0.282 0.0 2.2 2.2 21.8 Flood Risk 960 min Summer 17.678 0.258 0.0 2.1 2.1 17.77 0 K 1440 min Summer 17.678 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.527 0.107 0.0 1.2 1.2 2.3 3.0 o K 320 min Summer 17.527 0.082 0.0 1.0 1.0 1.9 0 K 4320 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 7200 min Summer 17.497 0.059 0.0 0.8 0.8 1.0 0 K 8640 min Summer 17.479 0.059 0.0 1.8 1.0 0 K 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 25.773 0.0 43.0 136	180 min Summer	17.763 0	.343	0	.0	2.4		2.4	27.0	Flood Risk		
360 min Summer 17.744 0.324 0.0 2.3 2.3 25.0 Flood Risk 480 min Summer 17.729 0.309 0.0 2.3 2.3 23.3 Flood Risk 600 min Summer 17.715 0.295 0.0 2.2 2.2 21.8 Flood Risk 720 min Summer 17.702 0.282 0.0 2.2 2.2 20.3 Flood Risk 960 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.598 0.178 0.0 1.9 13.4 0 K 2160 min Summer 17.558 0.178 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 7200 min Summer 17.487 0.067 0.0 0.9 1.9 0.8 1.0 0 K 7200 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 0 K 8640 min Summer 17.479 0.059 0.0 1.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 35.004 0.0 38.6 104 120 136 136 120 min Summer 25.973 0.0 43.0 136	240 min Summer	17.757 0	.337	0	.0	2.4		2.4	26.4	Flood Risk		
480 min Summer 17.729 0.309 0.0 2.3 2.3 23.3 Flood Risk 600 min Summer 17.715 0.295 0.0 2.2 2.2 21.8 Flood Risk 720 min Summer 17.702 0.282 0.0 2.2 2.2 20.3 Flood Risk 960 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.598 0.178 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.572 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.8 0.8 1.0 0 K 8640 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 30 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 56.713 0.0 38.6 104 120 min Summer 25.973 0.0 43.0 136 <td>360 min Summer</td> <td>17.744 0</td> <td>.324</td> <td>0</td> <td>.0</td> <td>2.3</td> <td></td> <td>2.3</td> <td>25.0</td> <td>Flood Risk</td> <td></td>	360 min Summer	17.744 0	.324	0	.0	2.3		2.3	25.0	Flood Risk		
600 min Summer 17.715 0.295 0.0 2.2 2.2 21.8 Flood Risk 720 min Summer 17.702 0.282 0.0 2.2 2.2 20.3 Flood Risk 960 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.639 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.598 0.178 0.0 1.7 1.7 9.0 0 K 2800 min Summer 17.592 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K 30 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 38.6 104 120 min Summer 35.004 0.0 38.6 104 120 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0	480 min Summer	17.729 0	.309	0	.0	2.3		2.3	23.3	Flood Risk		
720 min Summer 17.702 0.282 0.0 2.2 2.2 20.3 Flood Risk 960 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.639 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.598 0.178 0.0 1.7 1.7 9.0 0 K 2880 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 7200 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 8640 min Summer 17.479 0.059 0.0 0.8 1.0 0 K 700 min Summer 131.851 0.0 17.8 24 30 min Summer 131.851 0.0 17.8 24 30 min Summer 35.004 0.0 38.6 104 120 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0 50.8	600 min Summer	17.715 0	.295	0	.0	2.2		2.2	21.8	Flood Risk		
960 min Summer 17.678 0.258 0.0 2.1 2.1 17.7 0 K 1440 min Summer 17.639 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.588 0.178 0.0 1.7 1.7 9.0 0 K 280 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.602 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) (m³) 0.8 1.0 0 K 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 25.973 0.0 43.0 136 240 min Summer 15.365 0.0 50.8 240 480	720 min Summer	17.702 0	.282	0	.0	2.2		2.2	20.3	Flood Risk		
1440 min Summer 17.639 0.219 0.0 1.9 1.9 13.4 0 K 2160 min Summer 17.598 0.178 0.0 1.7 1.7 9.0 0 K 2880 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm (mm/hr) Volume (m3) Volume (mins) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 15.365 0.0 54.4 308 600 min Summer 12.341 0.0 54.4 308	960 min Summer	17.678 0	.258	0	.0	2.1		2.1	17.7	O K		
2160 min Summer 17.598 0.178 0.0 1.7 1.7 9.0 0 K 2880 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) (m³) 0 K 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376	1440 min Summer	17.639 0	.219	0	.0	1.9		1.9	13.4	O K		
2880 min Summer 17.568 0.148 0.0 1.5 1.5 6.2 0 K 4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) (m³) 0 K 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 20.877 0.0 43.0 136 240 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376	2160 min Summer	17.598 0	.178	0	.0	1.7		1.7	9.0	ОК		
4320 min Summer 17.527 0.107 0.0 1.2 1.2 3.3 0 K 5760 min Summer 17.502 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) (m³) (mins) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376	2880 min Summer	17.568 0	.148	0	.0	1.5		1.5	6.2	ОК		
3760 min Summer 17.302 0.082 0.0 1.0 1.0 1.9 0 K 7200 min Summer 17.487 0.067 0.0 0.9 0.9 1.3 0 K 8640 min Summer 17.479 0.059 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 56.713 0.0 31.1 64 120 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376	4320 min Summer	17.527 0	1.107	0	.0	1.2		1.2	3.3	O K		
3640 min Summer 17.479 0.059 0.0 0.0 0.8 0.8 1.0 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 56.713 0.0 38.6 104 120 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0 50.8 240 480 min Summer 10.402 0.0 57.3 376	7200 min Summer	17,502 0	067	0	.0	1.0		1.0	13	OK		
Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m³) (m³) (m³) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376	8640 min Summer	17.479 0	.059	0	.0	0.8		0.8	1.0	0 K		
Storn Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376		11.115 0	.000	Ū	• •	0.0		0.0	1.0	0 IX		
Event(mm/hr)Volume (m³)Volume (m³)(mins)15min Summer131.8510.017.82430min Summer88.5660.024.13760min Summer56.7130.031.164120min Summer35.0040.038.6104180min Summer25.9730.043.0136240min Summer20.8770.046.1170360min Summer15.3650.050.8240480min Summer12.3410.054.4308600min Summer10.4020.057.3376		Storm	F	Rain Fl	ooded	Disch	harge	Time-	Peak			
(m ³) (m ³) 15 min Summer 131.851 0.0 17.8 24 30 min Summer 88.566 0.0 24.1 37 60 min Summer 56.713 0.0 31.1 64 120 min Summer 35.004 0.0 38.6 104 180 min Summer 25.973 0.0 43.0 136 240 min Summer 20.877 0.0 46.1 170 360 min Summer 15.365 0.0 50.8 240 480 min Summer 12.341 0.0 54.4 308 600 min Summer 10.402 0.0 57.3 376		Event	(m	m/hr) Vo	lume	Vol	ume	(mir	ns)			
15 min Summer131.8510.017.82430 min Summer88.5660.024.13760 min Summer56.7130.031.164120 min Summer35.0040.038.6104180 min Summer25.9730.043.0136240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376				((m³)	(m	3)					
30 min Summer88.5660.024.13760 min Summer56.7130.031.164120 min Summer35.0040.038.6104180 min Summer25.9730.043.0136240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	:	15 min Su	mmer 13	1.851	0.0		17.8		24			
60 min Summer56.7130.031.164120 min Summer35.0040.038.6104180 min Summer25.9730.043.0136240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	:	30 min Su	mmer 8	8.566	0.0		24.1		37			
120 min Summer35.0040.038.6104180 min Summer25.9730.043.0136240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376		60 min Su	mmer 5	6.713	0.0		31.1		64			
180 min Summer25.9730.043.0136240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	1:	20 min Su	mmer 3	5.004	0.0		38.6		104			
240 min Summer20.8770.046.1170360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	1:	30 min Su	mmer 2	5.973	0.0		43.0		136			
360 min Summer15.3650.050.8240480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	2	40 min Su	mmer 2	0.877	0.0		46.1		170			
480 min Summer12.3410.054.4308600 min Summer10.4020.057.3376	3	60 min Su	mmer 1	5.365	0.0		50.8		240			
600 min Summer 10.402 0.0 57.3 376	4	30 min Su	mmer 1	2.341	0.0		54.4		308			
	6	JU min Su	mmer 1	0.402	0.0		57.3		376			
/20 min Summer 9.042 0.0 59.7 442	72	20 min Su	mmer	9.042	0.0		59.7		442			
960 min Summer 7.241 U.U 63.7 570	9	ou min Su 10 min Su	mmer	/.∠4⊥ 5. 201	0.0		ບວ./ ເດ =		0/U			
1440 min Summer 5.284 U.U 69.5 820 2160 min Summer 3.848 0.0 75.5 1176	14	HU MIN SU	mmer	J.∠∀4 3 0/0	0.0		09.5 75 5		02U 1176			
2100 min Summer = 3.040 0.0 73.5 11/0 $2880 min Summer = 3.068 0.0 79.9 1532$	21	20 min Su	mmer	3.040 3.068	0.0		79 9		1532			
4320 min Summer 2.226 0.0 86.1 2244	433	20 min Su	mmer	2.226	0.0		86.1		2244			

2944

3672

4400

90.5

93.9

96.7

0.0

0.0

0.0

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5760 min Summer

7200 min Summer

8640 min Summer

1.771

1.284

1.483

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							March
Date 16/04/2018 14:10	0	Desi	aned by	Z IR0658	329		- MICLO
File 2018-04-16-Pill	Station	Chec	ked by				Drainage
YP Solutions	beateron	Sour	ce Cont	-rol 201	17 1 2		
		SOUL	ce com	201 201	17.1.2		
Summa raz	of Posults	for 10		Poturn	Porio	A (110	e)
<u>Summary</u>	OI RESULLS	5 101 10	JU year	Recuin	rerroo	J (+40	~o)
Storm	Max Max	Max		Max	Max	Max	Status
Event	Level Depth	Infiltra	ation Co	ntrol Σ	Outflow	Volume	
	(m) (m)	(1/s) (1/s)	(l/s)	(m³)	
10080 min Summer	17.475 0.055		0.0	0.7	0.7	0.8	O K
30 min Winter	17 734 0 314		0.0	2.1	2.1	23 9	Flood Bisk
60 min Winter	17.780 0.360		0.0	2.5	2.5	28.7	Flood Risk
120 min Winter	17.807 0.387		0.0	2.6	2.6	31.1	Flood Risk
180 min Winter	17.806 0.386		0.0	2.5	2.5	30.9	Flood Risk
240 min Winter	17.795 0.375		0.0	2.5	2.5	30.1	Flood Risk
360 min Winter	17.771 0.351		0.0	2.4	2.4	27.8	Flood Risk
480 min Winter	17.748 0.328		0.0	2.3	2.3	25.4	Flood Risk
720 min Winter	17 707 0 287		0.0	2.3	2.3	20.9	Flood Risk
960 min Winter	17.672 0.252		0.0	2.0	2.0	17.1	O K
1440 min Winter	17.620 0.200		0.0	1.8	1.8	11.4	O K
2160 min Winter	17.568 0.148		0.0	1.5	1.5	6.3	O K
2880 min Winter	17.533 0.113		0.0	1.3	1.3	3.7	O K
4320 min Winter	17.494 0.074		0.0	1.0	1.0	1.6	O K
5760 min Winter	17.479 0.059		0.0	0.8	0.8	1.0	O K
8640 min Winter	17.468 0.048		0.0	0.6	0.6	0.6	0 K 0 K
	1,100 0.010		0.0	0.0	0.0	0.0	0 10
	Storm	Rain	Flooded	Dischar	ge Time-	-Peak	
	Event	(mm/hr)	Volume	Volume	e (mi	ns)	
			(m³)	(m³)			
1008	30 min Summer	1.137	0.0	99	. 0	5048	
1000	15 min Winter	131.851	0.0	20	.0	24	
3	30 min Winter	88.566	0.0	27	.1	37	
6	50 min Winter	56.713	0.0	34	.9	64	
12	20 min Winter	35.004	0.0	43	.3	114	
	30 min Winter	25.973	0.0	48	.2	⊥44 1 Q /	
24	50 min Winter	20.0//	0.0	51 57	• / . 1	104 258	
48	30 min Winter	12.341	0.0	61	.1	332	
60)0 min Winter	10.402	0.0	64	.3	402	
72	20 min Winter	9.042	0.0	67	.1	470	
96	50 min Winter	7.241	0.0	71	.5	604	
144	10 min Winter	5.284	0.0	78	.1	854	
216	No min Winter	3.848 3 NAR	0.0	84 20	. y 9	⊥∠∪U 1536	
432	20 min Winter	2.226	0.0	97	.0	2212	
576	50 min Winter	1.771	0.0	102	.0	2864	
720)0 min Winter	1.483	0.0	106	.0	3648	
864	10 min Winter	1.284	0.0	109	.3	4320	
	©19	82-2017	XP Sol	Lutions			

СН2М							Page 3	
Ash House								
Falcon Road							4	
Exeter EX2 7LB							Micco	m
Date 16/04/2018 14:10		Desi	gned by	IR06582	9			-
File 2018-04-16-Pill \$	Station	. Chec	ked by				Uldindu	Je
XP Solutions		Sour	ce Cont	rol 2017	.1.2			
Summary	of Results	for 10)0 year	Return H	Period	(+40%)		
Storm	Max Max	: N h Trefil	lax	Max	Max	Max	Status	
Event	(m) (m)	.n iniii ()	(s)	(1/s)	(1/s)	(m ³)		
	(,		, . ,	(=/ =/	(=/ =/	()		
10080 min Winter	17.464 0.04	4	0.0	0.5	0.5	0.6	0 K	
	Storm	Rain	Flooded	Discharge	Time-Pe	ak		
	Event	(mm/hr)	Volume	Volume	(mins)			
			(m³)	(m³)				
10080	min Winter	1.137	0.0	112.0	49	92		
	©198	2-2017	XP Sol	utions				

CH2M	Page 4
Ash House	
Falcon Road	4
Exeter EX2 7LB	Misso
Date 16/04/2018 14:10	Designed by IR065829
File 2018-04-16-Pill Station	Checked by Urainage
XP Solutions	Source Control 2017.1.2
Ra	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40
Tir	ne Area Diagram
Tot	al Area (ha) 0.075
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)
0 4 0.025	4 8 0.025 8 12 0.025
©1982·	-2017 XP Solutions

CH2M		Page 5
Ash House		
Falcon Road		4
Exeter EX2 7LB		Micco
Date 16/04/2018 14:10	Designed by IR065829	Desipado
File 2018-04-16-Pill Station	Checked by	Diginada
XP Solutions	Source Control 2017.1.2	
<u>I</u>	Model Details	
Storage is Or	lline Cover Level (m) 18.000	
Porous	Car Park Structure	
Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Pc Invert Lev	(m/hr)0.00000Width (m)mm/hr)1000Length (m)a (1/s)101.6Slope (1:X)Factor1.0Depression Storage (mm)prosity0.30Evaporation (mm/day)rel (m)17.420Cap Volume Depth (m)	9.5 38.5 200.0 2 3 0.330
Orific	ce Outflow Control	
Diameter (m) 0.045 Discharge	Coefficient 0.600 Invert Level (m) 17.	420
©1982-	-2017 XP Solutions	



APPENDIX D

Haul Roads Drainage Strategy Drawings and Calculations
CH2M Hill									I	Page	1
Ash House									(
Falcon Road										4	
Exeter EX2 7LB										Mire	Jun
Date 09/05/2018 11:	27		Desi	aned k	ov MAC	4795	0			MIL	U
File Test 2 - Ditch	1 (3	0 v	. Chec	ked by	7					Ural	nage
Micro Drainage	(0	•	Sour	ce Cor	trol	2017	' 1	2			
			0041	00 001	10101	2011	• - •	-			
Summarv	of Re	sults	for 30	0 vear	Retu	rn Pe	eric	od (+1	10%)		
	Drain Tir	ne : 489	minute	es.							
Storm	Max	Max	Max	1	Max	Max	_	Max	Stat	us	
Event	Level	Depth (m)	Infiltra (1/s)	tion Com	ntrol Σ 1/e)	Outfl (1/s)	low \ \	(m ³)			
	(111)	(111)	(1/3)	· · · ·	1/3/	(1/5)	,	(111)			
15 min Summer	9.663	0.463		0.0	1.8		1.8	47.5		ΟK	
30 min Summer	9.722	0.522		0.0	1.9	-	1.9	62.4	Flood	Risk	
60 min Summer	9.//3	0.573		0.0	2.0	-	2.U 2.1	//.5 Q1 /	Flood	RISK	
180 min Summer	9.832	0.632		0.0	∠•⊥ 2.1	4	2.1	97.6	Flood	Risk	
240 min Summer	9.840	0.640		0.0	2.1		2.1	100.6	Flood	Risk	
360 min Summer	9.846	0.646		0.0	2.1	2	2.1	102.6	Flood	Risk	
480 min Summer	9.845	0.645		0.0	2.1	2	2.1	102.5	Flood	Risk	
600 min Summer	9.844	0.644		0.0	2.1	2	2.1	101.8	Flood	Risk	
720 min Summer	9.841	0.641		0.0	2.1	4	2.1	100.8	Flood	Risk	
960 min Summer	9.834	0.634		0.0	2.1	4	2.1	98.1	Flood	Risk	
1440 min Summer	9.816	0.616		0.0	2.1	2	2.1	91.8	Flood	Risk	
2160 min Summer	9.788	0.588		0.0	2.0	-	2.0	82.4	Flood	Risk	
4320 min Summer	9.701	0.501		0.0	2.0	-	2.0 1 9	73.0 58.8	Flood	RISK	
5760 min Summer	9.660	0.460		0.0	1.8	-	1.8	46.9	rioou	O K	
7200 min Summer	9.617	0.417		0.0	1.7	-	1.7	37.6		ΟK	
8640 min Summer	9.579	0.379		0.0	1.6		1.6	30.3		ΟK	
10080 min Summer	9.545	0.345		0.0	1.5	-	1.5	24.5		ΟK	
15 min Winter	9.687	0.487		0.0	1.9	-	1.9	53.4		ΟK	
30 min Winter	9.749	0.549		0.0	2.0	2	2.0	70.3	Flood	Risk	
	Storm	n	Rain	Flooded	Discha	arge I	Cime-	Peak			
	Event	-	(mm/hr)	Volume	Volu	me	(mir	ıs)			
				(m³)	(m ³)					
	15 min	Summer	79.950	0.0	4	19.3		23			
	30 min	Summer	53.199	0.0	6	65.6		38			
	60 min	Summer	33.892	0.0	3	33.6		66			
12	20 min	Summer	20.940	0.0	11	13.3		126			
24	40 min	Summer	12 614	0.0	10	24 5		242			
30	60 min	Summer	9.343	0.0	1.3	38.3		354			
48	30 min	Summer	7.540	0.0	14	18.8		408			
60	00 min	Summer	6.381	0.0	15	57.4		470			
72	20 min	Summer	5.565	0.0	10	54.8		534			
90	60 min	Summer	4.481	0.0	17	76.9		668			
144	40 min	Summer	3.298	0.0	19	95.3		944			
210	60 min	Summer	2.424	0.0	21	15.3		1360			
288	SU min	Summer	1.946	0.0	23	30.5 52 F		1756			
432	20 min 60 min	Summer	1 1 1 4 2 /	0.0	25	ひろ、ち 71 0		3240			
720	00 min	Summer	1.144 0.964	0.0	29	7±.0 35.5		3968			
864	40 min	Summer	0.839	0.0	29	97.9		4672			
1008	30 min	Summer	0.745	0.0	30	08.9		5352			
	15 min	Winter	79.950	0.0	5	55.2		23			
	30 min	Winter	53.199	0.0		73.5		37			

									Page 2
Ash House									
Falcon Roa	d								4
Exeter E	X2 71B								- A
	/2010 11.	27		Deci	anad b	MA O	17050		— Micro
Jale 09/05	/2018 11:	21		Desi	.gnea b	y MAU	4/950		Drainan
file Test	2 - Ditch	11(3	30 y	. Chec	ked by	r			braining
Aicro Drai	nage			Sour	ce Con	itrol	2017.1	.2	
	Summarv	of Re	sults	for 3	0 vear	Retur	n Peri	od (+	10%)
	<u> </u>				<u> </u>			<u> </u>	/
	Storm	Max	Max	Max	N	lax.	Max	Max	Status
	Event	Level	Depth	Infiltra	tion Cor	itrol Σ	Outflow	Volume	000000
		(m)	(m)	(1/s)) (1	/s)	(1/s)	(m³)	
60) min Winter	9.803	0.603		0.0	2.1	2.1	87.5	Flood Risk
120	/ min Winter	9.849	0.649		0.0	2.1	2.1	103.7	Flood Risk
180	/ min Winter	9.869	0.669		0.0	2.2	2.2	111.4	Flood Risk
240) min Winter	9.8/9	0.679		0.0	2.2	2.2	110.0	Flood Risk
360) min Winter	2.000 9 888	0.000 0 688		0.0	2.2	2.2	110 2	Flood Risk
400) min Winter	9.885	0.685		0.0	2.2	2.2	117 R	Flood Risk
72.0) min Winter	9.882	0.682		0.0	2.2	2.2	116.6	Flood Risk
960) min Winter	9.873	0.673		0.0	2.2	2.2	113.0	Flood Risk
1440) min Winter	9.848	0.648		0.0	2.1	2.1	103.6	Flood Risk
2160) min Winter	9.808	0.608		0.0	2.1	2.1	89.1	Flood Risk
2880) min Winter	9.768	0.568		0.0	2.0	2.0	76.0	Flood Risk
4320) min Winter	9.691	0.491		0.0	1.9	1.9	54.4	O K
5760) min Winter	9.622	0.422		0.0	1.7	1.7	38.5	O K
7200	/ min Winter	9.562	0.362		0.0	1.6	1.6	27.2	O K
10090) min Winter	9.510	0.310		0.0	1.5	1.5	19.4	0 K
10080) min winter	9.46/	0.207		0.0	1.4	1.4	14.0	ΟK
		Stor Even	m t	Rain (mm/hr)	Flooded Volume	Discha Volur	rge Time ne (m:	-Peak ins)	
					(m³)	(m³))		
	,	co min	Wintow	22 002	0.0	0	2 7	6.6	
	1 1	20 min	Winter	20 9/0	0.0	9	5.7	00 122	
	12	20 min	Winter	15.610	0.0	12	9.4	180	
	}		MINCOL	TO.0T0	0.0	10	J • 1	100	
	24	30 min 40 min	Winter	12.614	0.0	13	9.4	238	
	11 24 36	40 min 50 min	Winter Winter	12.614 9.343	0.0	13 15	9.4 4.9	238 350	
	⊥≀ 24 36 48	40 min 60 min 30 min	Winter Winter Winter	12.614 9.343 7.540	0.0 0.0 0.0	13 15 <mark>16</mark>	9.4 4.9 6.7	238 350 <mark>454</mark>	
	24 36 48 60	40 min 60 min 80 min 30 min)0 min	Winter Winter Winter Winter	12.614 9.343 7.540 6.381	0.0 0.0 0.0 0.0	13 15 <mark>16</mark> 17	9.4 4.9 6.7 6.3	238 350 <mark>454</mark> 500	
	1 2 4 3 6 4 8 6 0 7 2	40 min 60 min 80 min 00 min 20 min	Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565	0.0 0.0 0.0 0.0 0.0	13 15 16 17 18	9.4 4.9 6.7 6.3 4.5	238 350 454 500 568	
	1 2 4 3 6 4 8 6 0 7 2 9 6	40 min 60 min 80 min 00 min 20 min 50 min	Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481	0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19	9.4 4.9 6.7 6.3 4.5 8.2	238 350 454 500 568 722	
	12 24 36 48 60 72 96 144	40 min 60 min 30 min 20 min 20 min 50 min	Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298	0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21	9.4 4.9 6.7 6.3 4.5 8.2 8.8	238 350 454 500 568 722 1026	
	12 24 36 48 60 72 96 144 216	40 min 40 min 60 min 30 min 20 min 20 min 60 min 40 min 30 min	Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946		13 15 16 17 18 19 21 24 25	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8 2	238 350 454 500 568 722 1026 1460 1876	
	18 24 36 48 60 72 96 144 216 288 433	40 min 40 min 60 min 30 min 20 min 20 min 60 min 60 min 20 min 50 min 30 min 30 min 20 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9	238 350 454 500 568 722 1026 1460 1876 2644	
	18 24 36 48 60 72 96 144 216 286 432 576	80 mini 40 min 60 min 30 min 20 min 60 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5	238 350 454 500 568 722 1026 1460 1876 2644 3400	
	1 1 2 4 3 6 4 8 6 0 7 2 9 6 1 4 4 2 8 8 4 3 2 5 7 6 7 2 0	40 min 40 min 60 min 80 min 20 min 20 min 60 min 40 min 30 min 20 min 50 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104	
	1 1 2 4 2 4 3 (4 8 6 (7 2 9 (1 4 4 2 1 (2 8 8 4 3 2 5 7 (7 2 0 8 6 4	40 min 60 min 80 min 20 min 60 min 60 min 60 min 60 min 30 min 20 min 50 min 30 min 40 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760	
	1 1 2 4 2 4 3 (4 8 6 0 7 2 9 (1 4 4 2 1 (2 8 8 4 3 2 5 7 (7 2 0 8 6 4 1 0 0 8	80 min 40 min 60 min 80 min 20 min 20 min 60 min 70 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	$\begin{array}{c} 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0$	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	18 24 36 48 60 72 96 144 216 286 432 576 720 864 1008	80 min 40 min 60 min 80 min 20 min 20 min 60 min 30 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	$\begin{array}{c} 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0$	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	1 2 4 2 4 3 (4 8 6 (7 2 9 (1 4 4 2 1 (2 8 8 4 3 2 5 7 (7 2 (8 6 4 1 0 0 8	40 min 60 min 80 min 20 min 20 min 60 min 40 min 30 min 20 min 50 min 30 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	40 min 60 min 80 min 20 min 20 min 60 min 40 min 30 min 20 min 60 min 30 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 60 72 96 144 216 288 432 576 720 864 1008	30 min 40 min 60 min 90 min 20 min 20 min 60 min 30 min 20 min 60 min 30 min 20 min 60 min 30 min 20 min 30 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 60 72 96 144 216 288 432 576 720 864 1008	30 min 40 min 60 min 20 min 20 min 20 min 60 min 30 min 20 min 60 min 30 min 20 min 30 min 20 min 30 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	00 min 40 min 60 min 20 min 20 min 60 min 40 min 30 min 20 min 40 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 48 60 72 96 144 216 286 432 576 720 864 1008	40 min 60 min 80 min 20 min 60 min 60 min 60 min 30 min 20 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	24 36 48 60 72 96 144 216 286 432 576 720 864 1008	80 min 40 min 60 min 20 min 60 min 60 min 60 min 30 min 20 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	80 min 40 min 60 min 80 min 00 min 60 min 60 min 30 min 20 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	
	12 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	40 min 60 min 80 min 20 min 60 min 60 min 60 min 30 min 20 min 30 min 30 min 30 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.745	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	13 15 16 17 18 19 21 24 25 28 30 31 33 34	9.4 4.9 6.7 6.3 4.5 8.2 8.8 1.1 8.2 3.9 3.5 9.7 3.7 6.0	238 350 454 500 568 722 1026 1460 1876 2644 3400 4104 4760 5448	

CH2M Hill	Page 3
Ash House	
Falcon Road	4
Exeter EX2 7LB	Mirco
Date 09/05/2018 11:27	Designed by MA047950
File Test 2 - Ditch 1 (30 y	Checked by
Micro Drainage	Source Control 2017.1.2
Ra:	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
Tin	ne Area Diagram
Tot	al Area (ha) 0.329
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)
	-2017 XP Solutions
©1982-	ZULI AE DULUCIUID

CH2M Hill		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 09/05/2018 11:27	Designed by MA047950	Desinado
File Test 2 - Ditch 1 (30 y	Checked by	Diamaye
Micro Drainage	Source Control 2017.1.2	
M	Nodel Details	

Storage is Online Cover Level (m) 10.000

Swale Structure

Infiltration Coefficient Base (m/hr)0.00000Length (m)376.0Infiltration Coefficient Side (m/hr)0.00000Side Slope (1:X)1.0Safety Factor2.0Slope (1:X)400.0Porosity1.00Cap Volume Depth (m)0.000Invert Level (m)9.200Cap Infiltration Depth (m)0.000Base Width (m)0.80.80.8

Orifice Outflow Control

Diameter (m) 0.036 Discharge Coefficient 0.600 Invert Level (m) 9.200

CH2M Hill									Page	1
Ash House										
Falcon Roa	d								4	
Exeter E	X2 7LB								<u> </u>	m
Date 09/05	/2018 11:	4.3		Desi	aned k	ov MAO	47950		MICI	0
File Test	2 - Ditch	2 (3	30 v	Chec	ked hi	7	1,300		Drai	nage
Micro Drai		2 (0		Sour		trol	2017 1	2		
MICIO DIAI	liage			Jour			201/.1	. 2		
	Summarv	of Re	sults	for 3	0 vear	Retur	n Peri	od (+)	10응)	
								(<u> </u>	
			Half	Drain Tir	me : 437	minute	s.			
	Storm	Storm Max Max				Max	Max	Max	Status	
	Event	Level	Depth	Infiltra	tion Co	ntrol Σ	Outflow	Volume		
		(m)	(m)	(1/s)) (1	l/s)	(1/s)	(m³)		
15	min Summer	9.660	0.460		0.0	1.8	1.8	42.6	O K	
30	min Summer	9.717	0.517		0.0	1.9	1.9	55.9	Flood Risk	
60	min Summer	9.767	0.567		0.0	2.0	2.0	69.2	Flood Risk	
120	min Summer	9.806	0.606		0.0	2.1	2.1	81.1	Flood Risk	
180	min Summer	9.822	0.622		0.0	2.1	2.1	86.2	Flood Risk	
360	min Summer	9 831	0.020		0.0	2.1	2.1	89 3	Flood Risk	
480	min Summer	9.830	0.630		0.0	2.1	2.1	89.0	Flood Risk	
600	min Summer	9.828	0.628		0.0	2.1	2.1	88.1	Flood Risk	
720	min Summer	9.824	0.624		0.0	2.1	2.1	87.0	Flood Risk	
960	min Summer	9.815	0.615		0.0	2.1	2.1	84.1	Flood Risk	
1440	min Summer	9.795	0.595		0.0	2.1	2.1	77.8	Flood Risk	
2160	min Summer	9.765	0.565		0.0	2.0	2.0	68.8	Flood Risk	
2880	min Summer	9.736	0.536		0.0	1.9	1.9	60.6	Flood Risk	
4320	min Summer	9.679	0.479		0.0	1.8	1.8	46.8	ОК	
5760	min Summer	9.629	0.429		0.0	1.7	1./	36.2	OK	
8640	min Summer	9 545	0.345		0.0	1.0	1.0	20.2	O K O K	
10080	min Summer	9.511	0.311		0.0	1.5	1.5	17.6	O K	
15	min Winter	9.684	0.484		0.0	1.8	1.8	47.8	ОК	
30	min Winter	9.744	0.544		0.0	2.0	2.0	62.9	Flood Risk	
		Stor	m	Rain	Flooded	Discha	rge Time	-Peak		
		Even	t	(mm/hr)	Volume (m³)	Volun (m³)	ne (mi)	ns)		
						. ,				
	1	.5 min	Summer	79.950	0.0	4	4.4	23		
	3	su min	Summer	53.199	0.0	5	9.⊥ 5.2	37		
	1 0	0 min	Summer	20 940	0.0	/ a	3.0	00 124		
	18	30 min	Summer	15.610	0.0	10	4.0	184		
	24	0 min	Summer	12.614	0.0	11	2.0	242		
	36	50 min	Summer	9.343	0.0	12	4.4	330		
	48	80 min	Summer	7.540	0.0	13	3.9	388		
	60	0 min	Summer	6.381	0.0	14	1.7	452		
	72	20 min	Summer	5.565	0.0	14	8.2	518		
	96	0 min	Summer	4.481	0.0	15	9.2	656		
	144	io min	Summor	3.298 0 101	0.0	1 / 1 0	3.7 3.7	93U 1340		
	210	0 min	Summer	2.424 1 946	0.0	19 20	7.4	1732		
	4.32	20 min	Summer	1.427	0.0	2.0	8.1	2472		
	576	50 min	Summer	1.144	0.0	24	3.8	3224		
	720	0 min	Summer	0.964	0.0	25	6.8	3904		
	864	0 min	Summer	0.839	0.0	26	8.1	4664		
	1008	30 min	Summer	0.745	0.0	27	7.9	5344		
	1	.5 min	Winter	19.950	0.0	4	9.1	23		

37

49.7 66.1

0.0

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 10080 min Summer
 0.745

 15 min Winter
 79.950

 30 min Winter
 53.199

CH2M Hill								Page 2
Ash House								
Falcon Road								L.
Exeter EX2 7LB								Mirco
Date 09/05/2018 11:	43		Desi	gned	by MAC)47950		Desipage
File Test 2 - Ditch	2 (3	30 y	. Chec	cked b	У			Dialnage
Micro Drainage			Sour	ce Co	ntrol	2017.1	.2	
Summary	of Re	esults	for 3	0 year	Retu	rn Peri	od (+1	<u>10%)</u>
					-			
Event	Max Level	Max Depth	Max Infiltra	tion Co	Max ntrol Σ	Max Outflow	Max Volume	Status
	(m)	(m)	(1/s))	1/s)	(1/s)	(m ³)	
60 min Winton	0 707	0 5 9 7		0 0	2 1	2 1	70 2	Flood Pick
120 min Winter	9.840	0.597		0.0	2.1	2.1	92.2	Flood Risk
180 min Winter	9.858	0.658		0.0	2.2	2.2	98.6	Flood Risk
240 min Winter	9.867	0.667		0.0	2.2	2.2	101.7	Flood Risk
360 min Winter	9.873	0.673		0.0	2.2	2.2	103.9	Flood Risk
480 Min Winter 600 min Winter	9.867	0.667		0.0	2.2	2.2	102.0	Flood Risk
720 min Winter	9.863	0.663		0.0	2.2	2.2	100.5	Flood Risk
960 min Winter	9.852	0.652		0.0	2.2	2.2	96.4	Flood Risk
1440 min Winter	9.824	0.624		0.0	2.1	2.1	86.9	Flood Risk
2160 min Winter	9.779	0.579		0.0	2.0	2.0	72.9	Flood Risk
2880 min Winter	9.736	0.536		0.0	1.9	1.9	60.7	Flood Risk
4320 min Winter 5760 min Winter	9.654	0.454		0.0	1.8	1.8	41.3 27.8	O K
7200 min Winter	9.521	0.321		0.0	1.5	1.5	18.8	O K
8640 min Winter	9.470	0.270		0.0	1.4	1.4	12.9	O K
10080 min Winter	9.430	0.230		0.0	1.2	1.2	9.0	O K
	Stor Even	m t	Rain (mm/hr)	Floode Volume (m³)	d Discha Volu (m ³	arge Time me (mi)	-Peak ins)	
	50 min	Winter	33.892	0.	c c	84.3	66	
12	20 min	Winter	20.940	0.) 1	04.1	122	
11	30 min	Winter	15.610	0.	0 1	16.4	180	
24	40 min	Winter	12.614	0.		25.5	236	
4	30 min	Winter	9.545	0.	J 1. D 1.	59.4 50.0	446	
60	00 min	Winter	6.381	0.) 1:	58.7	480	
7:	20 min	Winter	5.565	0.	0 1	66.0	556	
90	50 min	Winter	4.481	0.	0 1'	78.3	710	
144	40 min	Winter	3.298	0.	J 19	96.8 17 0	1012	
221	30 min	Winter	2.424 1.946	0.) 2.) 2 [.]	±7.0 32.3	1848	
432	20 min	Winter	1.427	0.	2	55.4	2600	
57	50 min	Winter	1.144	0.	D 2'	73.0	3336	
720)0 min	Winter	0.964	0.	28	87.6	4032	
864	40 min	Winter	0.839	0.) 30 n n	UU.2 11 ?	4672	
1000	,∪ III⊥II	WINCEL	0./43	υ.	. 3.	±±.J	2244	
		@1 Q Q	2-2017	YP C/	lutio	ng		
		OT AQ	2-201 <i>1</i>	AF SC	JIULIO	115		

CH2M Hill		Page 3
Ash House		
Falcon Road		4
Exeter EX2 7LB		Misson
Date 09/05/2018 11:43	Designed by MA047950	
File Test 2 - Ditch 2 (30 y	Checked by	Drainage
Micro Drainage	Source Control 2017.1.2	
<u>Ra</u> .	infall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years) Region Engl	30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.000 Shortest Storm (mins) 15	
Ratio R	0.350 Longest Storm (mins) 10080	
Summer Storms	res Climate Change & +10	
Tin	ne Area Diagram	
Tot	al Area (ha) 0.296	
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 3 0.099	3 6 0:098 6 9 0:099	
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CH2M Hill		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 09/05/2018 11:43	Designed by MA047950	Desinado
File Test 2 - Ditch 2 (30 y	Checked by	Diamage
Micro Drainage	Source Control 2017.1.2	·

Storage is Online Cover Level (m) 10.000

<u>Swale Structure</u>

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	297.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	1.0
Safety Factor	2.0	Slope (1:X)	400.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	9.200	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.7		

Orifice Outflow Control

Diameter (m) 0.036 Discharge Coefficient 0.600 Invert Level (m) 9.200

CH2M Hill							Page 1
Ash House							
Falcon Road							4
Exeter EX2 7LB							- Cm
Date 09/05/2018 11	:48	Desi	aned b	V MA0479	950		MICIO
File Test 3 - Ditc	h 3 (30 v	Chec	rked by	, ,			Drainage
Micro Drainage	11 5 (50 y.	Sour	ce Con	+rol 201	17 1	2	
MICIO DIAIMAge		5001		201	±/•±•	2	
Summary	of Result	s for 3	0 vear	Return	Peri	od (+	10%)
<u>b uninci y</u>	01 1000110	0 101 0	o year	neeurn	1011	04 (1	<u>100/</u>
	Half	Drain Ti	me : 215	minutes.			
Storm	Max Max	Max	M	íax Ma	ax	Max	Status
Event	Level Depth	Infiltra	tion Cor	trol Σ Ou	tflow	Volume	
	(m) (m)	(1/s)) (1	./s) (1,	/s)	(m³)	
15 min Summe	r 9 704 0 404		0 0	1 9	19	25 1	Flood Bisk
30 min Summe	r 9.752 0.452		0.0	2.0	2.0	32.7	Flood Risk
60 min Summe	r 9.790 0.490		0.0	2.1	2.1	39.6	Flood Risk
120 min Summe	r 9.815 0.515		0.0	2.1	2.1	44.6	Flood Risk
180 min Summe	r 9.820 0.520		0.0	2.1	2.1	45.5	Flood Risk
240 min Summe 360 min Summe	r 9.820 0.520 r 9.816 0.516		0.0	2.1	2.1	45.5	Flood Risk Flood Risk
480 min Summe	r 9.809 0.509		0.0	2.1	2.1	44.7	Flood Risk
600 min Summe	r 9.802 0.502		0.0	2.1	2.1	41.9	Flood Risk
720 min Summe	r 9.794 0.494		0.0	2.1	2.1	40.4	Flood Risk
960 min Summe	r 9.778 0.478		0.0	2.0	2.0	37.4	Flood Risk
1440 min Summe	r 9.747 0.447		0.0	2.0	2.0	31.9	Flood Risk
2160 min Summe	r 9.702 0.402		0.0	1.9	1.9	24.9	Flood Risk
2880 min Summe	r 9.662 0.362		0.0	1.8	1.8	19.5	O K
4320 min Summe	r 9.594 0.294 r 9.541 0.241		0.0	1.6	1.6	12.1	OK
7200 min Summe	r 9.541 0.241 r 9.500 0.200		0.0	1 3	1.4	/./ 5 1	O K O K
8640 min Summe	r 9.469 0.169		0.0	1.2	1.2	3.5	O K
10080 min Summe	r 9.444 0.144		0.0	1.1	1.1	2.5	O K
15 min Winte	r 9.725 0.425		0.0	1.9	1.9	28.3	Flood Risk
30 min Winte	r 9.776 0.476		0.0	2.0	2.0	37.0	Flood Risk
	8+~~~	Bain	Flooded	Diechan		-Deal-	
	Event	(mm/hr)	Volume	Volume	mi (mi	ns)	
		(/	(m ³)	(m ³)	(
	15 min Summe	r 79 950	0 0	27 0		22	
	30 min Summe:	53.199	0.0	35.9)	36	
	60 min Summe:	33.892	0.0	45.8		64	
	120 min Summe:	20.940	0.0	56.5		122	
	180 min Summe:	15.610	0.0	63.2		168	
	240 min Summe:	r 12.614	0.0	68.1		198	
	300 min Summe: 480 min Summe:	r 9.343	0.0	15.7		202 220	
	600 min Summe	r 6.381	0.0	0⊥.4 86 1		400	
	720 min Summe:	5.565	0.0	90.2		468	
	960 min Summe:	4.481	0.0	96.8		606	
1.	440 min Summe:	r 3.298	0.0	106.9)	870	
2:	160 min Summe	2.424	0.0	117.8		1252	
2	880 min Summe:	1.946	0.0	126.1		1616	
4.	320 min Summe: 760 min Summe:	c 1.427	0.0	138.7		2332 3000	
7:	200 min Summe	c 0.964	0.0	156.2		3744	
8	640 min Summe:	c 0.839	0.0	163.0		4416	
10	080 min Summe:	0.745	0.0	169.0		5144	
	15 min Winter	79.950	0.0	30.2		22	
	30 min Winte	r 53.199	0.0	40.2		36	

Ash House Exter Date 09/05/2018 11:48 File Test 3 - Ditch 3 (30 y Designed by MA047950 Checked by Micro Drainage Source Control 2017.1.2 Source Control 2017.1.	CH2M Hill										Page 2	
Falcen Road Designed by MA047950 Micro Drainage Source Control 2017.1.2 Source Control 2017.1.2	Ash House											_
Exercise KXZ 7.18 Designed by MA047950 Checked by Micro Drainage Source Control 2017.12 Junco Drainage Source Control 2017.12	Falcon Roa	d									L.	
Designed by MA047950 Checked by Designed by MA047950 Checked by Micro Drainage Source Control 2017.1.2 Summary of Results for 30 year Return Period (+108) Stom Max	Exeter E	X2 7LB									Mirco	m
<text></text>	Date 09/05	/2018 11:	48		Desi	gned	by MA	404795	50			
Micro Drainage Source Outpoil 2017.1.2 Succe Control 2017.1.2 Suce Control 2017.1.2 <t< td=""><td>File Test</td><td>3 - Ditch</td><td>3 (3</td><td>30 v</td><td>. Chec</td><td>cked l</td><td>2V</td><td></td><td></td><td></td><td>Uraina</td><td>ge</td></t<>	File Test	3 - Ditch	3 (3	30 v	. Chec	cked l	2V				Uraina	ge
Number of the series Subset Control Print Subset Control Print Subset Control Print Subset Contro Print Sub	Micro Drai	2200			· Sour		ontrol	201	7 1	2		-
<section-header></section-header>	MICIO DIAI	llage			5001		51101	201	/•⊥•	2		
Stammaty of Results for 30 year return period (FUS) Star Nax		0	- -	1 +	£	0				1 () (1.0.0.)	
Storn Newn Nax Level Nax (N) Max (N)		Summary	OI RE	sults	IOT 3	U yea	r Ret	urn P	eri	oa (+.	<u>108)</u>	
Joint Jak Jak </td <td></td> <td>Storm</td> <td>Mov</td> <td>May</td> <td>Маж</td> <td></td> <td>Mov</td> <td>Мол</td> <td></td> <td>Mow</td> <td>Status</td> <td></td>		Storm	Mov	May	Маж		Mov	Мол		Mow	Status	
Image: No. 10 (1/2)		Event	Level	Depth	Infiltra	tion (Control	Σ Outf	low	Volume	Status	
60 min Winter 9,848 0.518 0.0 2.1 2.1 45.1 Flood Risk 120 min Winter 9,855 0.555 0.0 2.2 2.2 52.9 Flood Risk 240 min Winter 9,855 0.555 0.0 2.2 2.2 52.9 Flood Risk 460 min Winter 9,850 0.556 0.0 2.2 2.2 52.9 Flood Risk 460 min Winter 9,850 0.556 0.0 2.2 2.2 49.8 Flood Risk 720 min Winter 9,830 0.518 0.0 2.1 2.1 45.2 Flood Risk 720 min Winter 9,740 0.448 0.0 2.1 2.1 45.2 Flood Risk 1440 min Winter 9,633 0.325 0.0 1.7 1.7 1.5.2 0.8 7200 min Winter 9,540 0.166 0.0 0.3 0.3 0.8 0.8 0.8 10080 min Winter 9,432 0.132 0.0 1.2 1.2 1.2 0.8 0.8 10080 min Winter 9,543 0.166 0.0 0.8 0.8 0.8 0.8 0.8 10080 min Winter 9,142 0.122 0.10 0.1 1.1 1.2 2.5 0.8 1			(m)	(m)	(1/s))	(1/s)	(1/s	5)	(m ³)		
60 min Winter 9.848 0.518 0.0 2.1 2.1 45.1 Flood Hisk 120 min Winter 9.856 0.556 0.0 2.2 2.2 52.9 Flood Hisk 360 min Winter 9.850 0.555 0.0 2.2 2.2 52.9 Flood Hisk 360 min Winter 9.851 0.555 0.0 2.2 2.2 51.6 Flood Hisk 460 min Winter 9.841 0.518 0.0 2.1 2.1 41.5 Plood Hisk 720 min Winter 9.818 0.538 0.0 0.1 2.1 2.1 40.5 Flood Hisk 720 min Winter 9.748 0.444 0.0 2.1 2.1 40.5 Flood Hisk 720 min Winter 9.625 0.355 0.0 1.7 1.7 1.7 1.7 1.7 7200 min Winter 9.625 0.355 0.0 1.7 1.7 1.7 1.7 1.7 1.7 1.7 7200 min Winter 9.452 0.122 0.0 1.4 1.4 7.2 0.8 7200 min Winter 9.458 0.368 0.00 0.1 1.0 1.0 2.0 0.8 10060 min Winter 9.452 0.106 0.0 1.2 1.2 1.6 0.8 <td></td>												
120 min Winter 9.886 0.586 0.0 2.2 2.2 52.9 Flood Hisk 240 min Winter 9.885 0.555 0.0 2.2 2.2 52.9 Flood Hisk 460 min Winter 9.880 0.586 0.0 2.2 2.2 53.6 Flood Hisk 470 min Winter 9.880 0.586 0.0 2.2 2.2 49.8 Flood Hisk 470 min Winter 9.880 0.586 0.0 2.1 2.1 45.2 Flood Hisk 720 min Winter 9.784 0.484 0.0 2.1 2.1 45.2 Flood Hisk 1440 min Winter 9.633 0.325 0.0 1.7 1.7 15.2 0.8 1440 min Winter 9.635 0.325 0.0 1.4 1.4 7.2 0.8 1280 min Winter 9.632 0.325 0.0 1.4 1.4 7.2 0.8 10080 min Winter 9.632 0.323 0.0 1.0 1.0 2.0 0.8 10080 min Winter 9.422 0.132 0.0 1.4 1.4 7.2 0.8 10080 min Winter 9.432 0.132 0.0 1.0 1.0 2.0 0.8 10080 min Winter 9.432 0.132 0.0 1.2 1.2 1.4 1.2 10080 min Winter	60	min Winter	9.818	0.518		0.0	2.1		2.1	45.1	Flood Risk	
1000 min Winter 9.835 0.555 0.0 2.2 2.2 2.1 Flood Risk 360 min Winter 9.830 0.530 0.0 2.2 2.2 31.6 Flood Risk 600 min Winter 9.830 0.530 0.0 2.2 2.2 47.5 Flood Risk 600 min Winter 9.830 0.530 0.0 2.1 2.1 45.2 Flood Risk 720 min Winter 9.794 0.494 0.0 2.0 2.0 32.1 Flood Risk 2160 min Winter 9.794 0.448 0.0 2.0 1.0 32.1 Flood Risk 2160 min Winter 9.472 0.172 0.0 1.4 1.4 7.2 0.8 2100 min Winter 9.432 0.162 0.0 1.0 1.0 2.0 0.8 10080 min Winter 9.438 0.088 0.0 0.8 0.9 0.8 10080 min Winter 9.438 0.088 0.0 0.1 51.2 64 10080 min Winter 9.388 0.088 0.0 0.1 63.3 120 10080 min Winter 9.388 0.088 0.0 0.1 63.3 120 10080 min Winter 9.388 0.088 0.0 0.1 63.3 120 10080 min Winter 1	120	min Winter	9.848	0.548		0.0	2.2		2.2	51.3	Flood Risk	
1360 min Winter 9,050 0,050 0.0 2.2 2.2 51.6 Flood Risk 480 min Winter 9,030 0,050 0.0 2.2 2.2 47.5 Flood Risk 120 min Winter 9,030 0,050 0.0 2.2 2.2 47.5 Flood Risk 1440 min Winter 9,030 0,044 0.0 2.1 2.1 45.5 Flood Risk 1440 min Winter 9,053 0,033 0.0 1.8 1.4 5.2 0.0 3.5 1440 min Winter 9,053 0,033 0.0 1.4 1.4 7.2 0.6 120 min Winter 9,053 0,036 0.0 1.2 1.2 3.6 0.8 10000 min Winter 9,050 0,036 0.0 1.2 1.2 0.6 0.6 10000 min Winter 9,046 0,106 0.0 0.9 0.9 1.3 0.8 10000 min Winter 9,080 0,008 0.0 0.8 0.9 0.8 0.9 0.8 10000 min Winter 9,080 0,008 0.0 0.1 1.2 1.2 1.4 0.4 0.5 10000 min Winter 9,080 0,008 0.0 0.1 1.2 1.2 0.5 0.5 10	240	min Winter	9.000	0.556		0.0	2.2		2.2	52.9	Flood Risk	
180 min Winter 9.841 0.541 0.0 2.2 2.2 49.8 Flood Risk 600 min Winter 9.818 0.518 0.0 2.1 2.1 45.2 Flood Risk 160 min Winter 9.749 0.444 0.0 2.2 2.2 47.5 Flood Risk 160 min Winter 9.625 0.255 0.0 1.7 1.7 1.5.2 0.8 2160 min Winter 9.432 0.122 0.0 1.4 1.4 7.2 0.8 7200 min Winter 9.432 0.122 0.0 1.0 1.0 2.0 0.8 10080 min Winter 9.432 0.122 0.0 1.4 1.4 7.2 0.8 10080 min Winter 9.432 0.122 0.0 1.0 1.0 2.0 0.8 10080 min Winter 9.432 0.122 0.0 0.8 0.9 0.8 0.9 0.8 10080 min Winter 9.432 0.122 0.0 1.2 1.2 2.6 0.8 0.9 0.8 10080 min Winter 9.432 0.122 0.0 0.1 1.0 2.0 0.8 0.9 0.8 10080 min Winter 9.433 0.08 0.0 0.6 51.2 64 64 60 61	360	min Winter	9.850	0.550		0.0	2.2		2.2	51.6	Flood Risk	
600 min Winter 9.830 0.530 0.0 2.2 2.2 47.5 Flood Risk 700 min Winter 9.794 0.494 0.0 2.1 2.1 40.5 Flood Risk 1440 min Winter 9.794 0.494 0.0 2.0 2.0 32.1 Flood Risk 1440 min Winter 9.633 0.333 0.0 1.8 1.8 22.2 0 K 2880 min Winter 9.534 0.244 0.0 1.7 1.7 1.5.2 0 K 2980 min Winter 9.432 0.122 0.0 1.4 1.4 7.2 0 K 700 min Winter 9.432 0.122 0.0 1.2 1.2 3.6 0 K 700 min Winter 9.432 0.122 0.0 1.0 1.0 2.0 0 K 700 min Winter 9.432 0.122 0.0 0.3 0.9 1.3 0 K 10080 min Winter 9.438 0.088 0.0 0.3 1.2 6 1.2 1.2 1.4 <td>480</td> <td>min Winter</td> <td>9.841</td> <td>0.541</td> <td></td> <td>0.0</td> <td>2.2</td> <td></td> <td>2.2</td> <td>49.8</td> <td>Flood Risk</td> <td></td>	480	min Winter	9.841	0.541		0.0	2.2		2.2	49.8	Flood Risk	
720 min Winter 9.740 0.494 0.0 2.1 2.1 2.1 40.5 Flood Risk 960 min Winter 9.683 0.383 0.0 1.8 1.8 2.2 0 K 2160 min Winter 9.625 0.325 0.0 1.7 1.7 15.2 0 K 3200 min Winter 9.625 0.325 0.0 1.4 1.4 7.2 0 K 3200 min Winter 9.472 0.172 0.0 1.2 1.2 3.6 0 K 7200 min Winter 9.432 0.132 0.0 1.0 1.0 2.0 0 K 8640 min Winter 9.438 0.088 0.0 0.8 0.9 0.8 0.9 0 K 10080 min Winter 9.388 0.088 0.0 0.8 0.9 0.8 0.9 0 K 10080 min Winter 9.388 0.088 0.0 0.51.2 64 64 64 64 64 66 65.2 64 66	600	min Winter	9.830	0.530		0.0	2.2		2.2	47.5	Flood Risk	
960 min Winter 9,744 0.494 0.0 2.1 2.1 2.1 2.1 Flood Risk 2160 min Winter 9,683 0.383 0.0 1.8 1.8 22.2 0 K 2800 min Winter 9,625 0.325 0.0 1.7 1.7 15.2 0 K 4320 min Winter 9,432 0.324 0.0 1.4 1.4 7.2 0 K 7200 min Winter 9,432 0.322 0.0 1.2 1.2 3.6 0 K 7200 min Winter 9,432 0.32 0.0 1.0 1.0 2.0 0 K 8400 min Winter 9,436 0.388 0.088 0.0 0.9 1.3 0 K 10080 min Winter 9,388 0.088 0.0 0.8 0.8 0.9 0 K 60 min Winter 15.610 0.0 70.8 176 226 360 min Winter 15.610 0.0 71.2 358 358 600 min Winter 7.540 0.0 91.2 358 600 min Winter 7.540 0.0 91.2 358 600 min Winter 7.540 0.0 110.0 510 960 min Winter 1.244 0.0 1654 1440 min Winter 1.242 0.0	720	min Winter	9.818	0.518		0.0	2.1		2.1	45.2	Flood Risk	
1440 min Winter 9.683 0.383 0.0 1.8 1.8 22.0 2.0 32.1 Flood Risk 2860 min Winter 9.625 0.325 0.0 1.7 1.7 1.5.2 0.K 4320 min Winter 9.472 0.172 0.0 1.4 1.4 7.2 0.K 7200 min Winter 9.432 0.132 0.0 1.0 1.0 2.0 0.K 8640 min Winter 9.432 0.122 0.0 1.0 1.0 2.0 0.K 8640 min Winter 9.388 0.088 0.0 0.8 0.9 0.K 10080 min Winter 9.388 0.088 0.0 0.8 0.9 0.K 10080 min Winter 9.388 0.088 0.0 51.2 64 10080 min Winter 15.610 0.0 70.8 176 240 min Winter 15.610 0.0 70.8 126 240 min Winter 7.540 0.0 84.8 280 480 min Winter 7.540 0.0 91.2 358 600 min Winter 7.544 0.0 11.9 726 240 min Winter 7.544 0.0 11.9 726 260 min Winter 7.543 0.0 119.7 726 <tr< td=""><td>960</td><td>min Winter</td><td>9.794</td><td>0.494</td><td></td><td>0.0</td><td>2.1</td><td></td><td>2.1</td><td>40.5</td><td>Flood Risk</td><td></td></tr<>	960	min Winter	9.794	0.494		0.0	2.1		2.1	40.5	Flood Risk	
2160 min Winter 9,625 0.325 0.0 1.7 1.7 15.2 0 K 4320 min Winter 9,534 0.234 0.0 1.4 1.4 7.2 0 K 5760 min Winter 9,472 0.172 0.0 1.2 1.2 3.6 0 K 7200 min Winter 9,432 0.132 0.0 1.0 1.0 2.0 0 K 8640 min Winter 9,436 0.106 0.0 0.9 0.9 1.3 0 K 10080 min Winter 9,388 0.088 0.0 0.8 0.8 0.9 0 K Kevnt Flocded Discharge Time-Peak (mins) (m) (m) (m) (m) 0.8 0.8 0.9 0 K 60 min Winter 33.892 0.0 51.2 64 120 min Winter 15.610 0.0 76.3 120 180 min Winter 7 9.343 0.0 84.8 240 460 min Winter 12.614 0.0 76.5 344 720 min Winter 5.565 0.101.0 100 510 960 min Winter 1.444 1.41.3 1672 343 120 min Winter 1.444 0.0 106.4 654	1440	min Winter	9.748	0.448		0.0	2.0		2.0	32.1	Flood Risk	
2880 min Winter 9.525 0.235 0.0 1.7 1.7 1.7 1.7 0.8 5760 min Winter 9.472 0.172 0.0 1.2 1.2 3.6 0 K 7200 min Winter 9.432 0.132 0.0 1.0 1.0 2.0 0 K 8640 min Winter 9.432 0.132 0.0 0.0 0.9 1.3 0 K 10080 min Winter 9.338 0.088 0.0 0.8 0.8 0.9 0.8 10080 min Winter 9.338 0.088 0.0 0.8 0.8 0.9 0 K 10080 min Winter 9.338 0.088 0.0 0.8 0.8 0.9 0 K 10080 min Winter 9.338 0.088 0.0 0.8 0.8 0.9 0 K 10080 min Winter 9.338 0.088 0.0 51.2 64 120 min Winter 15.610 0.0 76.3 126 180 min Winter 15.610 0.0 76.3 126 34 600 min Winter 4.481 0.0 161.0 516 360 min Winter 1.5.565 0.0 101.0 510 56 514 1440 min Winter 1.4477 0.0 155.3 2340 720 min Winter 1.427 0.0 <td>2160</td> <td>min Winter</td> <td>9.683</td> <td>0.383</td> <td></td> <td>0.0</td> <td>1.8</td> <td></td> <td>1.8</td> <td>22.2</td> <td>O K</td> <td></td>	2160	min Winter	9.683	0.383		0.0	1.8		1.8	22.2	O K	
4320 min Winter 9,432 0.132 0.0 1.4 1.4 1.4 7.2 0 K 7200 min Winter 9,432 0.132 0.0 1.0 1.0 2.0 0 K 8640 min Winter 9.406 0.106 0.0 0.9 0.9 1.3 0 K 10080 min Winter 9.338 0.088 0.0 0.8 0.9 0 K 10080 min Winter 9.338 0.088 0.0 0.8 0.9 0 K Storm (m/n) Flooded Discharge Time-Peak Event (m/n) 60 min Winter 133.892 0.0 51.2 64 120 min Winter 12.614 0.0 70.8 126 140 min Winter 12.614 0.0 70.8 126 240 min Winter 7.540 0.0 91.2 358 600 min Winter 1.6381 0.0 96.5 434 720 min Winter 1.441 1.41.3 1672 960 min Winter 1.946 0.0 119.7 926 2160 min Winter 1.946 0.0 131.9 1304 2800 min Winter 1.946 0.0 141.3 1672 1400 min Winter 0.964 0.0	2880	min Winter	9.625	0.325		0.0	1.7		1.7	15.2	ОК	
0.00 1.2 1.2 0.0 0	4320	min Winter	9.534	0.234		0.0	1.4		1.4	7.2	OK	
1000 min Winter 9.388 0.088 0.0 0.0 0.9 0.9 0.8 10000 min Winter 9.388 0.088 0.0 0.8 0.8 0.9 0 K Storm Rain Flooded Discharge Time-Peak Tevent (mm/hr) Volume Volume (mins) (m³) 60 min Winter 33.892 0.0 51.2 64 120 min Winter 12.614 0.0 76.3 226 360 min Winter 7.540 0.0 91.2 358 60 min Winter 5.565 0.0 101.0 510 400 min Winter 5.565 0.0 101.0 510 960 min Winter 1.9484 0.0 108.4 654 140 min Winter 1.946 0.0 119.7 326 360 min Winter 1.946 0.0 113.9 1304 280 min Winter 1.946 0.0 141.3 1672 4320 min Winter 0.964 0.0 174.9 3680 700 min Winter 0.9745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136	7200	min Winter	9.472	0.172		0.0	1.2		1 0	2.0	0 K	
10080 min Winter 9.388 0.088 0.0 0.8 0.8 0.9 0 K Storm main from the second secon	8640	min Winter	9.406	0.106		0.0	0.9		0.9	1.3	0 K	
Storm Rain Flooded Discharge Time-Peak No mm/hr Volume Volume Ministrate 100 min Winter 33.892 0.0 51.2 64 120 min Winter 15.610 0.0 70.8 120 180 min Winter 15.610 0.0 76.3 226 360 min Winter 7.540 0.0 91.2 358 600 min Winter 5.55 0.0 101.0 510 960 min Winter 1.481 0.0 108.4 654 1440 min Winter 1.496 0.0 119.7 326 2160 min Winter 1.496 0.0 141.3 1672 4320 min Winter 1.496 0.0 141.3 1672 4320 min Winter 1.496 0.0 174.9 3680 7020 min Winter 0.745 0.0 189.3 5136 10080 <	10080	min Winter	9.388	0.088		0.0	0.8		0.8	0.9	0 K	
Storn Event Rain (mm/hr) Flooded Volum (n ³) Discharge Volum (n ³) Time-Peak (mins) 60 nin Winter 33.892 0.0 51.2 64 120 min Winter 12.614 0.0 76.3 120 180 min Winter 12.614 0.0 76.3 226 360 min Winter 9.343 0.0 84.8 280 480 min Winter 5.555 0.0 101.4 514 720 min Winter 5.555 0.0 101.4 514 720 min Winter 1.946 0.0 131.9 1304 280 min Winter 1.427 0.0 155.3 2340 5760 min Winter 0.833 0.0 189.3 5136 6440 min Winter 0.745 0.0 189.3 5136 7200 min Winter 0.745 0.0 189.3 5136 7200 Min Winter 0.745 0.0 189.3												
Storm Rain (mm/hz) Flooded Volume (m) Storm Volume (m) Time-Peak (mins) 60 min Winter 33.892 0.0 51.2 64 120 min Winter 20.940 0.0 63.3 120 180 min Winter 12.610 0.0 76.3 226 360 min Winter 12.614 0.0 96.5 434 600 min Winter 6.381 0.0 94.8 280 480 min Winter 12.614 0.0 101.0 510 960 min Winter 5.565 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.441 0.0 166.4 654 1240 min Winter 1.946 0.0 141.3 1672 2160 min Winter 1.427 0.0 155.3 2340 5760 min Winter 0.439 0.0 162.6 4408 10080 min Winter 0.745 0.0 189.3 5136												
Storm Rain Flocked Discharge Time-Peak (mins) 60 min Winter 33.892 0.0 51.2 64 120 min Winter 20.940 0.0 63.3 120 180 min Winter 15.610 0.0 70.8 176 240 min Winter 15.610 0.0 76.3 226 360 min Winter 15.610 0.0 96.5 434 480 min Winter 7.540 0.0 96.5 434 700 min Winter 5.55 0.0 101.0 510 960 min Winter 1.443 0.0 108.4 654 1440 min Winter 2.428 0.0 113.9 1304 2800 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.427 0.0 152.3 2340 7200 min Winter 1.427 0.0 152.6 4408 10080 min Winter 0.745 0.0 189.3 5136												
Event (mm/hr) Volume (m³) Volume (m³) (mins) 60 min Winter 33.892 0.0 51.2 64 120 min Winter 20.940 0.0 63.3 120 180 min Winter 15.610 0.0 70.8 176 240 min Winter 12.614 0.0 76.3 226 360 min Winter 7.540 0.0 91.2 358 600 min Winter 7.555 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 3.298 0.0 119.7 926 2160 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.946 0.0 174.9 3680 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0			Stor	m	Rain	Flood	ed Disc	harge	Time-	Peak		
(m ³) (m ³) 60 min Winter 33.892 0.0 51.2 64 120 min Winter 12.610 0.0 70.8 176 240 min Winter 12.614 0.0 76.3 226 360 min Winter 9.343 0.0 84.8 280 480 min Winter 7.540 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.4481 0.0 131.9 1304 2880 min Winter 1.447 0.0 155.3 2340 5760 min Winter 1.447 0.0 156.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136			Even	t	(mm/hr)	Volum	e Vol	Lume	(mi	ns)		
60 min Winter 33.892 0.0 51.2 64 120 min Winter 20.940 0.0 63.3 120 180 min Winter 15.610 0.0 70.8 176 240 min Winter 12.614 0.0 76.3 226 360 min Winter 9.343 0.0 84.8 280 480 min Winter 7.540 0.0 96.5 434 720 min Winter 5.655 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.444 0.0 166.0 3008 7200 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136						(m³)	(n	n³)				
120 min Winter 20.940 0.0 63.3 120 180 min Winter 15.610 0.0 70.8 176 240 min Winter 12.614 0.0 76.3 226 360 min Winter 9.33 0.0 84.8 280 480 min Winter 6.381 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.555 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.946 0.0 174.9 3680 7200 min Winter 0.644 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		F	50 min	Winter	33 892	0	0	51 2		64		
180 min Winter 15.610 0.0 70.8 176 240 min Winter 12.614 0.0 76.3 226 360 min Winter 9.343 0.0 84.8 280 480 min Winter 7.540 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.4427 0.0 131.9 1304 2880 min Winter 1.4427 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		12	20 min	Winter	20.940	0	.0	63.3		120		
240 min Winter 12.614 0.0 76.3 226 360 min Winter 9.343 0.0 84.8 280 480 min Winter 7.540 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.447 0.0 155.3 2340 5760 min Winter 1.444 0.0 166.0 3008 7200 min Winter 0.844 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		18	30 min	Winter	15.610	0	.0	70.8		176		
360 min Winter 9.343 0.0 84.8 280 480 min Winter 7.540 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.427 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.444 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		24	10 min	Winter	12.614	0	.0	76.3		226		
480 min Winter 7.540 0.0 91.2 358 600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136		36	50 min	Winter	9.343	0	.0	84.8		280		
600 min Winter 6.381 0.0 96.5 434 720 min Winter 5.565 0.0 101.0 510 960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 0.964 0.0 174.9 3680 7200 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		48	30 min	Winter	7.540	0	.0	91.2		358		
720 min Winter 5.565 0.0 101.0 510 960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		60)0 min	Winter	6.381	0	.0	96.5		434		
960 min Winter 4.481 0.0 108.4 654 1440 min Winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		72	20 min	Winter	5.565	0	.0	101.0		510		
1440 min winter 3.298 0.0 119.7 926 2160 min Winter 2.424 0.0 131.9 1304 2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.745 0.0 189.3 5136 10080 min Winter 0.745 0.0 189.3 5136		96	50 min	Winter	4.481	0	.0	110 7		654		
2880 min Winter 1.946 0.0 141.3 1672 4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		144	iu min	Winter	3.298 2 121	0	.0	131 0		926 1307		
4320 min Winter 1.427 0.0 155.3 2340 5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		210	30 min	Winter	2.424	0	.0	141.3		1672		
5760 min Winter 1.144 0.0 166.0 3008 7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		432	20 min	Winter	1.427	0	.0	155.3		2340		
7200 min Winter 0.964 0.0 174.9 3680 8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136		576	50 min	Winter	1.144	0	.0	166.0		3008		
8640 min Winter 0.839 0.0 182.6 4408 10080 min Winter 0.745 0.0 189.3 5136 ©1982-2017 XP Solutions		720)0 min	Winter	0.964	0	.0	174.9		3680		
0.0 189.3 5136 ©1982-2017 XP Solutions		864	10 min	Winter	0.839	0	.0	182.6		4408		
©1982-2017 XP Solutions		1008	30 min	Winter	0.745	0	.0	189.3		5136		
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CH2M Hill	1	Page 3
Ash House	(-
Falcon Road		4
Exeter EX2 7LB		Misco
Date 09/05/2018 11:48	Designed by MA047950	
File Test 3 - Ditch 3 (30 y	Checked by	nanada
Micro Drainage	Source Control 2017.1.2	
<u>Ra</u>	infall Details	
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10	
Tin	ne Area Diagram	
Tot	al Area (ha) 0.180	
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 3 0.060	3 6 0.060 6 9 0.060	
©1982-	-2017 XP Solutions	

CH2M Hill		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 09/05/2018 11:48	Designed by MA047950	Desinado
File Test 3 - Ditch 3 (30 y	Checked by	Diamaye
Micro Drainage	Source Control 2017.1.2	1

Storage is Online Cover Level (m) 10.000

<u>Swale Structure</u>

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	187.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	1.0
Safety Factor	2.0	Slope (1:X)	400.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	9.300	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Orifice Outflow Control

Diameter (m) 0.038 Discharge Coefficient 0.600 Invert Level (m) 9.300

CH2M Hill								Page 1
Ash House								
Falcon Road								4
Exeter EX2 7LB								- m
Date 09/05/2018 11.	53		Desi	aned h	NV MAO	4795(0	MICrO
Filo Test 3 - Ditch 4 (30 y Checked by								Drainage
Micro Draipago	1 4 (50	y • • •	Sour		trol	2017	1 2	2
MICIO DIAINAGE			SOUL			2017	• 1 • 2	
Summary	of Res	ults	for 30) vear	Retur	n Pe	eriod (+	10%)
	01 1100	4100		<u> </u>	110041		122004 (**	<u> </u>
		Half Dr	ain Tin	ne : 447	minute	s.		
Storm	Max	Max	Max	1	lax	Мах	Max	Status
Event	Level D	epth Ir	nfiltra	tion Con	ntrol Σ	Outfl	ow Volume	
	(m)	(m)	(l/s)	(:	L/s)	(1/s)	(m³)	
15 min Summer	9.605 0	.505		0.0	1.8	1	.8 42.7	O K
30 min Summer	9.665 0	.565		0.0	1.9	1	.9 56.1	O K
60 min Summer	9.717 0	.617		0.0	2.0	2	.0 69.5	Flood Risk
120 min Summer	9.759 0	.659		0.0	2.0	2	.0 81.5	Flood Risk
180 min Summer	9.775 0	1.6/5		0.0	2.1	2	.1 86.6	Flood Risk
240 min Summer 360 min Summer	9 7 85 N) 685		0.0	∠.⊥ 2 1	2	1 20.9	Flood Risk
480 min Summer	9.784 0	.684		0.0	2.1	2	.1 89.5	Flood Risk
600 min Summer	9.781 0	.681		0.0	2.1	2	.1 88.6	Flood Risk
720 min Summer	9.778 0	.678		0.0	2.1	2	.1 87.5	Flood Risk
960 min Summer	9.769 0	.669		0.0	2.1	2	.1 84.6	Flood Risk
1440 min Summer	9.748 0	.648		0.0	2.0	2	.0 78.3	Flood Risk
2160 min Summer	9.717 0	0.617		0.0	2.0	2	.0 69.3	Flood Risk
2880 min Summer	9.686 0	.586		0.0	1.9	1	.9 61.1	O K
4320 min Summer	9.627 0	.527		0.0	1.8	1	.8 47.2	O K
5760 min Summer	9.573 0	.473		0.0	1.7	1	.7 36.5	O K
7200 min Summer	9.525 0),420		0.0	1.0	1	.0 28.3 5 22.1	OK
10080 min Summer	9.446 0).346		0.0	1.5	1	.5 17.5	0 K
15 min Winter	9.630 0	0.530		0.0	1.8	1	.8 48.0	0 K
30 min Winter	9.694 0	.594		0.0	1.9	1	.9 63.2	O K
	Storm		Rain	Flooded	Discha	rge T:	ime-Peak	
	Event	(1	mm/hr)	Volume	Volur	ne	(mins)	
				(m³)	(m³))		
:	15 min Su	ummer	79.950	0.0	4	4.5	23	
	30 min Su	ummer	53.199	0.0	5	9.3	37	
1	ou min Su 20 min C-	ummer	33.892 20 040	0.0	7	3.5 3.3	66 104	
1	20 min Sl 80 min Si	ummer	20.940 15.610	0.0	9 10	4.3	184	
2.	40 min St	ummer	12.614	0.0	11	2.4	242	
3	60 min Su	ummer	9.343	0.0	12	4.9	334	
48	30 min Su	ummer	7.540	0.0	13	4.4	392	
60	00 min Su	ummer	6.381	0.0	14	2.1	456	
72	20 min Sı	ummer	5.565	0.0	14	8.7	520	
99	60 min Sı	ummer	4.481	0.0	15	9.7	658	
144	40 min Su 60 min St	ummer	3.298	0.0	17	0.3 / /	930	
21	00 min Sl 80 min Si	unner	2.424	0.0	19 20	8.1	1732	
433	20 min Su	ummer	1.427	0.0	20	8.8	2504	
570	60 min Su	ummer	1.144	0.0	24	4.6	3224	
720	00 min Su	ummer	0.964	0.0	25	7.7	3960	
864	40 min Su	ummer	0.839	0.0	26	9.0	4664	
1008	30 min Su	ummer	0.745	0.0	27	8.9	5344	
	15 min Wi	inter	/9.950	0.0	4	9.9	23	
	SO IUTU MI	THLET.	72.123	0.0	6	0.4	31	

011011 111111							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							Mission
Date 09/05/2018 11:5	53	Desi	gned b	y MA047	950		MILIU
File Test 3 - Ditch	4 (30 v.,	. Chec	ked bv	<u> </u>			Urainage
Micro Drainage	1 (00]	Sour	ce Con	trol 20	17 1	2	
		5041	00 0011	0101 20		-	
Summary o	of Results	for 3	0 vear	Return	Peri	od (+:	10%)
						`	
Storm	Max Max	Max	м	lax M	lax	Max	Status
Event	Level Depth	Infiltra	tion Con	trol Σ Ou	tflow	Volume	
	(m) (m)	(1/s)) (1	./s) (1	/s)	(m³)	
60 min Winter	9.749 0.649		0.0	2.0	2.0	78.5	Flood Risk
120 min Winter	9.794 0.694		0.0	2.1	2.1	92.6	Flood Risk
180 min Winter 240 min Winter	9.813 0.713		0.0	2.1	2.1	99.1 102.2	Flood Risk
360 min Winter	9.828 0.728		0.0	2.2	2.1	102.2	Flood Risk
480 min Winter	9.827 0.727		0.0	2.2	2.2	104.0	Flood Risk
600 min Winter	9.823 0.723		0.0	2.1	2.1	102.7	Flood Risk
720 min Winter	9.819 0.719		0.0	2.1	2.1	101.2	Flood Risk
960 min Winter	9.807 0.707		0.0	2.1	2.1	97.2	Flood Risk
2160 min Winter	9.732 0.632		0.0	∠.⊥ 2.0	∠.⊥ 2 ∩	81.1 73 7	riood Risk
2880 min Winter	9.687 0.587		0.0	1.9	1.9	61.4	O K
4320 min Winter	9.600 0.500		0.0	1.8	1.8	41.8	O K
5760 min Winter	9.523 0.423		0.0	1.6	1.6	28.0	O K
7200 min Winter	9.457 0.357		0.0	1.5	1.5	18.8	O K
8640 min Winter	9.401 0.301		0.0	1.4	1.4	12.7	O K
10080 WIN WINCEL	9.556 0.256		0.0	1.2	1.2	0.0	0 K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	e Time (mi	-Peak ns)	
6	Storm Event 0 min Winter	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³) 84.6	e Time (mi	- Peak ns) 66	
6 12	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940	Flooded Volume (m ³) 0.0 0.0	Discharge Volume (m ³) 84.6 104.5	e Time (mi	- Peak ns) 66 122	
6 12 18	Storm Event 0 min Winter 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610	Flooded Volume (m ³) 0.0 0.0 0.0	Discharge Volume (m ³) 84.6 104.5 116.8	e Time (mi	- Peak ns) 66 122 180	
6 12 18 24	Storm Event 0 min Winter 0 min Winter 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614	Flooded Volume (m ³) 0.0 0.0 0.0 0.0	Discharge Volume (m ³) 84.6 104.5 116.8 125.9	e Time (mi	-Peak ns) 66 122 180 236	
6 12 18 24 36 48	Storm Event 0 min Winter 0 min Winter 0 min Winter 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0	Discharge Volume (m ³) 84.6 104.5 116.8 125.5 139.8 150	• Time (mi	-Peak ns) 66 122 180 236 348 448	
6 12 18 24 36 48 60	Storm Event 0 min Winter 0 min Winter 0 min Winter 0 min Winter 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2	• Time (mi	-Peak ns) 66 122 180 236 348 448 482	
6 12 18 24 36 48 60 72	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6	• Time (mi	-Peak ns) 66 122 180 236 348 448 482 558	
6 12 18 24 36 48 60 72 96	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.5	e Time (mi	-Peak ns) 66 122 180 236 348 448 482 558 712	
6 12 18 24 36 48 60 72 96 144	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.5 139.8 150.5 159.2 166.6 178.5 197.5	e Time (mi	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448	
6 12 18 24 36 48 60 72 96 144 216 288	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1	Time (mi	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848	
6 12 18 24 36 48 60 72 96 144 216 288 432	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.e 104.5 116.8 125.5 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3	Time (mi	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600	
6 12 18 24 36 48 60 72 96 144 216 288 432 576	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0	Time (mi 5 5 3 3 3 5 5 5 5 7 1 1 3 0	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 288.6	Time (mi 5 5 5 3 3 5 5 5 7 4 5 7 4 5 5 7 4 5 5 7 5 7 5 5 5 5	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 288.6 301.2	Time (mi 5 5 5 3 3 3 5 5 5 5 7 1 1 3 3 5 5 5 7 1 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 217.5 233.1 256.3 274.0 288.6 301.2	Time (mi 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.5 139.8 150.5 159.2 166.6 178.5 217.5 233.1 256.3 274.0 288.6 301.2	e Time (mi 65 53 33 33 55 22 55 71 1 33 35 55 22 55 71 1 33 35 55 22 55 71 1 55 22 55 23	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 288.6 301.2 312.3	e Time (mi 55 53 53 53 53 53 55 55 71 1 33 00 55 23	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 288.6 301.2 312.3	Time (mi 65 53 33 35 22 55 7 1 3 30 55 22 33	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 217.7 233.1 256.3 274.0 288.6 301.2 312.3	Time (mi 5 5 5 3 3 5 2 5 5 7 1 1 3 3 5 5 2 5 3 3 5 2 5 3 3 5 5 2 5 3 3 5 5 5 3 3 5 5 5 3 3 5 5 5 3 3 5	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 301.2 312.3	Time (mi 5 5 5 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 217.5 233.1 256.3 274.0 288.6 301.2 312.3	Time (mi 5 5 5 7 2 5 9 7 1 3 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.5 197.5 217.7 233.1 256.3 274.0 288.6 301.2 312.3	e Time (mi 55 53 53 53 53 53 55 55 71 1 33 00 55 23	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Flooded Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 197.5 217.7 233.1 256.3 274.0 288.6 301.2 312.3	Time (mi 65 53 33 35 22 55 7 1 3 30 55 22 33	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Storm Event 0 min Winter 0 min Winter	Rain (mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.745 0.745	Flooded Volume (m³) 0.0 </td <td>Discharge Volume (m³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 217.7 233.1 256.3 274.0 288.6 301.2 312.3</td> <td>Time (mi 5 5 5 3 3 5 2 2 5 7 1 1 3 3 5 2 2 5 3 3 5 2 2 3 3 3 5 2 2 3 3 5 2 2 3 3</td> <td>-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344</td> <td></td>	Discharge Volume (m ³) 84.6 104.5 116.8 125.9 139.8 150.5 159.2 166.6 178.9 217.7 233.1 256.3 274.0 288.6 301.2 312.3	Time (mi 5 5 5 3 3 5 2 2 5 7 1 1 3 3 5 2 2 5 3 3 5 2 2 3 3 3 5 2 2 3 3 5 2 2 3 3	-Peak ns) 66 122 180 236 348 448 482 558 712 1014 1448 1848 2600 3336 4032 4672 5344	

Сном ніці		Page 3
Ash House		rage 5
Falcon Road		4
Exeter EX2 7LB		m
$D_{2} = 0.9/05/2018 11.53$	Designed by MA047950	Micro
File Test 3 - Ditch 4 (30 v	Checked by	Drainage
Micro Drainage	Source Control 2017 1 2	
	Source control 2017.1.2	
Ra.	infall Details	
Rainfall Model	FSR Winter Storms Yes	3
Return Period (years)	30 Cv (Summer) 0.750)
Region Engl M5-60 (mm)	and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15	5
Ratio R	0.350 Longest Storm (mins) 10080)
Summer Storms	Yes Climate Change % +10)
Tin	ne Area Diagram	
Tot	al Area (ha) 0.297	
Time (mins) Area T. From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 3 0 099	3 6 0 0 9 6 9 0 0 9	
	5 0 0.099 0 9 0.099	
©1982-	2017 XP Solutions	

CH2M Hill		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 09/05/2018 11:53	Designed by MA047950	Desinado
File Test 3 - Ditch 4 (30 y	Checked by	Diamaye
Micro Drainage	Source Control 2017.1.2	1

Storage is Online Cover Level (m) 10.000

<u>Swale Structure</u>

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	343.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	1.0
Safety Factor	2.0	Slope (1:X)	400.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	9.100	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5		

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 9.100

CH2M Hill										P	age 1	
Ash House												
Falcon Roa	d										۲.	
Exeter E	X2 7LB										- u	~
Date 09/05	/2018 12.	0.4		Desi	aned]	JV MA()4795	50			MICLO	
File Test 2 - Ditch 5 (30 y) Checked by								Drainag	6			
Micro Drai	2 Ditter	5 (5	у . .	Sour		y ntrol	2017	7 1	2			
MICIO DIAI	llage			SOUL	Ce CO	ILIOI	2017	• •	2			
	Summary	of Re		for 3	0 vear	Retu	rn P	ori	nd (+'	10%)		
	<u>builliar</u> y		JULCO	IUI J	o ycai	necu			Ju (+.	1037		
			Half	Drain Tir	ne : 110) minute	es.					
	Storm	Max	Мах	Max		Max	Max	:	Max	Stat	us	
	Event	Level	Depth	Infiltra	tion Co	ntrol Σ	Outf	low	Volume			
		(m)	(m)	(l/s)	(1/s)	(1/s)	(m³)			
15	min Summer	9.719	0.319		0.0	1.7		1.7	13.4	Flood 1	Risk	
30	min Summer	9.764	0.364		0.0	1.9		1.9	17.1	Flood 1	Risk	
60	min Summer	9.796	0.396		0.0	1.9		1.9	20.0	Flood 1	Risk	
120	min Summer	9.808	0.408		0.0	2.0		2.0	21.2	Flood 1	Risk	
180	min Summer	9.807	0.407		0.0	2.0		2.0	21.1	Flood 1	Risk	
240	min Summer	9.802	0.402		0.0	2.0		2.0	20.6	Flood 1	Risk	
360	min Summer	9.789	0.389		0.0	1.9		1.9	19.3	Flood	Risk	
480	min Summer	9.775	0.375		0.0	1 9		1 0	16.9	Flood	RISK Diek	
720	min Summer	9.747	0.347		0.0	1.8		1.8	15.7	Flood	Risk	
960	min Summer	9.721	0.321		0.0	1.7		1.7	13.5	Flood 1	Risk	
1440	min Summer	9.677	0.277		0.0	1.6		1.6	10.1		ОК	
2160	min Summer	9.626	0.226		0.0	1.4		1.4	6.6		O K	
2880	min Summer	9.588	0.188		0.0	1.3		1.3	4.4		O K	
4320	min Summer	9.535	0.135		0.0	1.1		1.1	2.1		O K	
5760	min Summer	9.502	0.102		0.0	0.9		0.9	1.2		ΟK	
7200	min Summer	9.480	0.080		0.0	0.8		0.8	0.7		ОК	
10090	min Summer	9.466	0.066		0.0	0.7		0.7	0.5		OK	
15	min Winter	9.430	0.341		0.0	1.8		1.8	15.1	Flood	Risk	
30	min Winter	9.790	0.390		0.0	1.9		1.9	19.4	Flood 1	Risk	
		Stor	n	Rain	Flooded	l Discha	arge 1	Time-	Peak			
		Even	t	(mm/hr)	Volume	Volu	me	(mi	ns)			
					(m³)	(m³)					
	1	5 min	Summer	79.950	0.0) [15.0		21			
	3	30 min	Summer	53.199	0.0) _	19.9		35			
	1 0	ou min	Summer	33.892	0.0	, <u>,</u>	∠⊃.4 31 /		62 102			
	12	20 min	Summer	20.940 15 610	0.0	, .) .	31.4 35 1		134			
	24	10 min	Summer	12.614	0.0)	37.8		168			
	36	50 min	Summer	9.343	0.0) 4	42.0		238			
	48	30 min	Summer	7.540	0.0) 4	45.2		306			
	60)0 min	Summer	6.381	0.0) 4	47.9		372			
	72	20 min	Summer	5.565	0.0) !	50.1		438			
	96	50 min	Summer	4.481	0.0) !	53.8		568			
	144	iu min	Summer	3.298	0.0		59.4 65 /		812 1172			
	210	30 min	Summer	2.424 1.946	0.0	, ,	70.1		1528			
	4.32	20 min	Summer	1.427	0.0) -	77.1		2212			
	576	50 min	Summer	1.144	0.0) 8	82.4		_ 2936			
	720)0 min	Summer	0.964	0.0) 8	86.8		3672			
	864	10 min	Summer	0.839	0.0)	90.6		4400			
	1008	30 min	Summer	0.745	0.0)	93.9		4992			
	1	.5 min	Winter	/9.950	0.0) <u> </u>	16.8 22 2		22			
	3	,∪ III⊥II	wrncer.	22.123	0.0	, <u> </u>			50			

								Page 2
Ash House								
Falcon Road								4
Exeter EX2 7LB								Mission
Date 09/05/2018 12:	04		Desi	aned b	ov MA	047950		
File Test 2 - Ditch	5 (?	80 v	Chec	ked h	7			Drainage
Migro Drainago	5 (5	ло у	Sour		$\frac{1}{2}$	2017 1	2	
MICIO DIAINAge			50UI		ILIOI	2017.1	• 2	
Cummo rou	of Do		for 2	0	Doty	wn Dow	ad (1	100)
Summary	JI KE	SUILS	101 3	U year	Rell	III FEL	<u>100 (+</u>	103)
Storm	Max	Max	Мах	1	Max	Max	Max	Status
Event	Level	Depth	Infiltra	tion Co	ntrol 3	Σ Outflow	Volume	
	(m)	(m)	(1/s)) (1/s)	(1/s)	(m³)	
60 min Winter	9 826	0 426		0 0	2 0	2 0	22 Q	Flood Pick
120 min Winter	9.842	0.428		0.0	2.0	2.0	22.9	Flood Risk
180 min Winter	9.840	0.440		0.0	2.1	2.1	24.3	Flood Risk
240 min Winter	9.832	0.432		0.0	2.0	2.0	23.5	Flood Risk
360 min Winter	9.813	0.413		0.0	2.0	2.0	21.6	Flood Risk
480 min Winter	9.792	0.392		0.0	1.9	1.9	19.6	Flood Risk
600 min Winter	9.771	0.371		0.0	1.9	1.9	17.7	Flood Risk
/20 min Winter	9./50 9.710	U.350 0 313		0.0	1.8 1.7	1.8	12.9	Flood Risk
1440 min Winter	9.651	0.251		0.0	⊥•/ 1.5	1 5	12.9 8 3	U K
2160 min Winter	9.585	0.185		0.0	1.3	1.3	4.3	0 K
2880 min Winter	9.540	0.140		0.0	1.1	1.1	2.3	O K
4320 min Winter	9.489	0.089		0.0	0.8	0.8	0.9	O K
5760 min Winter	9.465	0.065		0.0	0.7	0.7	0.5	O K
7200 min Winter	9.454	0.054		0.0	0.6	0.6	0.3	ОК
8640 min Winter	9.449	0.049		0.0	0.5	0.5	0.3	OK
	J. 110	0.010		0.0	0.1	0.1	0.2	0 11
	Stor	n	Rain	Flooded	Disch	arge Time	e-Peak	
	0001							
	Even	t	(mm/hr)	Volume	Volu	ume (m	ins)	
	Even	t	(mm/hr)	Volume (m³)	Volu (m	ume (m ³)	ins)	
6	Even	t Winter	(mm/hr)	Volume (m ³)	Volu (m	ume (m ³) 28.5	ins) 62	
6	Even 0 min 0 min	t Winter Winter	(mm/hr) 33.892 20.940	Volume (m ³) 0.0	Volu (m	ume (m ³) 28.5 35.2	ins) 62 114	
6 12 18	Even 0 min 0 min 0 min	t Winter Winter Winter	(mm/hr) 33.892 20.940 15.610	Volume (m ³) 0.0 0.0	Volu (m	28.5 35.2 39.3	ins) 62 114 142	
6 12 18 24	0 min 0 min 0 min 0 min 0 min	t Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614	Volume (m ³) 0.0 0.0 0.0	Volu (m	28.5 35.2 39.3 42.4	62 62 114 142 182	
6 12 18 24 36	0 min 0 min 0 min 0 min 0 min 0 min	t Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343	Volume (m ³) 0.0 0.0 0.0 0.0	Volu (m	(m 3) 28.5 35.2 39.3 42.4 47.1	62 114 142 182 256	
6 12 18 24 36 48	Even 0 min 0 min 0 min 0 min 0 min 0 min	Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0	Volu (m	28.5 35.2 39.3 42.4 47.1 50.7	62 114 142 182 256 330	
6 12 18 24 36 48 60	Even 0 min 0 min 0 min 0 min 0 min 0 min 0 min	t Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1	62 114 142 182 256 330 400 468	
6 12 18 24 36 48 60 72 96	Even 0 min 0 min 0 min 0 min 0 min 0 min 0 min 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 50.2 30.2	62 114 142 182 256 330 400 468 598	
6 12 18 24 36 48 60 72 96 144	Even 0 min 0 min 0 min 0 min 0 min 0 min 0 min 0 min 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volı (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5	62 114 142 182 256 330 400 468 598 844	
6 12 18 24 36 48 60 72 96 144 216	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	nume (m 3) 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3	62 114 142 182 256 330 400 468 598 844 1192	
6 12 18 24 36 48 60 72 96 144 216 288	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432	Even 0 min 0 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 3	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576	Even 0 min 0 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 22.2 2	62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 2055	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720	Even 0 min 0 min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.962	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volı (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4	62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864	Even 0 min 0 m	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Vol ı (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 144	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<pre>(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745</pre>	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m)	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<pre>(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745</pre>	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<pre>(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745</pre>	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m)	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 05.2	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Vol ı (m	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 1.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2008 2912 3656 4400 5016</pre>	
6 12 18 24 36 48 60 72 96 144 216 288 432 576 720 864 1008	Even Even 0 min 0 min	t Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	(mm/hr) 33.892 20.940 15.610 12.614 9.343 7.540 6.381 5.565 4.481 3.298 2.424 1.946 1.427 1.144 0.964 0.839 0.745	Volume (m ³) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Volu (m)	ume (m 28.5 35.2 39.3 42.4 47.1 50.7 53.6 56.1 60.2 66.5 73.3 78.5 86.3 92.2 97.2 01.4 05.2 01.4	<pre>62 114 142 182 256 330 400 468 598 844 1192 1528 2208 2912 3656 4400 5016</pre>	

CH2M Hill	Page 3
Ash House	
Falcon Road	4
Exeter EX2 7LB	Mirco
Date 09/05/2018 12:04	Designed by MA047950
File Test 2 - Ditch 5 (30 y	Checked by
Micro Drainage	Source Control 2017.1.2
Rainfall Model	infall Details FSR Winter Storms Yes
Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	30Cv (Summer)0.750and and WalesCv (Winter)0.84020.000Shortest Storm (mins)150.350Longest Storm (mins)10080YesClimate Change %+10
Tim	ne Area Diagram
Tot	al Area (ha) 0.100
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)
0 3 0.033	3 6 0.033 6 9 0.034
©1982-	ZUL/ XP SOLUTIONS

CH2M Hill		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 09/05/2018 12:04	Designed by MA047950	Desinado
File Test 2 - Ditch 5 (30 y	Checked by	Diamaye
Micro Drainage	Source Control 2017.1.2	
М	odel Details	

Storage is Online Cover Level (m) 10.000

Swale Structure

 Infiltration Coefficient Base (m/hr)
 0.00000
 Length (m)
 87.0

 Infiltration Coefficient Side (m/hr)
 0.00000
 Side Slope (1:X)
 1.0

 Safety Factor
 2.0
 Slope (1:X)
 400.0

 Porosity
 1.00
 Cap Volume Depth (m)
 0.000

 Invert Level (m)
 9.400
 Cap Infiltration Depth (m)
 0.000

 Base Width (m)
 0.5
 0.5
 0.000

Orifice Outflow Control

Diameter (m) 0.039 Discharge Coefficient 0.600 Invert Level (m) 9.400

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Cum
Date 16/05/2018 14.4	1	Desi	aned h	V DD0481	36	MICrO
	+ x) aray	Chor	wheel by	y DD0101	5.0	Drainage
VD Goldeland	I).SICX		cked by		7 1 0	
XP Solutions		Sour	rce Con	trol 201	1.1.2	
		c 0	0			
Summary	of Result	s ior 3	0 year	Return H	Period (+	LU%)
	Half	Drain Ti	.me : 439) minutes.		
Storm	Max Max	Max	N	lax Ma	x Max	Status
Event	Level Depth	Infiltra	tion Cor	trol Σ Out	flow Volume	
	(m) (m)	(1/s)) (1	/s) (1/	's) (m³)	
15 min Summer	9 660 0 460		0 0	1 8	1 8 12 7	O K
30 min Summer	9.718 0.518		0.0	1.9	1.9 56.1	Flood Risk
60 min Summer	9.767 0.567		0.0	2.0	2.0 69.5	Flood Risk
120 min Summer	9.807 0.607		0.0	2.1	2.1 81.4	Flood Risk
180 min Summer	9.823 0.623		0.0	2.1	2.1 86.5	Flood Risk
240 min Summer	9.829 0.629		0.0	2.1	2.1 88.7	Flood Risk
360 min Summer	9.832 0.632		0.0	2.1	2.1 89.7	Flood Risk
480 min Summer	9.831 0.631		0.0	2.1	2.1 89.4	Flood Risk
600 min Summer	9.829 0.629		0.0	2.1	Z.L 88.5	Flood Risk
960 min Summer	9 817 0 617		0.0	2.1	2.1 87.5	Flood Risk
1440 min Summer	9.797 0.597		0.0	2.1	2.1 78.2	Flood Risk
2160 min Summer	9.766 0.566		0.0	2.0	2.0 69.2	Flood Risk
2880 min Summer	9.737 0.537		0.0	1.9	1.9 61.0	Flood Risk
4320 min Summer	9.681 0.481		0.0	1.8	1.8 47.1	O K
5760 min Summer	9.630 0.430		0.0	1.7	1.7 36.5	ОК
7200 min Summer	9.585 0.385		0.0	1.6	1.6 28.4	O K
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Evenc	((m ³)	(m ³)	(millis)	
	E min Orm				0.0	
⊥ د	o min Summer	19.950 53 100	0.0	44.5	23 27	
	50 min Summer	33.892	0.0	75.5	66	
12	0 min Summer	20.940	0.0	93.3	124	
18	0 min Summer	15.610	0.0	104.3	184	
24	0 min Summer	12.614	0.0	112.4	242	
36	0 min Summer	9.343	0.0	124.9	330	
48	0 min Summer	7.540	0.0	134.4	390	
60 c -	o min Summer	6.381 5.565	0.0	142.1 170 7	45Z 510	
/2 96	50 min Summer	4.481	0.0	159.7	656	
144	0 min Summer	3.298	0.0	176.3	930	
216	0 min Summer	2.424	0.0	194.4	1340	
288	0 min Summer	1.946	0.0	208.1	1732	
432	0 min Summer	1.427	0.0	228.8	2476	
576	0 min Summer	1.144	0.0	244.6	3224	
/20	o min Summer	0.964	0.0	257.7	3904	
	<u></u>	00 0017	VD C-	1+		
	©19	OZ-ZUI/	AP 50	LULIONS		

CH2M		Page 2
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 16/05/2018 14:41	Designed by DD048136	Desinado
File Ditch 6 (30 year).srcx	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Summary of Results for 30 year Return Period (+10%)

	Storm Event	n :	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min S	Summer	9.546	0.346	0.0	1.5	1.5	22.3	ОК
10080	min S	Summer	9.512	0.312	0.0	1.5	1.5	17.7	O K
15	min N	Winter	9.684	0.484	0.0	1.8	1.8	48.0	O K
30	min N	Winter	9.745	0.545	0.0	2.0	2.0	63.2	Flood Risk
60	min N	Winter	9.798	0.598	0.0	2.1	2.1	78.5	Flood Risk
120	min N	Winter	9.841	0.641	0.0	2.1	2.1	92.5	Flood Risk
180	min N	Winter	9.859	0.659	0.0	2.2	2.2	99.0	Flood Risk
240	min N	Winter	9.868	0.668	0.0	2.2	2.2	102.1	Flood Risk
360	min N	Winter	9.874	0.674	0.0	2.2	2.2	104.3	Flood Risk
480	min N	Winter	9.872	0.672	0.0	2.2	2.2	103.7	Flood Risk
600	min N	Winter	9.869	0.669	0.0	2.2	2.2	102.4	Flood Risk
720	min N	Winter	9.864	0.664	0.0	2.2	2.2	100.9	Flood Risk
960	min N	Winter	9.853	0.653	0.0	2.2	2.2	96.9	Flood Risk
1440	min N	Winter	9.825	0.625	0.0	2.1	2.1	87.3	Flood Risk
2160	min N	Winter	9.781	0.581	0.0	2.0	2.0	73.4	Flood Risk
2880	min N	Winter	9.737	0.537	0.0	1.9	1.9	61.1	Flood Risk
4320	min N	Winter	9.655	0.455	0.0	1.8	1.8	41.6	O K
5760	min N	Winter	9.583	0.383	0.0	1.6	1.6	28.1	0 K

Storm		Rain	Flooded	Discharge	Time-Peak		
	Event		(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m³)		
8640	min	Summer	0.839	0.0	269.0	4664	
10080	min	Summer	0.745	0.0	278.9	5344	
15	min	Winter	79.950	0.0	49.9	23	
30	min	Winter	53.199	0.0	66.4	37	
60	min	Winter	33.892	0.0	84.6	66	
120	min	Winter	20.940	0.0	104.5	122	
180	min	Winter	15.610	0.0	116.8	180	
240	min	Winter	12.614	0.0	125.9	236	
360	min	Winter	9.343	0.0	139.8	346	
480	min	Winter	7.540	0.0	150.5	446	
600	min	Winter	6.381	0.0	159.2	480	
720	min	Winter	5.565	0.0	166.6	556	
960	min	Winter	4.481	0.0	178.9	712	
1440	min	Winter	3.298	0.0	197.5	1012	
2160	min	Winter	2.424	0.0	217.7	1436	
2880	min	Winter	1.946	0.0	233.1	1848	
4320	min	Winter	1.427	0.0	256.3	2600	
5760	min	Winter	1.144	0.0	274.0	3336	
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Ash House		
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Summary of Results for 30 year Return Period (+10%)

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
7200	min V	Winter	9.522	0.322	0.0	1.5	1.5	19.0	ОК
8640	min V	Winter	9.472	0.272	0.0	1.4	1.4	13.0	ΟK
10080	min V	Winter	9.431	0.231	0.0	1.2	1.2	9.1	ОК

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter 8640 min Winter	0.964	0.0	288.6	4032
10080 min Winter	0.745	0.0	312.3	5344

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Ra	infall Details					
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10					
<u>Tir</u>	ne Area Diagram					
Iot	ar Area (Na) 0.297					
Time (mins) Area T. From: To: (ba) Fr	ime (mins) Area Time (mins) Area					
0 3 0.099	3 6 0.099 6 9 0.099					
From: To: (ha) From: To: (ha) 0 3 0.099 3 6 0.099 6 9 0.099						
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<u> </u>	10del Details	

Storage is Online Cover Level (m) 10.000

Swale Structure

Infiltration	Coefficient	Base	(m/	hr)	0.00000		Ler	gth	(m)	296.0
Infiltration	Coefficient	Side	(m/	hr)	0.00000		Side Slop	e (1	:X)	1.0
	Sa	afety	Fac	tor	2.0		Slop	e (1	:X)	400.0
		Pc	pros	ity	1.00		Cap Volume De	pth	(m)	0.000
	Inver	t Lev	vel	(m)	9.200	Сар	Infiltration De	pth	(m)	0.000
	Bas	se Wid	lth	(m)	0.7					

Orifice Outflow Control

Diameter (m) 0.036 Discharge Coefficient 0.600 Invert Level (m) 9.200





8.2m Ponds	Notes: 1. This drawing should be read in conjunction with the Drainage Strategy Report. 2. Drainage system design based on 1:30 year return period plus climate change allowance. 3. Exceedance flow design based on 1:100 year return period plus climate change allowance. 4. All dimensions are in meters unless noted otherwise. 5. The indicative layout is based on available OS or topographical surveys. 6. Outfalls should be monitored on a regular basis nd equipped with shut-off valves.
	KEY: Order limits Nationally Significant Infrastructure Project (NSIP) Construction compound Permanent access Haul Road Proposed ditch Proposed pipeline Proposed catchpit
SP THE PORTBURY HUNDRED	FOR INFORMATION A DFS - 05/07/18 First Issue Rev By Chkd Apprvd Date Description
	CH2M HILL 1 The Square Temple Quay Bristol BS1 6DG Tel +44 (0)117 910 2580 Fax +44 (0)117 910 2581 www.ch2m.com Project PORTISHEAD BRANCH LINE (METROWEST PHASE 1) Drawing Drawing Drawing Draw by: DFS Date: 05/07/2018 Checked by: - Date: - Approved by: - Drawing No.
	467470.BQ.04.20-DS-Haulroads A

APPENDIX E

Compounds Drainage Strategy Drawings and Calculations

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		Proposed ca	atch-pit with flow control to limit	discharge rate to 2.5l/s	H	
Be	B	Proposed ca	atch-pit with flow control to limit	discharge rate to 2.51/s	H	
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			atch-pit with flow control to limit	discharge rate to 2.51/s		
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This drowing is to be Architects. Engineers drawings and specific Engineer.	read in conjunction w and specialist Manufac ations. If in doubt plea	Proposed ca B B B C C C C C C C C C C C C C C C C	atch-pit with flow control to limit	discharge rate to 2.51/s		



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	NOTES
	1. This drawing should be read in conjunction
	2. Drainage system design based on 1:30 year
	return period plus climate change allowance.
	year return period plus climate change
LARY	allowance. 4. All dimensions are in meters unless noted
LOSEMIN' TE	otherwise. 5 The indicative layout based on available OS
TROSE	or topographical survey.
	 Outfalls should be monitored on a regular basis and equipped with shut-off valves.
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	Red line boundary
	Compound boundaries
A LIS	roposed drainage pipeline
	Proposed Filter Drain
	Proposed MH/Catchpit
	 Proposed Chamber by others
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	travelwest •
	Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport
	ОПДИ ПІСС 1 The Square Temple Quay Bristol BS1 6DG Tel +44 (0)117 910 2580 Fax +44 (0)117 910 2581
	www.ch2m.com
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	Project
	PORTISHEAD BRANCH LINE
	(WETROWEST FRASE T)
	Drawing
	EAST OF PORTISHEAD COMPOUND
	DRAINAGE STRATEGY
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	<u></u>				100							
			Hali	E Drain I	Cime :	4 minut	ces.					
	Storm	Max	Max	Max		Max	Ma	x	Max	Stat	us	
	Event	Level	Depth (m)	Infiltra	tion C	ontrol	Σ Out	tlow c)	Volume (m ³)			
		(111)	(111)	(1/5)	(1/5)	(1)	5)	(
15	min Summer	5.691	1.091		0.0	43.2		43.2	13.8		ОК	
30	min Summer	5.741	1.141		0.0	44.2		44.2	14.6	Flood	Risk	
60	min Summer	5.581	0.981		0.0	40.9		40.9	12.2		ΟK	
120	min Summer	5.292	0.692		0.0	33.9		33.9	7.9		ΟK	
180	min Summer	5.107	0.507		0.0	28.6		28.6	4.9		ΟK	
240	min Summer	4.997	0.397		0.0	24.9		24.9	3.2		ОК	
360	min Summer	4.869	0.269		0.0	19.7		19.7	1.6		ОК	
480	min Summer	4.805	0.205		0.0	16.5		16.5	1.0		OK	
600	min Summer	4.783	0.183		0.0	14.0		14.0	0.8		OK	
720	min Summer	4.708	0.108		0.0	12.3		12.3	0.7		OK	
1440	min Summer	4.740	0.140		0.0	9.9 7 3		9.9 7 3	0.5		OK	
2160	min Summer	4.698	0.098		0.0	5.4		5.4	0.2		0 K	
2880	min Summer	4.686	0.086		0.0	4.3		4.3	0.2		ОК	
4320	min Summer	4.675	0.075		0.0	3.2		3.2	0.1		ОК	
5760	min Summer	4.668	0.068		0.0	2.6		2.6	0.1		ОК	
7200	min Summer	4.662	0.062		0.0	2.2		2.2	0.1		ΟK	
		Stor	rm	Rain	Floode	ed Disc	harge	Time	-Peak			
		Ever	nt	(mm/hr)	Volum	e Vol	lume	(mi	ns)			
					(m³)	(1	n³)					
	1	15 min	Summer	79.950	0.	. 0	40.5		16			
	3	30 min	Summer	53.199	0.	. 0	53.9		24			
	e	60 min	Summer	33.892	0.	. 0	68.6		40			
	12	20 min	Summer	20.940	0.	. 0	84.8		70			
	18	30 min	Summer	15.610	0.	. 0	94.8		100			
	24	40 min	Summer	12.614	0.	. 0	102.2		128			
	36	60 min	Summer	9.343	0.	. 0	113.5		188			
	48	BO min	Summer	7.540	0.	.0	122.1		246			
	60	JU min	Summer	6.381	0.	. U	129.2		306			
	72	20 min	Summer	5.565	0.	. U	145.2		366			
	96	ou min	Summer	4.481	0.	. U	160 2		488 720			
	144 214	10 III1I 60 min	Summer	2.298 2.424	0.	0	176 7		,∠0 1072			
	210	30 min	Summer	1.946	0.	. 0	189.2		1464			
	432	20 min	Summer	1.427	0.	.0	208.0		2156			
	576	60 min	Summer	1.144	0.	. 0	222.4		2888			
	720	00 min	Summer	0.964	0.	. 0	234.3		3544			
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Exeter EX2	2 7LB							Micro
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Summary of Results f Storm Max Max Event Level Depth In: (m) (m)				tor 30 yea	ar Retui	rn Perio	d (+1)	0%)
	Storm Event	Max Level (m)	Max Depth In (m)	Max filtration (l/s)	Max Control Σ (1/s)	Max Coutflow (1/s)	Max Volume (m³)	Status
8640	Storm Event min Summer	Max Level (m) 4.657	Max Depth In (m) 0.057	Max filtration (1/s)	Max Control Σ (1/s) 1.9	Max Coutflow (1/s)	Max Volume (m ³) 0.1	Status O K
8640 10080	Storm Event min Summer min Summer	Max Level (m) 4.657 4.654	Max Depth In (m) 0.057 0.054	Max filtration (1/s) 0.0 0.0	Max Control Σ (1/s) 1.9 1.7	Max 2 Outflow (1/s) 1.9 1.7	Max Volume (m ³) 0.1 0.1	Status 0 K 0 K
8640 10080 15	Storm Event min Summer min Summer min Winter	Max Level (m) 4.657 4.654 5.833	Max Depth In (m) 0.057 0.054 1.233	Max filtration (1/s) 0.0 0.0 0.0	Max Control Σ (1/s) 1.9 1.7 46.1	Max 2 Outflow 7 (1/s) 1.9 1.7 46.1	Max Volume (m ³) 0.1 0.1 16.0	Status O K O K Flood Risk
8640 10080 15 30	Storm Event min Summer min Summer min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830	Max Depth In (m) 0.057 0.054 1.233 1.230	Max filtration (1/s) 0.0 0.0 0.0 0.0	Max Control 2 (1/s) 1.9 1.7 46.1 46.0	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0	Max Volume (m ³) 0.1 0.1 16.0 15.9	Status O K O K Flood Risk Flood Risk
8640 10080 15 30 60	Storm Event min Summer min Summer min Winter min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830 5.544	Max Depth In (m) 0.057 0.054 1.233 1.230 0.944	Max filtration (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Max Control 2 (1/s) 1.9 1.7 46.1 46.0 40.0	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0 40.0	Max Volume (m ³) 0.1 0.1 16.0 15.9 11.7	OK OK Flood Risk Flood Risk OK
8640 10080 15 30 60 120	Storm Event min Summer min Summer min Winter min Winter min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830 5.544 5.151	Max In Depth In 0.057 0.054 1.233 0.944 0.551 0.551	Max filtration (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Max Control 2 (1/s) 1.9 1.7 46.1 46.0 40.0 29.9	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0 40.0 29.9	Max Volume (m ³) 0.1 0.1 16.0 15.9 11.7 5.7	Status O K O K Flood Risk Flood Risk O K O K
8640 10080 15 30 60 120 180	Storm Event min Summer min Summer min Winter min Winter min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830 5.544 5.151 4.970	Max In Depth In 0.057 1 0.054 1 1.233 1 0.944 0 0.551 0 0.2050 2	Max filtration (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Max Control 2 (1/s) 1.9 1.7 46.1 46.0 40.0 29.9 23.9 23.9	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0 40.0 29.9 23.9 23.9	Max Volume (m ³) 0.1 0.1 16.0 15.9 11.7 5.7 2.8	Status O K O K Flood Risk Flood Risk O K O K O K O K
8640 10080 15 30 60	Storm Event min Summer min Summer min Winter min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830 5.544	Max Depth In 0.057 0.054 1.233 1.230 0.944 0.944	Max filtration (1/s) 0.0 0.0 0.0 0.0 0.0	Max Control 2 (1/s) 1.9 1.7 46.1 46.0 40.0	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0 40.0	Max Volume (m ³) 0.1 0.1 16.0 15.9 11.7	Status OK OK Flood Risk Flood Risk OK
8640 10080 15 30 60 120 180	Storm Event min Summer min Summer min Winter min Winter min Winter min Winter min Winter	Max Level (m) 4.657 4.654 5.833 5.830 5.544 5.151 4.970	Max In Depth In 0.057 1.233 1.233 1.230 0.944 0.551 0.370 0.260	Max filtration (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Max Control 2 (1/s) 1.9 1.7 46.1 46.0 40.0 29.9 23.9 20.0	Max 2 Outflow (1/s) 1.9 1.7 46.1 46.0 40.0 29.9 23.9 10.0	Max Volume (m ³) 0.1 0.1 16.0 15.9 11.7 5.7 2.8	Status OK OK Flood Risk Flood Risk OK OK OK

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480 min Winter 4.765 0.165

600 min Winter 4.749 0.149

720 min Winter 4.737 0.137

960 min Winter 4.721 0.121

1440 min Winter 4.697 0.097

2160 min Winter 4.682 0.082

2880 min Winter 4.674 0.074

4320 min Winter 4.664 0.064

5760 min Winter 4.657 0.057

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	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)
8640	min	Summer	0.839	0.0	244.5	4312
10080	min	Summer	0.745	0.0	253.5	5040
15	min	Winter	79.950	0.0	45.3	16
30	min	Winter	53.199	0.0	60.3	24
60	min	Winter	33.892	0.0	76.9	40
120	min	Winter	20.940	0.0	95.0	70
180	min	Winter	15.610	0.0	106.2	100
240	min	Winter	12.614	0.0	114.4	128
360	min	Winter	9.343	0.0	127.1	186
480	min	Winter	7.540	0.0	136.8	246
600	min	Winter	6.381	0.0	144.7	306
720	min	Winter	5.565	0.0	151.5	364
960	min	Winter	4.481	0.0	162.6	486
1440	min	Winter	3.298	0.0	179.5	728
2160	min	Winter	2.424	0.0	197.9	1076
2880	min	Winter	1.946	0.0	211.9	1472
4320	min	Winter	1.427	0.0	233.0	2152
5760	min	Winter	1.144	0.0	249.1	2984
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Ash House										
Falcon Road									4	
Exeter EX2	7LB								Micro	
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File FILTER I	DRAIN_1.4M	1_DEEP	.SRCX	Chec	ked by				Drainac	Je
XP Solutions				Sour	ce Cont	trol 2017	7.1.2			
	Summary c	of Res	ults	for 3	0 year	Return P	eriod	(+10%	5)	
	Storm	Max	Maw	M	. .	Max	Mav	May	St 2+110	
	Event	Level	Depth	Infilt	ration C	Control E O	utflow '	Volume	btatus	
		(m)	(m)	(1	/s)	(l/s) (1/s)	(m³)		
7200) min Winter	4.652	0.052		0.0	1.6	1.6	0.1	ОК	
8640) min Winter	4.649	0.049		0.0	1.4	1.4	0.1	O K	
10080) min Winter	4.646	0.046		0.0	1.2	1.2	0.0	O K	
		Storm		Rain	Flooded	Discharge	Time-Pe	ak		
		Event	(mm/hr)	Volume	Volume	(mins))		
					(m³)	(m³)				
	7200	min Wi	nter	0.964	0.0	262.4	37	36		
	8640	min Wi	nter	0.839	0.0	273.9	43	92		
	10080	IIIII WI	nter	0.745	0.0	283.9	50	00		

Ash House Falcon Road Exeter EX2 7LB Date 22/05/2018 16:51 Designed by GR061116	_
Falcon RoadMicroExeter EX2 7LBDesigned by GR061116	_
Exeter EX2 7LB Date 22/05/2018 16:51 Designed by GR061116	
Date 22/05/2018 16:51 Designed by GR061116 Designed	
	10
File FILTER DRAIN_1.4M_DEEP.SRCX Checked by	Je
XP Solutions Source Control 2017.1.2	
Rainfall Model FSR Winter Storms Yes	
Return Period (years)30CV (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000 Shortest Storm (mins)15Ratio R0.350 Longest Storm (mins)10080Summer StormsYesClimate Change %	
<u>Time Area Diagram</u>	
Total Area (ha) 0.270	
Time (mins) Area Time (mins) Area Time (mins) Area From: To: (ha) From: To: (ha) From: To: (ha)	

CH2M		Page 5
Ash House		· · · · · · · · · · · · · · · · · · ·
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 16:51	Designed by GR061116	
File FILTER DRAIN_1.4M_DEEP.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)0.00000Pipe Diameter (m)0.150Infiltration Coefficient Side (m/hr)0.0000Pipe Depth above Invert (m)0.000Safety Factor2.0Slope (1:X)200.0Porosity0.30Cap Volume Depth (m)0.000Invert Level (m)4.600Cap Infiltration Depth (m)0.000Trench Width (m)0.5Number of Pipes1Trench Length (m)100.0100.01

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	4.600
Roughness k (mm)	0.600		

CH2M							Page 1
Ash House							
Falcon Road							4
Evotor EV2 71D							1 mm
Exeler EX2 /LB							- Micro
Date 22/05/2018 16:53		Desi	gned b	oy GR0611	16		Drainago
File FILTER DRAIN_1.4M_	DEEP.SRCX	(Chec	ked by	Y			Diamage
XP Solutions		Sour	ce Coi	ntrol 201	7.1.2		
Summary of	Results	for 10)0 vea	r Return	Period	A (+10	(%)
<u> </u>			100				
	Half I	Drain T	ime : 6	minutes.			
Storm	Max Max	Ma	x	Max	Max	Max	Status
Event L	evel Depth	Infilt	ration	Control E C	Dutflow	Volume	
	(m) (m)	(1/	s)	(1/s)	(l/s)	(m³)	
15 min Summer 6	002 1 402		0 0	49 3	493	20 5	FI.OOD
30 min Summer 6	.004 1.404		0.0	49.3	49.3	22.6	FLOOD
60 min Summer 6	.001 1.401		0.0	49.2	49.2	19.5	FLOOD
120 min Summer 5	.656 1.056		0.0	42.5	42.5	13.3	O K
180 min Summer 5	.373 0.773		0.0	36.0	36.0	9.1	O K
240 min Summer 5	.188 0.588		0.0	31.0	31.0	6.3	O K
360 min Summer 4	.997 0.397		0.0	24.9	24.9	3.2	O K
480 min Summer 4	.892 0.292		0.0	20.8	20.8	1.8	O K
600 min Summer 4	.829 0.229		0.0	17.8	17.8	1.2	O K
720 min Summer 4	.798 0.198		0.0	15.7	15.7	0.9	O K
960 min Summer 4	.770 0.170		0.0	12.6	12.6	0.7	O K
1440 min Summer 4	.739 0.139		0.0	9.2	9.2	0.4	O K
2160 min Summer 4	.715 0.115		0.0	6.7	6.7	0.3	O K
2880 min Summer 4	.698 0.098		0.0	5.4	5.4	0.2	O K
4320 min Summer 4	.682 0.082		0.0	3.9	3.9	0.2	OK
5760 min Summer 4	.6/5 0.0/5		0.0	3.2	3.2	0.1	O K
7200 min Summer 4	.669 0.069		0.0	2.0	2.0	0.1	ΟK
St	corm	Rain	Flooded	l Discharge	Time-Pe	eak	
Ex	vent (1	mm/hr)	Volume	Volume	(mins)	
			(m³)	(m³)			
15		0.2 507	2 (. EO 4		1.0	
15 III 30 mi	in Summer I	60 507	2.0	70 5		24	
50 mi	in Summer	09.JO7 11 560	4.1	- 70.3		24 40	
120 mi	in Summer	27 503	1.0) 111 4		70	
180 mi	in Summer	20.407	0.0) 124.0		100	
240 mi	in Summer	16.403	0.0	132.9		130	
360 mi	in Summer	12.073	0.0	146.7		188	
480 mi	in Summer	9.697	0.0	157.1		248	
600 mi	in Summer	8.173	0.0	165.5	:	308	
720 mi	in Summer	7.104	0.0	172.6		366	
960 mi	in Summer	5.689	0.0	184.3	4	186	
1440 mi	in Summer	4.152	0.0	201.8		734	
2160 mi	in Summer	3.023	0.0	220.4	10	076	
2880 mi	in Summer	2.411	0.0	234.3	14	156	
4320 mi	in Summer	1.749	0.0	255.0	21	140	
5760 mi	in Summer	1.391	0.0	270.4	28	340	
//200 mi	ın Summer	1.166	0.0	283.2	3	044	
	©1982	2-2017	XP Sc	olutions			

Ash House Falcon Road Exeter EX2T TLB Designed by GR061116 Date 22/05/2018 16:53 Designed by GR061116 Checked by File FILTER DRAIN_1.4M_DEEP.SRCX Conce Control 2017.1.2 Source Control 2017.1.2 Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Source Control 2017.1.2 Source Control 2017.1.2 <th col<="" th=""><th>CH2M</th><th></th><th></th><th></th><th></th><th></th><th></th><th>Page 2</th><th></th></th>	<th>CH2M</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Page 2</th> <th></th>	CH2M							Page 2	
Falcon Road Designed by GR061116 Date 22/05/2018 16:53 Designed by GR061116 Pile PILTER DRAIN_1.4M_DEEP.SRCX Source Control 2017.1.2	Ash House									
Earler EX2 71B Designed by GR061116 Pile FILTER DRAIN_1.4M_DEP.SRX Checked by Source Control 2017.1.2 Source Control 2017.1.	Falcon Road							4		
Excert Date 22/05/2018 16:53 Designed by GR061116 Designed by GR061116 File FILTER DRAIN_1.4M_DEEP.SRCX Checked by Checked by Checked by XP Solutions Source Control 2017.1.2 Control 2017.1.2 Summary of Results for 100 year Return Period (+10%) Storm Max Max Max Max Max Status 10000 nin Summer 4.663 0.063 0.0 2.3 2.3 0.1 0 K 10000 nin Summer 4.663 0.063 0.0 2.0 0.1 0 K 10000 nin Summer 4.6659 0.059 0.0 2.0 0.1 0 K 10000 nin Summer 4.6659 0.059 0.0 49.4 49.4 25.6 FLOOD 30 nin Winter 6.000 1.400 0.0 49.4 49.4 25.6 FLOOD 120 nin Winter 5.160 0.566 0.0 30.4 5.9 0 K 240 nin Winter 4.375 0.10.410 0.0 25.4 25.4 3.3 0 K 240 nin Winter 4.739 0.139 0.0 11.4 11.4 0.4 K 280 nin Wi								1 mg	m	
Date 22/05/2018 16:53 Designed by GRO61116 Checked by File FILTER DRAIN_1.4M_DEEP.SRCX Checked by Checked by Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Summer 4.653 0.063 0.0 2.3 0.1 0 8640 min Summer 4.653 0.059 0.0 2.3 2.3 0.1 0 K 13 nin Winter 6.000 1.400 0.0 49.3 49.3 24.3 FLOOD 30 nin Winter 5.046 0.061 0.0 30.4 30.4 5.9 FLOOD 30 nin Winter 5.467 0.867 0.0 31.4 15.4 0.9 0.8 300 nin Winter 4.796 0.196 0.0 11.4 11.4 0.6 0.8 300 nin Winter 4.795 0.129 0.0 11.4 11.4 0.6 0.8 300 nin Winter 4.730 0.139 0.0 <td>Exeter EX2 /LB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>— Micro</td> <td></td>	Exeter EX2 /LB							— Micro		
File FILTER DRAIN_1.4M_DEEP.SRCX Checked by Control 2017.1.2 Summary of Results for 100 year Return Period (+108). Summary of Results for 100 year Return Period (+108). Storm Max Max Max Control 2 Outflow Volume (1/s) Status 8640 min Summer 4.663 0.063 0.0 2.3 2.3 0.1 0.K 10080 min Summer 4.663 0.065 0.0 49.4 24.3 FLOOD 30 min Winter 6.000 1.406 0.0 49.4 24.6 FLOOD 30 min Winter 6.000 1.407 0.0 49.4 24.6 FLOOD 30 min Winter 5.060 0.566 0.0 30.4 50.9 0.K 300 min Winter 5.060 0.566 0.0 30.4 50.9 0.K 300 min Winter 5.060 0.566 0.0 13.4 1.4 0.K 300 min Winter 4.739 0.139 0.0 13.1 1.5.4 0.5.4 0.5.4 300 min Winter 4.739 0.139 0.0 1.1.4 0.K 0.K 2.60 300 min Winter 4.632 0.063 0.0 2.3 2.3 0.K <td>Date 22/05/2018 16:53</td> <td></td> <td>Desi</td> <td>gned b</td> <td>y GR0611</td> <td>16</td> <td></td> <td>Depin</td> <td>200</td>	Date 22/05/2018 16:53		Desi	gned b	y GR0611	16		Depin	200	
XP Solutions Source Control 2017.1.2 Summary of Results for 100 year Return Period (+10%) Summary of Results for 100 year Return Period (+10%) Storm Max Max Max Max Max Max Max Status Event Infiltration Control 2 Outflow Volume (1/s) 8640 min Summer 4.653 0.059 0.0 2.3 2.3 0.1 0 K 10080 min Summer 4.653 0.059 0.0 2.4 2.4 2.5.6 FLOOD 30 min Winter 6.001 1.406 0.0 49.3 49.3 24.3 FLOOD 10080 min Summer 4.570 0.867 0.0 38.3 38.3 10.5 0 K 240 min Winter 5.166 0.566 0.0 30.4 30.4 5.9 0 K 240 min Winter 4.7370 0.136 0.0 1.4 1.4 0.6 6 00 min Winter 4.7370 0.139 0.0 1.9 1.9 1.4 0.4 0.8 240 min Winter 4.632 0.063 0.0 2.9 2.9 0.1 0.8	File FILTER DRAIN_1.4M	L_DEEP.SRCX	Chec	ked by				Digiti	aye	
Summary of Results for 100 year Return Period (+10%) Storm Max Max Max Max Max Max Max Max Storm Storm Max Max Max Max Max Max Storm Storm Max Max Max Max Max Max Max Storm Max Max Max Max Max Max Max Storm Max	XP Solutions		Sour	ce Con	trol 201	7.1.2				
Storn Nax Nax </td <td></td> <td></td> <td></td> <td></td> <td>0101 101</td> <td></td> <td></td> <td></td> <td></td>					0101 101					
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Storn Prent Max (n)	Summary O	E Results	IOF IU	JU year	r Return	Perioc	(+10-	<u>5)</u>		
Storm Max Max Max Max Max Max Max Status Been Level Oppting Control I Control I <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td>								-		
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Béddu min Summer 4.663 0.063 0.0 2.3 2.3 0.1 0 K 10000 min Summer 4.665 0.059 0.0 2.0 2.0 0.1 0 K 15 min Winter 6.000 1.406 0.0 49.3 49.3 24.3 FLOOD 30 min Winter 5.000 1.400 0.0 49.4 25.6 FLOOD 16.0 16.0 17.0 17.0 49.4 25.6 FLOOD 16.0 17.0 17.0 49.4 25.6 FLOOD 16.0 17.0 17.0 49.4 25.6 FLOOD 17.0 17.0 49.4 25.6 17.0	Event	Level Deptn	INTIIC	ration (a)	Control 2	(1/a)	volume			
8640 min Summer 4.663 0.063 0.0 2.3 2.3 0.1 0 K 10080 min Summer 4.659 0.059 0.0 2.0 2.0 0.1 0 K 30 min Winter 6.007 1.407 0.0 49.4 49.3 24.3 FLOOD 30 min Winter 6.000 1.400 0.0 49.4 49.2 18.9 FLOOD 120 min Winter 5.060 0.466 0.0 30.4 30.4 5.9 0 K 140 min Winter 5.166 0.566 0.0 15.4 15.4 3.3 0 K 360 min Winter 5.000 0.410 0.0 25.4 3.3 0 K 360 min Winter 4.790 0.190 0.15.4 15.4 0.8 600 min Winter 4.790 0.190 0.11.4 11.4 0 K 480 min Winter 4.790 0.139 0.0 13.0 13.0 0.7 0 K 950 min Winter 4.739 0.139 0.0 11.4 11.4 0.6 0 K 1440 min Winter 4.714 0.114 0.0 6.6 6.6 0.3 0 K 286 min Winter 4.681 0.083 0.0 2.3 0.1 0 K </td <td></td> <td>(111) (111)</td> <td>(1)</td> <td>/5)</td> <td>(1/5)</td> <td>(1/5)</td> <td>(111°)</td> <td></td> <td></td>		(111) (111)	(1)	/5)	(1/5)	(1/5)	(111°)			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	8640 min Summer	4.663 0.063		0.0	2.3	2.3	0.1	ΟK		
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	15 min Winter	6.006 1.406		0.0	49.3	49.3	24.3	FLOOD		
60min Winter6.0001.4000.049.249.218.9FLOOD120min Winter5.1660.6670.038.338.310.50K180min Winter5.0100.4100.025.425.43.30K360min Winter4.8550.2550.019.119.11.40K480min Winter4.7760.1960.015.415.40.40.4720min Winter4.7790.1390.09.19.10.40K600min Winter4.7790.1390.09.19.10.40K120min Winter4.7390.1390.09.19.10.40K120min Winter4.6920.0920.04.94.90.20K280min Winter4.6810.0610.02.32.30.10K5760min Winter4.6630.0630.02.32.30.10K10080min Summer1.0090.0294.343441008010.40K10080min Summer1.0390.0124.813010224014010012014.813015min Winter9.5877.078.9256016.4101.140120120120120120120124.8 <td< td=""><td>30 min Winter</td><td>6.007 1.407</td><td></td><td>0.0</td><td>49.4</td><td>49.4</td><td>25.6</td><td>FLOOD</td><td></td></td<>	30 min Winter	6.007 1.407		0.0	49.4	49.4	25.6	FLOOD		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	60 min Winter	6.000 1.400		0.0	49.2	49.2	18.9	FLOOD		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	120 min Winter	5.467 0.867		0.0	38.3	38.3	10.5	O K		
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1440 min Winter 4.714 0.1140.06.66.60.30 K2160 min Winter 4.681 0.0810.03.93.90.20 K2880 min Winter 4.672 0.0720.02.92.90.10 K4320 min Winter 4.663 0.0630.02.32.30.10 K5760 min Winter 4.663 0.0630.02.32.30.10 KNote: The second of the	960 min Winter	4.739 0.139		0.0	9.1	9.1	0.4	O K		
2160 min Winter 4.692 0.092 0.0 4.9 4.9 0.2 0 K 2880 min Winter 4.672 0.072 0.0 2.9 2.9 0.1 0 K 4320 min Winter 4.672 0.072 0.0 2.9 2.9 0.1 0 K 5760 min Winter 4.663 0.063 0.0 2.3 2.3 0.1 0 K Kern (mm/hr) Volume Volume (mins) Wolume 1.009 0.0 294.3 4344 10080 min Summer 1.009 0.0 294.3 4344 10080 min Summer 0.893 0.0 303.9 5096 15 min Winter 103.597 5.7 58.7 17 30 min Winter 44.560 0.4 101.1 40 120 min Winter 20.407 0.0 138.9 102 240 min Winter 12.073 0.0 164.3 188 480 min Winter 12.073 0.0 164.3 188 480 min Winter 5.689 0.0 206.4 484 4140 min Winter 4.152 0.0 226.0 732 2160 min Winter 4.152 0.0 226.0 732 2160 min Winter 4.152 0.	1440 min Winter	4.714 0.114		0.0	6.6	6.6	0.3	O K		
2880 min Winter 4.681 0.081 0.0 3.9 3.9 0.2 0 K 4320 min Winter 4.672 0.072 0.0 2.9 2.9 0.1 0 K 5760 min Winter 4.663 0.063 0.0 2.3 2.3 0.1 0 K Storm Rain Flooded Discharge Time-Peak (mm/hr) Volume (mins) (m³) Storm Rain Flooded Discharge Time-Peak (mins) (m³) 8640 min Summer 1.009 0.0 294.3 4344 10080 min Summer 0.893 0.0 303.9 5096 15 min Winter 103.597 5.7 58.7 17 30 min Winter 44.560 0.4 101.1 40 120 min Winter 16.403 0.0 124.8 72 180 min Winter 16.403 0.0 148.8 130 360 min Winter 16.403 0.0 148.8 130 360 min Winter 8.173 0.0 185.4 306 720 min Winter 7.104 0.0 193.4 364 960 min Winter 7.104 0.0 193.4 364 960 min Winter 4.152 0.0 226.0 732 2160 min Winter 1.523 0.0 226.4 <td>2160 min Winter</td> <td>4.692 0.092</td> <td></td> <td>0.0</td> <td>4.9</td> <td>4.9</td> <td>0.2</td> <td>O K</td> <td></td>	2160 min Winter	4.692 0.092		0.0	4.9	4.9	0.2	O K		
4320 min Winter 4.672 0.072 5760 min Winter 4.663 0.063 0.0 2.3 2.3 0.1 0 K Storm Rain Flooded Discharge Time-Peak Event (mm/hr) Volume Volume (mins) (m ³) 8640 min Summer 1.009 0.0 294.3 4344 10080 min Summer 0.893 0.0 303.9 5096 15 min Winter 103.597 5.7 58.7 17 30 min Winter 69.587 7.0 78.9 25 60 min Winter 44.560 0.4 101.1 40 120 min Winter 27.503 0.0 124.8 72 180 min Winter 16.403 0.0 148.8 130 360 min Winter 12.073 0.0 164.3 188 480 min Winter 8.173 0.0 164.3 188 480 min Winter 7.104 0.0 193.4 364 960 min Winter 7.104 0.0 193.4 364 960 min Winter 5.689 0.0 206.4 484 1440 min Winter 4.152 0.0 226.0 732 2160 min Winter 3.023 0.0 246.8 1096 2280 min Winter 1.391 0.0 302.9 2784	2880 min Winter	4.681 0.081		0.0	3.9	3.9	0.2	O K		
5760 min Winter 4.663 0.063 0.0 2.3 2.3 0.1 0 K Storm Rain Flooded Discharge Time-Peak (mm/hr) Volume Volume (mins) (m ³) 8640 min Summer 1.009 0.0 294.3 4344 10080 min Summer 0.893 0.0 303.9 5096 15 min Winter 103.597 5.7 58.7 17 30 min Winter 44.560 0.4 101.1 40 120 min Winter 44.560 0.4 101.1 40 120 min Winter 27.503 0.0 124.8 72 180 min Winter 16.403 0.0 138.9 102 240 min Winter 12.073 0.0 164.3 188 480 min Winter 9.697 0.0 175.9 244 600 min Winter 8.173 0.0 185.4 306 720 min Winter 7.104 0.0 193.4 364 960 min Winter 4.152 0.0 226.0 732 2160 min Winter 3.023 0.0 246.8 1096 2880 min Winter 2.411 0.0 262.4 1444 4320 min Winter 1.391 0.0 302.9 2784	4320 min Winter	4.672 0.072		0.0	2.9	2.9	0.1	O K		
Storm EventRain (mm/hr)Flooded Volume (m³)Discharge Volume (m³)Time-Peak (mins)8640min Summer1.0090.0294.3434410080min Summer0.8930.0303.9509615min Winter103.5975.758.71730min Winter69.5877.078.92560min Winter44.5600.4101.140120min Winter20.4070.0138.9102240min Winter16.4030.0148.8130360min Winter12.0730.0164.3188480min Winter9.6970.0175.9244600min Winter7.1040.0193.4364960min Winter5.6890.0206.44841440min Winter3.0230.0246.81096280min Winter3.0230.0246.81096280min Winter3.0230.0262.414444320min Winter1.7490.0285.62100576min Winter1.3910.0302.92784	5760 min Winter	4.663 0.063		0.0	2.3	2.3	0.1	ОК		
Storn EventRain (mm/m)Flooded volume (m³)Discharge Volume (mins)Time-Peak (mins)8640minSumer1.0090.02.94.34.34410080minSumer0.8030.0303.95.09615minWinter103.5975.575.7730minWinter69.5877.007.8.92.5560minWinter20.4070.001.24.87.22100minWinter20.4070.001.38.91.02240minWinter20.4070.001.46.31.884000minWinter12.0730.001.64.31.884000minWinter12.0730.001.75.92.44600minWinter7.1040.001.93.43.64700minWinter7.1040.001.93.43.64700minWinter7.1040.001.93.43.64700minWinter7.1040.001.93.43.64700minWinter7.1040.002.26.07.327100minWinter7.1040.002.26.07.327100minWinter7.1040.002.26.07.327100minWinter7.1040.002.26.07.327100minWinter7.1040.002.26.07.327100Minter										
Event(mm/hr)Volume (m³)Volume (m³)(mins)8640minSummer1.0090.0294.3434410080minSummer0.8930.0303.9509615minWinter103.5975.758.71730minWinter69.5877.078.92560minWinter27.5030.0124.872180minWinter20.4070.0138.9102240minWinter16.4030.0148.8130360minWinter12.0730.0164.3188480minWinter9.6970.0175.9244600minWinter7.1040.0193.4364960minWinter5.6890.0226.07322160minWinter3.0230.0246.81096280minWinter2.4110.0262.414444320minWinter1.3910.0302.92784		Storm	Rain	Flooded	l Discharge	e Time-P	eak			
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8640 min Summer1.0090.0294.3434410080 min Summer0.8930.0303.9509615 min Winter103.5975.758.71730 min Winter69.5877.078.92560 min Winter44.5600.4101.140120 min Winter27.5030.0124.872180 min Winter16.4030.0148.8130360 min Winter12.0730.0164.3188480 min Winter9.6970.0175.9244600 min Winter8.1730.0185.4306720 min Winter5.6890.0206.44841440 min Winter3.0230.0246.81096280 min Winter3.0230.0246.81096280 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784				(m³)	(m³)					
3040 min Summer1.0090.0294.3434410080 min Summer0.8930.0303.9509615 min Winter103.5975.758.71730 min Winter69.5877.078.92560 min Winter44.5600.4101.140120 min Winter20.4070.0138.9102240 min Winter16.4030.0148.8130360 min Winter12.0730.0164.3188480 min Winter9.6970.0175.9244600 min Winter7.1040.0193.4364960 min Winter5.6890.0226.07322160 min Winter3.0230.0246.810962880 min Winter2.4110.0262.414444320 min Winter1.7490.0302.92784	0.640	min Common	1 000	0.0)))//	, л	211			
15 min Summer 0.093 0.0 303.9 5090 15 min Winter 103.597 5.7 58.7 17 30 min Winter 69.587 7.0 78.9 25 60 min Winter 44.560 0.4 101.1 40 120 min Winter 27.503 0.0 124.8 72 180 min Winter 20.407 0.0 138.9 102 240 min Winter 16.403 0.0 148.8 130 360 min Winter 12.073 0.0 164.3 188 480 min Winter 9.697 0.0 175.9 244 600 min Winter 8.173 0.0 185.4 306 720 min Winter 7.104 0.0 193.4 364 960 min Winter 5.689 0.0 206.4 484 1440 min Winter 3.023 0.0 246.8 1096 2880 min Winter 2.411 0.0 262.4 1444 4320 min Winter 1.749 0.0 285.6 2100 5760 min Winter 1.391 0.0 302.	8640	min Summer	1.009	0.0	v 294.3 v 200 r	o 4	096			
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120 min Winter27.3030.0124.072180 min Winter20.4070.0138.9102240 min Winter16.4030.0148.8130360 min Winter12.0730.0164.3188480 min Winter9.6970.0175.9244600 min Winter8.1730.0185.4306720 min Winter7.1040.0193.4364960 min Winter5.6890.0206.44841440 min Winter4.1520.0226.07322160 min Winter3.0230.0246.810962880 min Winter2.4110.0285.621005760 min Winter1.3910.0302.92784	120	min Winter	27 502	0.4	, 101.1					
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480 min Winter 9.697 0.0 175.9 244 600 min Winter 8.173 0.0 185.4 306 720 min Winter 7.104 0.0 193.4 364 960 min Winter 5.689 0.0 206.4 484 1440 min Winter 4.152 0.0 226.0 732 2160 min Winter 3.023 0.0 246.8 1096 2880 min Winter 2.411 0.0 262.4 1444 4320 min Winter 1.749 0.0 285.6 2100 5760 min Winter 1.391 0.0 302.9 2784	360	min Winter	12.073	0.0) 164 3	- }	188			
600 min Winter8.1730.0185.4306720 min Winter7.1040.0193.4364960 min Winter5.6890.0206.44841440 min Winter4.1520.0226.07322160 min Winter3.0230.0246.810962880 min Winter2.4110.0262.414444320 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784	480	min Winter	9.697	0.0) 175 0)	2.4.4			
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960 min Winter5.6890.0206.44841440 min Winter4.1520.0226.07322160 min Winter3.0230.0246.810962880 min Winter2.4110.0262.414444320 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784	720	min Winter	7.104	0.0) 193.4	-	364			
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2160 min Winter3.0230.0246.810962880 min Winter2.4110.0262.414444320 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784	1440	min Winter	4.152	0.0	226.0)	732			
2880 min Winter2.4110.0262.414444320 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784	2160	min Winter	3.023	0.0	246.8	3 1	096			
4320 min Winter1.7490.0285.621005760 min Winter1.3910.0302.92784	2880	min Winter	2.411	0.0	262.4	1 1	444			
5760 min Winter 1.391 0.0 302.9 2784	4320	min Winter	1.749	0.0	285.6	5 2	100			
	5760	min Winter	1.391	0.0	302.9	2	784			

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CH2M								Page 3
Ash House								
Falcon Road								4
Exeter EX2 7LB								Micco
Date 22/05/2018 16:53			Desi	gned b	y GR0611	16		
File FILTER DRAIN_1.4N	1_DEEP	.SRCX	Chec	ked by				Drainage
XP Solutions			Sour	ce Con	trol 201	7.1.2		
Summary o	f Resi	ults f	or 10)0 year	Return	Period	(+10	%)
Storm	Max	Max	Ma	ах	Max	Max	Max	Status
Event	Level	Depth	Infilt	ration (Control E	Outflow	Volume	
	(m)	(m)	(1	/s)	(1/s)	(1/s)	(m³)	
7200 min Winter	4.657	0.057		0.0	1.9	1.9	0.1	O K
8640 min Winter	4.653	0.053		0.0	1.6	1.6	0.1	O K
10080 min Winter	4.650	0.050		0.0	1.4	1.4	0.1	O K
	Storm Event	1 (n	Rain m/hr)	Flooded Volume	Discharge Volume (m ³)	e Time-Po (mins	eak :)	
				()	()			
7200	min Wi	nter	1.166	0.0	317.2	2 3	640	
10080	min Wi	nter	0.893	0.0	340.4	5 4. 1 4	290 968	

CH2M	Page 4
Ash House	
Falcon Road	4
Exeter EX2 7LB	Micro
Date 22/05/2018 16:53	Designed by GR061116
File FILTER DRAIN_1.4M_DEEP.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Rainfall Model Return Period (years) Region Engl	FSR Winter Storms Yes 100 Cv (Summer) 0.750 Land and Wales Cv (Winter) 0.840
M5-60 (mm) Ratio R Summer Storms	20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
Tin	me Area Diagram
Tot	tal Area (ha) 0.270
Time (mins) Area T: From: To: (ha) Fr	Time (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)
0 3 0.090	3 6 0.090 6 9 0.090
@1982-	-2017 XP Solutions

CH2M		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 16:53	Designed by GR061116	Desinado
File FILTER DRAIN_1.4M_DEEP.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)0.00000Pipe Diameter (m)0.150Infiltration Coefficient Side (m/hr)0.0000Pipe Depth above Invert (m)0.000Safety Factor2.0Slope (1:X)200.0Porosity0.30Cap Volume Depth (m)0.000Invert Level (m)4.600Cap Infiltration Depth (m)0.000Trench Width (m)0.5Number of Pipes1Trench Length (m)100.0100.01

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	4.600
Roughness k (mm)	0.600		

CH2M										I	Page 1	L
Ash House											2	
Falcon Roa	d										4	
Exeter E	x2 71.B											m
Dato 25/05	/2018 13.	19		Dogi	anod	h tr	170170	250			MICIO]
Date 25705	72010 13.	49	apav	Desi	.gnec	l Dy M	IA0473	950			Drain	ane
FILE DITCH	_A_2018=0	5-24.	SRUX	Chec	кеа	ya.	1 0 0 1					
XP Solutio	ns			Sour	ce u	ontro	DI 20.	∟/.⊥.	• 2			
	G	. f. D.	1 +	£	o	D	L	D	1 () (100)		
	Summary	<u>oi ke</u>	esuits	IOT 3	u ye	ar ke	turn	Peri	<u>oa (+</u>	103)		
			Half	Drain Ti	.me :	20 minu	ites.					
	Storm	Max	Max	Max		Max	Ma	ax	Max	Stat	us	
	Event	Level	Depth	Infiltra	tion	Control	LΣOut	tflow	Volume			
		(m)	(m)	(1/s)		(1/s)	(1,	(s)	(m³)			
15	min Summer	6.696	0.726		0.0	215.5	5 2	215.5	323.4	Flood	Risk	
30	min Summer	6.751	0.781		0.0	226.2	2 2	226.2	390.8	Flood	Risk	
60	min Summer	6.760	0.790		0.0	227.9	9 2	227.9	403.1	Flood	Risk Diel	
120	min Summer	6.725	0./55		0.0	221.1	L 2 A '	221.1 211 0	357.6 303 6	Flood	KlSK Rieb	
240	min Summer	6.633	0.663		0.0	202.5	5 2	202.5	256.0	rioou	O K	
360	min Summer	6.558	0.588		0.0	185.8	3	185.8	188.4		ОК	
480	min Summer	6.505	0.535		0.0	167.2	2 1	167.2	148.3		ΟK	
600	min Summer	6.466	0.496		0.0	150.7	7 2	150.7	122.5		ΟK	
720	min Summer	6.436	0.466		0.0	136.8	3 :	136.8	104.8		ОК	
960	min Summer	6.395	0.425		0.0	115.1 01 -	L . 7	01 7	83.3 50 0		OK	
2160	min Summer	6.254	0.284		0.0	64.8	3	64.8	31.5		OK	
2880	min Summer	6.214	0.244		0.0	52.4	1	52.4	22.1		0 K	
4320	min Summer	6.174	0.204		0.0	38.0	5	38.6	14.7		ΟK	
5760	min Summer	6.156	0.186		0.0	31.0)	31.0	11.8		ΟK	
7200	min Summer	6.144	0.174		0.0	26.1	L	26.1	10.2		ΟK	
8640	min Summer	6.130	0.160		0.0	22.6	5	22.6	8.4		OK	
10080	min Summer	6 735	0.149		0.0	20.1		20.1 223 1	370 2	Flood	U K Risk	
30	min Winter	6.793	0.823		0.0	234.0) 2	234.0	447.5	Flood	Risk	
		Stor	m +	Rain	Flood	ded Dis	charge	Time	-Peak			
		Even	t	(mm/hr)	Volu (m ³	me Vo v	o⊥ume (m³)	(m)	lns)			
					(III	,	()					
	1	L5 min	Summer	79.950	(0.0	494.7		20			
	3	30 min	Summer	53.199	(0.0	658.3		30			
	6	50 min	Summer	33.892	().0	838.8		46			
	18	30 min	Summer	20.940	().0	1159.1		110			
	24	10 min	Summer	12.614	(0.0	1248.8		142			
	36	50 min	Summer	9.343	(0.0	1387.4		200			
	48	30 min	Summer	7.540	(0.0	1492.9		260			
	60)0 min	Summer	6.381	(0.0	1579.2		318			
	12	20 min 50 min	Summer	5.565 4 / Q1	(.0	177/ 6		3/8 196			
	144	10 min	Summer	3.298	(0.0	1959.1		746			
	216	50 min	Summer	2.424	(0.0	2159.6		1100			
	288	30 min	Summer	1.946	(0.0	2312.2		1468			
	432	20 min	Summer	1.427	(0.0	2542.7		2188			
	576	o0 min	Summer	1.144	(.0	2717.9		2928			
	120	10 min	Summer	0.839	ſ).0).0	2988.4		4368			
	1008	30 min	Summer	0.745	(0.0	3098.6		5120			
	1	L5 min	Winter	79.950	(0.0	554.1		21			
	-	20 min	Winter	53 100	(737 3		31			

 10080 min Summer
 0.745

 15 min Winter
 79.950

 30 min Winter
 53.199

554.1 737.3

0.0

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CH2M							Page 2			
Ash House										
Falcon Road							Ya			
Exeter EX2 7LB							Micro			
Date 25/05/2018 13	:49	Des	Designed by MA047950							
File DITCH_A_2018-	05-24.SRC	X Cheo	cked by	/			Diamaye			
XP Solutions		Soui	rce Cor	ntrol	2017.1.	. 2				
Summary	of Resul	ts for 3	0 year	Retur	n Peri	od (+)	<u>10%)</u>			
Storm	Max Max	ĸ Max	. 1	Max	Max	Max	Status			
Event	Level Dept	th Infiltra	ation Con	ntrol Σ	Outflow	Volume				
	(m) (m)) (l/s) (3	l/s)	(1/s)	(m³)				
60 min Winter	6.794 0.82	24	0.0	234.2	234.2	449.2	Flood Risk			
120 min Winter	6.734 0.70	64	0.0	222.8	222.8	368.7	Flood Risk			
180 min Winter	6.662 0.69	92	0.0	208.4	208.4	285.1	O K			
240 min Winter	6.595 0.62	25	0.0	194.1	194.1	219.6	O K			
360 min Winter	6.501 0.53	31	0.0	165.4	165.4	145.2	O K			
480 min Winter	6.443 0.4	73	0.0	140.1	140.1	108.8	O K			
600 min Winter	6.406 0.43	36	0.0	121.3	121.3	88.8	O K			
720 min Winter	6.381 0.43	11	0.0	106.7	106.7	76.9	O K			
960 min Winter	6.348 0.3	78	0.0	83.7	83.7	62.5	O K			
1440 min Winter	6.251 0.28	31	0.0	64.0	64.0	30.8	O K			
2160 min Winter	6.197 0.22	27	0.0	47.2	47.2	18.7	OK			
2880 min Winter	6.1/3 0.20]3	0.0	38.0	38.0	14.4	OK			
4320 min Winter	6.148 U.1	/8	0.0	27.9	27.9	10.8	0 K			
7200 min Winter	6.128 0.13	08 4 4	0.0	10 0	10 0	8.3	0 K			
200 min Winter	-6.1040.1	24	0.0	16 /	16.0	5.0	OK			
10080 min Winter	6.096 0.12	26	0.0	14.6	10.4	5.0	0 K			
	Storm	Rain	Flooded	Discha	rge Time	-Peak				
	Event	(mm/hr)	Volume	Volum	ne (mi	.ns)				
			(m³)	(m³)						
	60 min Wint	er 33.892	0.0	93	9.5	50				
1	20 min Wint	er 20.940	0.0	116	0.9	84				
1	80 min Wint	er 15.610	0.0	129	8.1	116				
2	40 min Wint	er 12.614	0.0	139	8.6	146				
3	60 min Wint	er 9.343	0.0	155	3.9	202				
4	80 min Wint	er 7.540	0.0	167	2.1	260				
	UU min Wint	er 6.381	0.0	176	δ./ 1 1	318 270				

600	min	Winter	6.381	0.0	1768.7	318
720	min	Winter	5.565	0.0	1851.1	378
960	min	Winter	4.481	0.0	1987.5	514
1440	min	Winter	3.298	0.0	2194.2	738
2160	min	Winter	2.424	0.0	2418.7	1100
2880	min	Winter	1.946	0.0	2589.6	1472
4320	min	Winter	1.427	0.0	2847.8	2176
5760	min	Winter	1.144	0.0	3044.1	2848
7200	min	Winter	0.964	0.0	3206.8	3624
8640	min	Winter	0.839	0.0	3347.1	4336
10080	min	Winter	0.745	0.0	3470.5	5120



CH2M								Page 1		
Ash House										
Falcon Road								4		
Evotor EX2 7LB								1 mm		
			Deel		147	047050		— Micro		
Date 25/05/2018 1.	3:50		Desi	Chacked by MAU4/930						
File DITCH_A_2018	-05-24.8	SRCX	Chec	ked by	Y			brainage		
XP Solutions			Sour	ce Coi	ntrol	. 2017.1.	.2			
Summary	of Res	ults :	for 10	0 yea:	r Ret	urn Peri	Lod (+	·10%)		
		Half D	rain Ti	me : 28	minut	.es.				
Storm	Max	Max	Мах		Max	Max	Max	Status		
Event	Level	Depth I	nfiltra	tion Co	ntrol	Σ Outflow	Volume	00000		
	(m)	(m)	(1/s)	(1/s)	(1/s)	(m³)			
15	6 700			0.0			445 0			
15 min Summe 30 min Summe	er 6.792	0.822		0.0	233.9	233.9	445.9	Flood Risk Flood Risk		
60 min Summe	er 6.883	0.913		0.0	250.1	250.1	583.1	Flood Risk		
120 min Summe	er 6.853	0.883		0.0	244.8	244.8	535.6	Flood Risk		
180 min Summe	er 6.806	0.836		0.0	236.4	236.4	465.7	Flood Risk		
240 min Summe	er 6.757	0.787		0.0	227.3	227.3	398.9	Flood Risk		
360 min Summe	er 6.673	0.703		0.0	210.8	210.8	297.4	Flood Risk		
480 min Summe	er 6.603	0.633		0.0	195.9	195.9	226.9	OK		
600 min Summe	er 6.54/	0.5//		0.0	183.2	183.2	1/9.6	O K		
960 min Summe	r 6.007	0.537		0.0	1/3 2	1/3 2	149.5	O K O K		
1440 min Summe	er 6.386	0.416		0.0	109.8	109.8	79.1	0 K		
2160 min Summe	er 6.311	0.341		0.0	78.8	78.8	48.8	0 K		
2880 min Summe	er 6.254	0.284		0.0	64.8	64.8	31.5	O K		
4320 min Summe	er 6.197	0.227		0.0	47.2	47.2	18.7	O K		
5760 min Summe	er 6.172	0.202		0.0	37.6	37.6	14.3	O K		
7200 min Summe	er 6.157	0.187		0.0	31.4	31.4	12.0	O K		
8640 min Summe	er 6.147	0.177		0.0	27.3	27.3	10.6	OK		
10080 min Summe	er 6.136	0.166		0.0	24.1	24.1	9.2	O K		
30 min Winte	er 6.913	0.866		0.0	241.7	241.7	631.3	Flood Risk		
		0.010		0.0	200.1	20012	001.0	11000 1110/1		
	Storm		Rain	Flooded	Disc	harge Time	-Peak			
	Event		(mm/hr)	Volume	Vol	lume (mi	.ns)			
				(m³)	(n	n ³)				
	15 min S	Summer 1	L03.597	0.0)	641.0	21			
	30 min S	Summer	69.587	0.0)	861.1	31			
	60 min S	Summer	44.560	0.0	1	102.9	48			
	120 min S	Summer	27.503	0.0	1	361.4	82			
	180 min S	Summer	20.407	0.0) 1	515.2	114			
	240 min S	Summer	12 073	0.0	/ 1	023.9 702 8	206			
	480 min S	Summer	9 697	0.0	, 1	919 9	264			
	600 min S	Summer	8.173	0.0	2	022.9	322			
	720 min S	Summer	7.104	0.0	2	110.0	380			
	960 min S	Summer	5.689	0.0	2	252.9	498			
1	.440 min S	Summer	4.152	0.0	2	466.2	736			
2	2160 min S	Summer	3.023	0.0	2	693.7	1108			
2	880 min S	Summer	2.411	0.0	2	864.0	1468			
4	is∠u min S 760 min S	Summer	1 201	0.0	י ג י ו	110./ 305 3	2001 2001			
	/200 min S	Summer	1.166	0.0	. 3	461.6	3664			
3	8640 min S	Summer	1.009	0.0	3	596.4	4400			
10	080 min S	Summer	0.893	0.0	3	714.5	5088			
	15 min W	linter 1	L03.597	0.0)	717.9	21			
	30 min W	linter	69.587	0.0)	964.5	32			

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CH2M									Page 2
Ash House									
Falcon Roa	d								4
Exeter E	X2 7LB								Mission
Date 25/05	/2018 13:	50		Desi	Igned				
File DITCH	A 2018-0	5-24.	SRCX	Cheo	cked k	- SV			Urainage
XP Solutio	<u> </u>			Sour	cce Co	ontrol	2017.1	.2	
	Summary o	of Rea	sults	for 10)0 yea	ar Ret	urn Peri	Lod (+	-10%)
	<u>/</u>				4				<u>_</u>
	Storm	Max	Max	Max		Max	Max	Max	Status
	Event	Level	Depth	Infiltra	ation C	ontrol	Σ Outflow	Volume	
		(m)	(m)	(1/s)	(l/s)	(l/s)	(m³)	
60) min Winter	6.929	0.959		0.0	257.8	257.8	658.7	Flood Risk
120) min Winter	6.877	0.907		0.0	248.9	248.9	572.9	Flood Risk
180) min Winter	6.804	0.834		0.0	236.0	236.0	462.8	Flood Risk
240) min Winter	6.732	0.762		0.0	222.5	222.5	366.6	Flood Risk
360) min Winter	6.611	0.641		0.0	197.6	197.6	234.4	O K
480) min Winter	6.525	0.555		0.0	175.0	175.0	162.6	O K
600) min Winter	6.470	0.500		0.0	152.7	152.7	125.3	O K
720) min Winter	6.432	0.462		0.0	135.1	135.1	102.9	O K
960) min Winter	6.386	0.416		0.0	109.8	109.8	79.2	O K
1440) min Winter	6.313	0.343		0.0	79.4	79.4	49.6	O K
2160) min Winter	6.234	0.264		0.0	58.8	58.8	26.7	O K
2880) min Winter	6 163	0.220		0.0	4/.U 2/ 1	47.0	12.0	OK
5760) min Winter	6 146	0.195		0.0	27 1	27 1	10 5	O K O K
7200) min Winter	6.130	0.160		0.0	22.8	22.8	8.5	0 K
8640) min Winter	6.117	0.147		0.0	19.6	19.6	7.0	0 K
10080) min Winter	6.108	0.138		0.0	17.5	17.5	6.1	O K
						1			
		Stori	u ⊢	Kain	FT0006		narge Time	-reak	
		Even	-	((m ³)	LOV =. (1)	n ³)		
					()	(1	- ,		
	e	50 min	Winter	44.560	0	.0 1	235.2	50	
	12	20 min	Winter	27.503	0	.0 1	524.8	86	
	18	30 min	Winter	20.407	0	.0 1	697.1	120	
	24	10 min	Winter	16.403	0	.0 1	818.8	152	

	Even	t	(mm/hr)	Volume	Volume	(mins)
				(m³)	(m³)	
60	min	Winter	44.560	0.0	1235.2	50
120	min	Winter	27.503	0.0	1524.8	86
180	min	Winter	20.407	0.0	1697.1	120
240	min	Winter	16.403	0.0	1818.8	152
360	min	Winter	12.073	0.0	2008.0	210
480	min	Winter	9.697	0.0	2150.3	266
600	min	Winter	8.173	0.0	2265.6	324
720	min	Winter	7.104	0.0	2363.2	380
960	min	Winter	5.689	0.0	2523.2	498
1440	min	Winter	4.152	0.0	2762.1	752
2160	min	Winter	3.023	0.0	3016.9	1104
2880	min	Winter	2.411	0.0	3207.7	1464
4320	min	Winter	1.749	0.0	3490.7	2168
5760	min	Winter	1.391	0.0	3701.9	2856
7200	min	Winter	1.166	0.0	3877.0	3648
8640	min	Winter	1.009	0.0	4028.0	4400
10080	min	Winter	0.893	0.0	4160.3	5008



CH2M									Page 1
Ash House									
Folgon Boo	4								2
	u 110 71 D								1 m
Exeter E	XZ /LB								Micro
Date 25/05	/2018 13:	47		Desi	.gned]	by MA047	7950		Drainago
File DITCH	_D_2018-0	5-24.	SRCX	Chec	cked by	Y			Diamage
XP Solutio	ns			Sour	ce Co	ntrol 20)17.1.	.2	
	Summary	of Re	sults	for 3	0 year	Return	Peri	od (+	<u>10%)</u>
			Half	Drain Ti	.me : 39	minutes.			
	Storm	Mav	Max	Mav		Mav	veN	Mav	Status
	Event	Level	Depth	Infiltra	tion Co	ntrol Σ O	utflow	Volume	blacus
		(m)	(m)	(1/s)) (1/s) (l/s)	(m³)	
1	min Group	6 401	0 (51		0 0	77 5	77 F	001 0	0 V
15	min Summer	0.481 6.546	0.716		0.0	11.5 82.1	//.5 82 1	∠31.2 287 5	U K Flood Risk
60	min Summer	6.573	0.743		0.0	83.9	83.9	312.0	Flood Risk
120	min Summer	6.564	0.734		0.0	83.3	83.3	303.4	Flood Risk
180	min Summer	6.538	0.708		0.0	81.6	81.6	280.1	Flood Risk
240	min Summer	6.509	0.679		0.0	79.6	79.6	255.0	0 K
360	min Summer	6.455	0.625		0.0	75.6	75.6	210.5	O K
480	min Summer	6.405	0.575		0.0	71.8	71.8	173.5	0 K
600	min Summer	6 360	0 530		0.0	68 3	68 3	143 5	O K
720	min Summer	6 321	0.330		0.0	65 0	65 0	119 4	O K
960	min Summer	6 257	0.427		0.0	59.2	59.0	8/ 5	O K
1440	min Summer	6 169	0.427		0.0	50.0	50 0	17 0	0 K
2160	min Summer	6 107	0.330		0.0	20.0	20.0	47.9	0 K
2160	min Summer	6.107	0.277		0.0	39.L	39.1 21 0	29.8	O K
2880	min Summer	6.071	0.241		0.0	31.8	31.8	21.0	O K
4320	min Summer	6.030	0.200		0.0	23.4	23.4	13.9	O K
5760	min Summer	6.005	0.1/5		0.0	18.8	18.8	10.3	OK
/200	min Summer	5.985	0.155		0.0	15.8	15.8	/.8	OK
8640	min Summer	5.9/1	0.141		0.0	13.8	13.8	6.3	OK
10080	min Summer	5.960	0.130		0.0	12.2	12.2	5.4	O K
15	min Winter	6.519	0.689		0.0	80.3	80.3	263.5	O K
30	min winter	0.391	0./61		0.0	82.1	82.1	329.3	Flood Risk
		Stor	m	Pain	Floodor	Discharg	o Timo	-Posk	
		Fron	uu ←	(mm/hm)	Volumo	Volumo	e 11111e /mi	reak	
		Lven	6	(1111)	(m ³)	(m ³)	(1113		
	1	.5 min	Summer	79.950	0.0	301.	3	22	
	3	30 min	Summer	53.199	0.0	401.	0	32	
	6	50 min	Summer	33.892	0.0	510.	9	50	
	12	20 min	Summer	20.940	0.0	631.	3	84	
	18	30 min	Summer	15.610	0.0	706.	0	118	
	24	10 min	Summer	12.614	0.0	760.	6	152	
	36	50 min	Summer	9.343	0.0	845.	0	216	
	48	30 min	Summer	7.540	0.0	909.	3	278	
	60)0 min	Summer	6.381	0.0	961.	9	338	
	72	20 min	Summer	5.565	0.0	1006.	7	398	
	96	50 min	Summer	4.481	0.0	1080.	9	514	
	144	10 min	Summer	3.298	0.0	1193.	3	746	
	216	50 min	Summer	2.424	0.0	1315.	4	1104	
	288	30 min	Summer	1.946	0.0	1408.	3	1468	
	432	20 min	Summer	1.427	0.0	1548.	7	2200	
	576	50 min	Summer	1.144	0.0	1655.	5	2912	
	720)0 min	Summer	0.964	0.0	1744.	0	3608	

8640 min Summer 0.839 0.0 1820.2

0.0 1887.3 0.0 337.5

0.0

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337.5 449.1

 10080 min Summer
 0.745

 15 min Winter
 79.950

 30 min Winter
 53.199

4384

5136

22

CH2M									Page 2				
Ash House									C				
Falcon Roa	d								4				
Exeter E	X2 7LB								Misson				
Date 25/05	/2018 13:	47		Desi	Designed by MA047950								
File DITCH	D 2018-0	5-24	SRCX	Chec	Checked by								
XP Solutio	 ns	<u> </u>	01:011	Sour		ontrol	2017	1 2					
MI DOIUCIO	115			5001		5110101	. 2017	• - • - 2					
	Summarv	of Re	sults	for 3	0 vea	r Ret	urn Pe	eriod (+	-10%)				
	<u>,</u>				-			*					
	Storm	Max	Max	Max		Max	Max	Max	Status				
	Event	Level	Depth 3	Infiltra	tion C	ontrol	Σ Outf	low Volume	2				
		(m)	(m)	(1/s))	(l/s)	(1/s) (m ³)					
60	min Winter	6.620	0.790		0.0	87.0	8	7.0 358.1	Flood Risk				
120	min Winter	6.602	0.772		0.0	85.8	8	5.8 339.7	Flood Risk				
180	min Winter	6.562	0.732		0.0	83.2	8	3.2 301.5	Flood Risk				
240	min Winter	6.518	0.688		0.0	80.1	8	0.1 262.4	O K				
360	min Winter	6.436	0.606		0.0	74.3	7	4.3 196.6	O K				
480	min Winter	6.365	0.535		0.0	68.7	6	8.7 146.4	O K				
600	min Winter	6.304	0.474		0.0	63.5	6	3.5 109.3	O K				
720	min Winter	6.253	0.423		0.0	58.9	5	8.9 82.4	O K				
960	min Winter	6.175	0.345		0.0	50.8	5	0.8 50.3	O K				
1440	min Winter	6.105	0.275		0.0	38.8	3	8.8 29.4	OK				
2160	min Winter	6.056	0.226		0.0	28.7	2	8.7 18.6	OK				
2880	min Winter	6.028	0.198		0.0	23.1	2	3.1 13.7	O K				
4320	min Winter	5.992	0.162		0.0	16.9	1	6.9 8.7	O K				
5760	min Winter	5.969	0.139		0.0	13.6	1	3.6 6.2	OK				
/200	min Winter	5.956	0.126		0.0	11.5	Ţ	1.5 5.0	O K				
8640	min Winter	5.948	0.118		0.0	9.9		9.9 4.4	O K				
10080	min wincer	5.945	0.115		0.0	0.9		0.9 5.9					
		Stor	n	Rain	Flood	ed Disc	harge 1	Time-Peak					
		Event	t	(mm/hr)	Volum	e Vol	ume	(mins)					
					(m³)	(n	n³)						
	e	50 min	Winter	33.892	0	.0	572.2	54					
	12	20 min	Winter	20.940	0	.0	707.1	92					
	18	30 min	Winter	15.610	0	.0	790.7	128					
	24	10 min	Winter	12.614	0	.0	851.9	162					
	36	50 min	Winter	9.343	0	.0	946.4	226					
	48	30 min	Winter	7.540	0	.0 1	018.4	288					
	60)0 min	Winter	6.381	0	.0 1	077.3	348					
	72	20 min	Winter	5.565	0	.0 1	127.5	404					
	96	50 min	Winter	4.481	0	.0 1	210.6	514					
	144	10 min	Winter	3.298	0	.0 1	336.5	742					
	216	50 min	Winter	2.424	0	.0 1	473.2	1104					
	288	30 min	Winter	1.946	0	.0 1	577.3	1468					
	432	20 min	Winter	1.427	0	.0 1	734.6	2200					
	576	50 min	Winter	1.144	0	.0 1	854.1	2872					
	720)U min	Winter	0.964	0	.0 1	953.2	3568					
	864	10 min	Winter	0.839	0	.0 2	038.7	4400					

10080 min Winter 0.745 0.0 2113.8



CH2M							Page 1	
Ash House								
Falcon Road							4	
Exeter EX2 7LB							- m	
Date 25/05/2018 13	• 4 4	Desi	aned h	MANA7	350		MICLO	
$E_{10} DIPCH D 2019 - 0$		Choc	Designed by MAU4/950					
VD Colutions	JJ-24.5KC2			+ mal 201			J	
XP SOLUCIONS		Sour	ce con	LITOI ZUI	. / . 1 . 2			
Cummo rat	of Poquit	a for 10		Doturn	Doriod	(+10%)		
<u>Summary</u>	OI RESUIL	5 101 10	JU year	Recuili	reriou	(+10%)	-	
	Hal	f Drain Ti	.me : 51	minutes.				
Storm	Max Max	Max Trfilter	N N	lax Ma	ax Ma	ax Sta	atus	
Event	(m) (m)	(1/s) (1	./s) (1/	/s) (m	ume 1 ³)		
	(,	(=) 0	, (-	., _, _, _,		. ,		
15 min Summer	6.573 0.74	3	0.0	83.9	83.9 31	2.0 Floor	d Risk	
30 min Summer	6 698 0 86	/ R	0.0	89.3 91.8	89.3 39 91.8 //	0.0 Floor	a Kisk d Risk	
120 min Summer	6.696 0.86	6	0.0	91.7	91.7 43	8.4 Floor	d Risk	
180 min Summer	6.671 0.84	1	0.0	90.2	90.2 41	1.2 Floo	d Risk	
240 min Summer	6.641 0.81	1	0.0	88.3	88.3 37	9.4 Floo	d Risk	
360 min Summer	6.585 0.75	5	0.0	84.7	84.7 32	2.9 Floo	d Risk	
480 min Summer	6.531 U.70	1	0.0	81.1	81.1 27	3.8 F1000	d Risk	
720 min Summer	6.438 0.60	<u>∽</u> 8	0.0	74.4	74.4 19	7.6	0 K	
960 min Summer	6.362 0.53	2	0.0	68.4	68.4 14	4.4	0 K	
1440 min Summer	6.251 0.42	1	0.0	58.7	58.7 8	1.5	O K	
2160 min Summer	6.152 0.32	2	0.0	48.0	48.0 4	2.6	O K	
2880 min Summer	6.108 0.27	3	0.0	39.3	39.3 3	0.0	O K	
4320 min Summer	6.056 0.22	0 7	0.0	28.7	28./ I 22.8 1	8.6	OK	
7200 min Summer	6.008 0.17	, B	0.0	19.2	19.2 1	0.7	0 K	
8640 min Summer	5.990 0.16	D	0.0	16.6	16.6	8.4	O K	
10080 min Summer	5.977 0.14	7	0.0	14.7	14.7	7.0	O K	
15 min Winter	6.617 0.78	7	0.0	86.8	86.8 35	4.5 Floo	d Risk	
30 min Winter	6./09 0.8/	9	0.0	92.5	92.5 45	2.4 1100	a Kisk	
	Storm	Rain	Flooded	Discharge	Time-Pea	ak		
	Event	(mm/hr)	Volume	Volume	(mins)			
			(m³)	(m³)				
	15 min Summe	r 103.597	0.0	390.4	-	22		
	30 min Summe	r 69.587	0.0	524.5		33		
	60 min Summe	r 44.560	0.0	671.7	ļ	54		
1	20 min Summe	r 27.503	0.0	829.2	{	38		
1	40 min Summe	r = 20.407 r = 16.403	0.0	922.9	1	56		
3	60 min Summe	r 12.073	0.0	1092.0	22	20		
4	80 min Summe	r 9.697	0.0	1169.4	28	34		
6	00 min Summe	r 8.173	0.0	1232.1	34	16		
7	20 min Summe	r 7.104	0.0	1285.2	40)6		
у 1л	40 min Summe	⊥ 5.689 r 4.152	0.0	13/2.2 1502 1	52	24 58		
21	60 min Summe	r 3.023	0.0	1640.7	11()8		
28	80 min Summe	r 2.411	0.0	1744.4	140	58		
43	20 min Summe	r 1.749	0.0	1898.4	220	00		
57	60 min Summe	r 1.391	0.0	2013.2	293	L2		
86	40 min Summe	r 1.009	0.0	2190.5	44()0		
100	80 min Summe	r 0.893	0.0	2262.5	50	72		
	15 min Winte	r 103.597	0.0	437.3	2	23		
	30 min Winte	r 69.587	0.0	587.5		34		

CH2M								Page 2
Ash House								
Falcon Road								4
Exeter EX2 7LE	3							Mirco
Date 25/05/2018	13:44		Designe	ed by	MA0479	50		Desinado
File DITCH_D_201	L8-05-24.S	SRCX	Checked	d by				Diamaye
XP Solutions			Source	Conti	rol 201	7.1.2	2	
Summa	ry of Res	ults fo	or 100 -	year H	Return	Peric	od (+	-10%) <u></u>
Storm	Max	Max	Max	Max	: Ma	x	Max	Status
Event	Level	Depth In:	filtratio	n Contr	ol Σ Out	flow V	olume	00000
	(m)	(m)	(1/s)	(1/s) (1/	s)	(m³)	
60 min Wi	nter 6.756	0.926	0.1) 95 0 04	.3	95.3	507.2	Flood Risk
120 min Wi	nter 6./49	0.919	0.0	J 94	.9	94.9	498.3	Flood Risk
180 min Wi	nter 6./11	0.881	0.1	J 92	. /	92.7	455.0	Flood Risk
240 min Wi	nter 6.667	0.837	0.	J 89 N 04	5	89.9 01 E	400.1	Flood Risk
360 min Wi	nter 6.582	0.752	0.	J 84 N 70		84.J	320.8	FICOD RISK
400 min Wi	nter 6.303	0.075	0.	ני ג גר ר	2	79.2	106 1	OK
720 min Wi	nter 6 375	0.000	0.0	J /4 1 69	. 2	69 5	153 1	OK
960 min Wi	nter 6 277	0.343	0.0	5 05 N 61	1	61 1	94 8	O K
1440 min Wi	nter 6 154	0.324	0.0) 01 1 48	. 1	48 3	43 4	O K
2160 min Wi	nter 6 091	0.261	0.0)	.5	35.8	25 9	O K
2880 min Wi	nter 6 056	0.201	0.0) 28 1 28	.0	28 6	18 5	O K
4320 min Wi	nter 6 016	0.186	0.0	20 1 20	8	20.0	11 9	O K
5760 min Wi	nter 5 989	0 159	0) 16	.5	16 5	8 4	O K
7200 min Wi	nter 5.971	0.141	0.) 13	.8	13.8	6.3	0 K
8640 min Wi	nter 5.959	0.129	0.) 12	.0	12.0	5.2	0 K
10080 min Wi	nter 5.952	0.122	0.	D 10	.6	10.6	4.6	O K
	Storm	1	Rain Flo	oded D	ischarge	Time-E	eak	
	Event	(11	m/hr) Vo	lume	Volume	(min	s)	
			(1	m³)	(m³)			
	60 min W	Vinter 4	4.560	0.0	752.4		58	
	120 min W	linter 2	27.503	0.0	928.7		94	
	180 min W	linter 2	0.407	0.0	1033.7		132	
	240 min W	linter 1	6.403	0.0	1107.8		166	
	360 min W	linter 1	2.073	0.0	1223.0		234	
	480 min W	linter	9.697	0.0	1309.7		298	
1	600 min W	unter	8.173	0.0	1380.0		360	

600	min	Winter	8.173	0.0	1380.0	360
720	min	Winter	7.104	0.0	1439.4	418
960	min	Winter	5.689	0.0	1536.9	532
1440	min	Winter	4.152	0.0	1682.4	752
2160	min	Winter	3.023	0.0	1837.6	1104
2880	min	Winter	2.411	0.0	1953.8	1452
4320	min	Winter	1.749	0.0	2126.2	2168
5760	min	Winter	1.391	0.0	2254.8	2936
7200	min	Winter	1.166	0.0	2361.5	3600
8640	min	Winter	1.009	0.0	2453.4	4392
10080	min	Winter	0.893	0.0	2534.0	5016



CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					- Cum
Date 22/05/2018 17.06	Des	igned by	V GR061110	6	- MICrO
Eilo COLLECTOR DIDE B CDCY	Cho	akad by	y GROOTIT,	0	Drainage
VD Colutions	Cile	CKEU Dy	Fmol 2017	1 0	
	500	rce com	LFOI 2017	• 1 • 2	
Cummary of Do	ulta for	20 11000	Doturn Do	rid (108)	
Summary or Res	SUILS IOL .	SU year	Recuill Pe	erioa (+10%)	
Storm	Max	Max M	Max Max	Status	
Event	Level	Depth Con	ntrol Volume		
	(m)	(m) (1	L/s) (m³)		
15 min 9	11mmer 3 323	1 543 6	551 1 29 4	O K	
30 min S	ummer 3.466	1.686 6	586.5 32.7	O K	
60 min S	ummer 3.255	1.475 6	533.6 27.8	O K	
120 min S	ummer 2.752	0.972 4	184.5 16.4	O K	
180 min S	ummer 2.517	0.737 3	389.5 11.0	O K	
240 min S	ummer 2.428	0.648 3	326.4 9.0	ОК	
360 min S	ummer 2.335	0.555 2	250.9 6.9	ОК	
480 min S	ummer 2.261	U.481 2	205.5 5.2	O K	
720 min 9	ummer 2.185	0.440 1	176.7 4.4 154.4 3.7	OK OK	
960 min S	ummer 2.127	0.347 1	24.7 2.7	O K	
1440 min S	ummer 2.069	0.289	91.8 1.8	O K	
2160 min S	ummer 2.033	0.253	67.3 1.4	ОК	
2880 min S	ummer 2.008	0.228	54.1 1.1	O K	
4320 min S	ummer 1.972	0.192	39.9 0.8	O K	
5760 min S	ummer 1.953	0.173	32.5 0.6	ОК	
7200 min S	ummer 1.939	0.159	27.1 0.5	OK	
8640 min S	unmer 1.92/	0.14/	23.5 0.5	O K	
Storm	Rain	Flooded	Discharge I	'ime-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
15 min 0	mmor 70 0F0	0.0	500 7	1 5	
ID MIN SU 30 min Su	mmer 53 199		678 3	10 23	
60 min Su	mmer 33.892	0.0	864.3	38	
120 min Su	mmer 20.940	0.0	1068.0	68	
180 min Su	mmer 15.610	0.0	1194.2	96	
240 min Su	ummer 12.614	0.0	1286.6	126	
360 min Su	mmer 9.343	0.0	1429.4	186	
480 min Su	ummer 7.540	0.0	1538.2	246	
600 min Su 720 min Su	uumer 6.381	0.0	1702 °	306 366	
960 min Su	mmer 4.481	0.0	1828.4	486	
1440 min Su	mmer 3.298	0.0	2018.5	718	
2160 min Su	mmer 2.424	0.0	2225.0	1100	
2880 min Su	mmer 1.946	0.0	2382.2	1424	
4320 min Su	mmer 1.427	0.0	2619.8	2132	
5760 min Su	mmer 1.144	0.0	2800.3	2856	
7200 min Su 8640 min Su	mmer 0.964	0.0	2950.0	3656 1384	
0040 MIII St	uuulei 0.039	0.0	5019.0	4004	
	@1000 001				
	@I307-701	/ AP SO	LULIONS		

СН2М						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Com
Date 22/05/2018 17:06	Desi	aned b	v GRO	61116		MICrO
File COLLECTOR DIDE B SPCY	Chec	ked by	y 0110	01110		Drainage
VD Solutions	Cilec	Red by	+ rol	2017	1 0	
	SOUL	Ce CON	LIOI	2017.	1.2	
Cummany of Deculta	famo	0	Dota	nn Doi	rad (110%)	
Summary of Results	LOL S	u year	Retu	rn rei	100 (+103)	
Storm	Max	Max	Max	Max	Status	
Event 1	Level 1	Depth Co	ntrol	Volume	blutub	
	(m)	(m) (1/s)	(m³)		
10000 min Summer	1 017	0 1 2 7	20.0	0 1	O K	
10080 MIN Summer	3 653 '	U.137 1 873	20.8	0.4 36.8	OK	
30 min Winter 3	3.694	1.914	739.4	37.7	O K	
60 min Winter 3	3.118	1.338	596.7	24.7	O K	
120 min Winter 2	2.541	0.761	403.9	11.6	O K	
180 min Winter 2	2.402	0.622	307.2	8.4	O K	
240 min Winter 2	2.334	0.554	250.4	6.9	O K	
360 min Winter 2	2.234	0.454	186.5	4.7	O K	
480 min Winter 2	2.178 0	0.398 0.354	128 0	3.6 2.8	OK	
720 min Winter 2	2.102	0.322	111.6	2.3	0 K 0 K	
960 min Winter 2	2.067	0.287	90.1	1.8	0 K	
1440 min Winter 2	2.032	0.252	66.6	1.4	O K	
2160 min Winter 3	1.994 (0.214	48.8	1.0	O K	
2880 min Winter 1	1.970	0.190	39.3	0.8	O K	
4320 min Winter 1	1.944	0.164	28.7	0.6	O K	
7200 min Winter	L.925 1 912	0.145 0.132	23.1 19.4	0.4	0 K 0 K	
	1.912	0.132	17.4	0.4	0 1	
Storm	Rain	Flooded	Disch	arge T	ime-Peak	
Event (r	mm/hr)	Volume	Volu	ume	(mins)	
		(m³)	(m	3)		
10080 min Summer	0.745	0.0	31	92.5	5016	
15 min Winter	79.950	0.0	5	70.9	15	
30 min Winter	53.199	0.0	7	59.7	22	
60 min Winter 3	33.892	0.0	9	68.0	38	
120 min Winter	20.940	0.0	11	96.1	66	
180 min Winter	15.610	0.0	13	37.5	96	
240 min Winter . 360 min Winter	12.614 9 343	0.0	14 16	41.U	128 186	
480 min Winter	7.540	0.0	17	22.8	248	
600 min Winter	6.381	0.0	18	22.3	308	
720 min Winter	5.565	0.0	19	07.2	368	
960 min Winter	4.481	0.0	20	47.8	490	
1440 min Winter	3.298	0.0	22	60.7	730	
2160 min Winter	2.424	0.0	24	92.0	1096	
2880 min Winter 4320 min Winter	1 427	0.0	26 29	134 1	1444 2144	
5760 min Winter	1.144	0.0	31	36.3	2936	
7200 min Winter	0.964	0.0	33	04.0	3488	
©1982	-2017	XP So	lutio	ns		
L						

CH2M		Page 3
Ash House		
Falcon Road		4
Exeter EX2 7LB		Micro
Date 22/05/2018 17:06	Designed by GR061116	
File COLLECTOR PIPE_B.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	
Summary of Results	for 30 year Return Period (+10%)	
Storm	Max Max Max Max Status	
Event	Level Depth Control Volume (m) (m) (1/s) (m ³)	
8640 min Winter	1.904 0.124 17.0 0.3 ОК	
10080 min Winter	1.897 0.117 15.0 0.3 ОК	
Storm	Rain Flooded Discharge Time-Peak	
Event ((m ³) (m ³)	
8640 min Winter	0.839 0.0 3448.5 4384	
10080 min Winter	0.745 0.0 3575.6 5064	

CH2M	Page 4
Ash House	· · · · · · · · · · · · · · · · · · ·
Falcon Road	<u> </u>
Exeter EX2 7LB	Mirro
Date 22/05/2018 17:06	Designed by GR061116
File COLLECTOR PIPE_B.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Ra.	infall Details
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
<u>Tim</u>	ne Area Diagram
Tota	ar Area (Na) 3.400
Time (mins) Area Ti From: To: (ba) Fr	ime (mins) Area Time (mins) Area
0 4 1.140	4 8 1.130 8 12 1.130
©1982-	-2017 XP Solutions

СН2М		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:06	Designed by GR061116	Desinado
File COLLECTOR PIPE_B.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Pipe Structure

Diameter (m) 0.525 Length (m) 222.466 Slope (1:X) 100.210 Invert Level (m) 1.780

Pipe Outflow Control

Diameter (m)	0.525	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	1.780
Roughness k (mm)	0.600		

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						Jun
Date 22/05/2018 17:07	Γ	Designed	by GR(061116		MILLO
File COLLECTOR PIPE B.SR	.cx c	Checked	bv			Urainage
XP Solutions		Source C	ontrol	2017.	1.2	
			0110202	2017.		
Summary of H	Results fo:	r 100 ve	ar Ret	urn Pe	eriod (+10%)	
St	orm Ma	ax Max	Max	Max	Status	
Ev	rent Lev	vel Depth	Control	Volume		
	(m	n) (m)	(1/s)	(m³)		
15 mi	n Summer 4.1	.64 2.384	837.9	48.0	ОК	
30 mi	n Summer 4.5	65 2.785	913.8	50.9	O K	
60 mi	n Summer 4.1	17 2.337	828.6	47.1	O K	
120 mi	n Summer 3.2	262 1.482	635.3	28.0	O K	
180 mi	n Summer 2.8	1.039	507.0	17.9	O K	
240 mi	n Summer 2.5	003 U.803	422.9 323 /	12.5 2 0	OK	
480 mi	n Summer 2.4	349 0.569	264 6	0.9 7 2	0 K	
600 mi	n Summer 2.3	811 0.531	226.5	6.4	O K	
720 mi	n Summer 2.2	249 0.469	197.1	5.0	O K	
960 mi	n Summer 2.1	92 0.412	158.0	3.8	O K	
1440 mi	n Summer 2.1	09 0.329	115.4	2.4	O K	
2160 mi	n Summer 2.0	0.278	83.9	1.7	O K	
2880 mi	n Summer 2.0	0.253	66.9	1.4	O K	
4320 mi 5760 mi	n Summer 1.9	994 0.214	48.8	1.0	OK	
7200 mi	n Summer 1.9	354 0.189	30.9	0.8	OK	
8640 mi	n Summer 1.9	943 0.163	28.3	0.6	0 K	
Sto	orm Ra:	in Flood	ed Disch	arge Ti	ime-Peak	
Eve	ent (mm/	hr) Volur	ne Volu	ume	(mins)	
		(m ³)) (m	3)		
15 mir	n Summer 103.	.597 0	.0 6	60.5	15	
30 mir	n Summer 69.	.587 0	.0 8	87.3	22	
60 mir	a Summer 44.	.560 0	.0 11	36.4	38	
120 mir	Summer 27.	.503 0	.0 14	02.7	68	
180 mir	Summer 20.	407 0	.0 15	61.2	98	
240 mir 260 mir	i summer 16.	.4U3 U	.0 10	13.2	126	
480 mir	1 Summer 9	.697 N	.0 19	78.1	246	
600 mir	1 Summer 8.	.173 0	.0 20	84.2	308	
720 mir	n Summer 7.	.104 0	.0 21	73.9	366	
960 mir	Summer 5.	.689 0	.0 23	21.2	488	
1440 mir	Summer 4.	.152 0	.0 25	40.9	720	
2160 mir	Summer 3.	.023 0	.0 27	75.3	1100	
2880 mir	Summer 2.	.411 0	.0 29	50.8	1424	
4320 mir 5760 mir	i summer 1.	./49 U 391 N	.0 32	.11.2	2196	
7200 mir	i Summer 1.	.JJ⊥ 0 .166 ∩	.0 35	66.6	3608	
8640 mir	Summer 1.	.009 0	.0 37	05.3	4344	
	©1982-2	2017 XP	Solutio	ons		
	51,02 2					

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						1 mm
$D_{2} = 22/05/2019 = 17.07$	Dogi	anod k		61116		MICLO
	Desi	gnea r	by GRU	01110		Drainage
FILE COLLECTOR PIPE_B.SRCX	Chec	ked by	7			or an in a ge
XP Solutions	Sour	ce Cor	itrol	2017.	1.2	
Summary of Results f	for 10)0 yea:	r Reti	ırn Pe	riod (+10%)	
Storm	Max	Max	Max	Max	Status	
Event	(m)	(m)	(1/s)	(m ³)		
	(,	(,	(_/0/	()		
10080 min Summer 1	1.932 (0.152	25.1	0.5	O K	
15 min Winter 4	4.991	3.211	987.9	51.4	ОК	
30 min Winter 5	5.027	3.247	993.9	51.4	O K	
60 min Winter 3	3.887 . 	2.10/ 1 107	/81.4 520 0	42.1	O K	
120 min Winter 2	2.00/ 2.536 /	1.10/ 0.756	J∠0.8 400 9	19.4 11 5	OK	
240 min Winter 2	2.42.6	0.646	324.9	9.0	O K	
360 min Winter 2	2.325	0.545	241.0	6.7	0 K	
480 min Winter 2	2.245	0.465	193.9	4.9	O K	
600 min Winter 2	2.202	0.422	164.1	4.0	O K	
720 min Winter 2	2.162	0.382	142.6	3.3	O K	
960 min Winter 2	2.107	0.327	114.1	2.3	O K	
1440 min Winter 2	2.057	0.277	83.6	1.7	O K	
2160 min Winter 2	2.024	0.244	60.8	1.3	OK	
4320 min Winter 1	1.994 I 1.960 I	0.214 0.180	40.0 35.1	1.0	OK	
5760 min Winter 1	1.942	0.162	28.1	0.6	0 K	
7200 min Winter 1	1.927	0.147	23.5	0.5	0 K	
Storm	Rain	Flooded	l Disch	arge T	ime-Peak	
Event (r	mm/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	3)		
10080 min Summer	0 803	0.0) 30	27 1	5008	
15 min Winter 10	03.597	0.0	,	/2 / • ± /39.7	1.3	
30 min Winter	69.587	0.0) <u> </u>	93.7	20	
60 min Winter	44.560	0.0) 12	272.7	38	
120 min Winter 2	27.503	0.0) 15	571.0	68	
180 min Winter 2	20.407	0.0) 17	48.5	96	
240 min Winter	16.403	0.0) 18	373.9	126	
360 min Winter	12.073	0.0) 20	068.8	184	
480 min Winter	9.697	0.0) 22) 22	(15.5 234 2	248	
720 min Winter	0.⊥/J 7 1∩/	0.0	, ∠3) ⊃∧	134.3	366	
960 min Winter	5.689	0.0) 25	599.7	482	
1440 min Winter	4.152	0.0) 28	345.8	732	
2160 min Winter	3.023	0.0) 31	08.4	1072	
2880 min Winter	2.411	0.0) 33	304.9	1460	
4320 min Winter	1.749	0.0) 35	596.5	2212	
5760 min Winter	1.391	0.0) 38	314.1	2888	
7200 min Winter	1.166	0.0	J 39	194.5	3608	
©1982	-2017	XP Sc	lutio	ns		

СН2М		Page 3
Ash House		5
Falcon Road		Ly.
Exeter EX2 7LB		Micro
Date 22/05/2018 17:07	Designed by GR061116	Desinado
File COLLECTOR PIPE_B.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	
Summary of Results f	or 100 year Return Period (+10%)	
Storm	Max Max Max Max Status	
Event 1	evel Depth Control Volume	
	(m) (m) $(1/s)$ (m^3)	
8640 min Winter 1	.916 0.136 20.4 0.4 ОК	
10080 min Winter 3	.908 0.128 18.1 0.4 O K	
Storm	Rain Flooded Discharge Time-Peak	
Event (1	m/hr) Volume Volume (mins) (m ³) (m ³)	
8640 min Winter	1.009 0.0 4150.0 4272	
10080 min Winter	0.893 0.0 4286.3 5104	

CH2M		Page 4
Ash House		
Falcon Road		Ly.
Exeter EX2 7LB		Micro
Date 22/05/2018 17:07	Drainage	
File COLLECTOR PIPE_B.SRCX	Checked by	biainage
XP Solutions		
Ra	infall Details	
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10	
<u>Tin</u>	ne Area Diagram	
Time (mins) Area T: From: To: (ba) Fr	ime (mins) Area Time (mins) Area	
0 4 1.140	4 8 1.130 8 12 1.130	
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СН2М		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:07	Designed by GR061116	Desinado
File COLLECTOR PIPE_B.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Pipe Structure

Diameter (m) 0.525 Length (m) 222.466 Slope (1:X) 100.210 Invert Level (m) 1.780

Pipe Outflow Control

Diameter (m)	0.525	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	1.780
Roughness k (mm)	0.600		

CH2M							Page 1		
Ash House									
Falcon Road							4		
Exeter EX2 7LB							- Cum		
Date $22/05/2018$ 17.08		Des	ianed	hy GR	061116		MICLO		
	CDCV	Cha	Designed by GRUOILIO						
PITE COLLECTOR PIPE_C.	SKCA		ckeu i	<u>y</u>	0017	1 0			
XP Solutions		Sou	rce Co	ontrol	2017.	1.2			
		c	2.0	5	5				
<u>Summary o</u>									
	Storm	Мак	Maw	May	Maw	Status			
	Event	Level	Depth (Control	Volume	Status			
		(m)	(m)	(1/s)	(m ³)				
15	min Summer	3.608	1.048	509.8	18.1	O K			
30	min Summer	3.700	1.140	539.U 191 8	20.1 17 0	OK			
120	min Summer	3.283	1.002	494.0 380 4	10 7	0 K			
180	min Summer	3.177	0.617	303.5	8.3	O K			
240	min Summer	3.119	0.559	254.8	7.0	O K			
360	min Summer	3.026	0.466	195.0	4.9	O K			
480	min Summer	2.976	0.416	160.1	3.9	O K			
600	min Summer	2.932	0.372	137.5	3.1	O K			
720	min Summer	2.899	0.339	120.3	2.5	O K			
960	min Summer	2.857	0.297	97.2	1.9	OK			
1440	min Summer	2.819	0.259	/1.4 52 6	1.4	OK			
2100	min Summer	2.758	0.198	42.2	0.8	O K O K			
4320	min Summer	2.730	0.170	31.3	0.6	0 K			
5760	min Summer	2.712	0.152	25.1	0.5	O K			
7200	min Summer	2.699	0.139	21.3	0.4	O K			
8640	min Summer	2.688	0.128	18.3	0.4	O K			
					_				
	Storm	Rain	Floode	ed Disch	narge T:	ime-Peak			
	Lvent	(mm/nr)	(m ³)	e voi (m	3)	(mins)			
			((. ,				
15 r	min Summer	79.950	0.	.0 3	397.3	15			
30 r	min Summer	53.199	θ Ο.	.0 5	528.7	22			
60 r	min Summer	33.892	20.	.0 6	573.7	38			
120 r	min Summer	20.940) 0.	.0.8	332.4	66			
180 1	nin Summer	12 614	, U. I A	0 10	730.8 102 8	90 126			
360 r	nin Summer	9.343	. 0. 3 0.	.0 11	114.1	186			
480 r	min Summer	7.540	0.	.0 11	198.9	246			
600 r	min Summer	6.381	. 0.	.0 12	268.2	306			
720 r	min Summer	5.565	5 O.	.0 13	327.2	366			
960 r	min Summer	4.481	. 0.	.0 14	425.1	484			
1440 r	nin Summer	3.298	³ 0.	.0 15	573.2	734			
2160 r	nin Summer	2.424	۱ O.	.0 17	/34.2	1072			
2880 r	nin Summer	1 405	o 0.	.u 18	336./	1432			
4320 I 5760 r	nin Summer	1,144	. 0.	.0 21	182.6	2104 2888			
72.00 r	min Summer	0.964	. 0.	.0 2.2	299.3	3608			
8640 r	min Summer	0.839) O.	.0 23	399.8	4352			
	©198	2-201	7 XP S	olutio	ons				
L	0100	VI							

СН2М						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Com
Date 22/05/2018 17:08	Desi	aned b	v GRO	61116		MICrO
File COLLECTOR DIDE C SPCY	Chec	ked by	1 0110	01110		Drainage
VD Solutions	Cour	vae Cor	+ rol	2017	1 0	
	SOUL	Ce CON	LIOI	2017.	1.2	
Cummany of Deculte	F a 22 2	0	Dota	nn Doi	$d \left(+10\% \right)$	
Summary of Results 1						
Storm	Max	Max	Max	Max	Status	
Event I	Level 1	Depth Co	ntrol	Volume	btutub	
	(m)	(m) (1/s)	(m³)		
10000 min Gumman (0 1 2 2	1 (1	0.2	O IZ	
10080 min Summer 2	2.682 (2.814 ·	U.IZZ 1 254	10.4 572 9	22 7	OK	
30 min Winter 3	3.845 I	1.285	581.7	23.4	O K	
60 min Winter 3	3.477	0.917	465.5	15.1	O K	
120 min Winter 3	8.192	0.632	314.9	8.6	O K	
180 min Winter 3	3.103	0.543	239.5	6.6	O K	
240 min Winter 3	3.026	0.466	195.0	4.9	ОК	
360 min Winter 2	2.947	0.387	145.2	3.3	OK	
480 min Winter 2 600 min Winter 2	2.894 0 2.861 0	0.334 0.301	11/./ 99.9	2.4	OK	
720 min Winter 2	2.842	0.282	87.0	1.7	O K	
960 min Winter 2	2.818	0.258	70.3	1.4	ΟK	
1440 min Winter 2	2.782	0.222	51.8	1.0	O K	
2160 min Winter 2	2.747	0.187	38.1	0.7	O K	
2880 min Winter 2	2.729	0.169	30.7	0.6	O K	
4320 min Winter 2	2.703	0.143	22.4	0.4	OK	
7200 min Winter 2	2.688	0.128 0.118	15.1	0.4	OK	
		0.110	10.0	0.0	0 10	
Storm	Rain	Flooded	Disch	arge T	ime-Peak	
Event (n	nm/hr)	Volume	Volu	ume	(mins)	
		(m³)	(m	3)		
10080 min Summer	0.745	0.0	24	88.3	5112	
15 min Winter	79.950	0.0	4	44.9	15	
30 min Winter 5	53.199	0.0	5	92.1	22	
60 min Winter 3	33.892	0.0	7	54.4	38	
120 min Winter 2	20.940	0.0	9	32.2	66	
240 min Winter 1	12.614	0.0	11	23 1	90 126	
360 min Winter	9.343	0.0	12	47.8	188	
480 min Winter	7.540	0.0	13	42.7	246	
600 min Winter	6.381	0.0	14	20.3	306	
720 min Winter	5.565	0.0	14	86.5	370	
960 min Winter	4.481	0.0	15	96.1	490	
1440 min Winter	3.298	0.0	17	62.0	1076	
2100 MILL WINTER 2880 min Winter	2.424	0.0	19 20	79.5	1464	
4320 min Winter	1.427	0.0	22	86.9	2212	
5760 min Winter	1.144	0.0	24	44.5	2880	
7200 min Winter	0.964	0.0	25	75.1	3672	
©1982-	-2017	XP So	lutio	ns		

CH2M						Page 3
Ash House						
Falcon Road						4
Exeter EX2 7LB						Micro
Date 22/05/2018 17:08	Desig	ned by	GR0	61116		
File COLLECTOR PIPE_C.SRCX	Check	ed by				Diamage
XP Solutions	Sourc	e Cont	rol	2017.	1.2	
Summary of Results :	Eor 30	year	Retu	rn Pei	ciod (+10%)	
Storm	Max N	Max N	lax	Max	Status	
Event I	evel De (m)	epth Cor (m) (]	ntrol ./s)	Volume (m³)		
8640 min Winter 2	.670 0.	.110	13.2	0.3	0 K	
10080 min Winter 2	.663 0.	.103	11.7	0.2	O K	
Storm	Rain 1	Flooded	Disch	arge T:	ime-Peak	
Event (n	m/hr)	Volume (m³)	Volu (m ³	ume ³)	(mins)	
8640 min Winter	0.839	0.0	26	87.8	4280	
10080 min Winter	0.745	0.0	27	86.9	5160	

CH2M	Page 4							
Ash House								
Falcon Road	~~.							
Exeter EX2 7LB	Micro							
Date 22/05/2018 17:08	Designed by GR061116							
File COLLECTOR PIPE_C.SRCX	Checked by							
XP Solutions Source Control 2017.1.2								
<u>Ra</u>	ainfall Details							
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 Land and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10							
<u>Tir</u>	me Area Diagram							
Time (mins) Area T From: To: (ba) Fr	lime (mins) Area Time (mins) Area							
0 4 0.890	4 8 0.880 8 12 0.880							
©1982-	-2017 XP Solutions							

СН2М		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:08	Designed by GR061116	Desinado
File COLLECTOR PIPE_C.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Pipe Structure

Diameter (m) 0.525 Length (m) 144.000 Slope (1:X) 100.000 Invert Level (m) 2.560

Pipe Outflow Control

Diameter (m)	0.525	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	2.560
Roughness k (mm)	0.600		

CH2M							Page 1
Ash House							
Falcon Road							4
Eveter EX2 7I.B							The second
$D_{2} = 22/05/2018 + 17.08$		Dog	igned k		761116		— Micro
Date 22/05/2018 1/:08	~~ ~~ ~	Des	Ignea i	by GRU	101110	1	Drainac
File COLLECTOR PIPE_C.	SRCX	Che	cked by	7			brainiag
XP Solutions		Sou	rce Cor	ntrol	2017.	1.2	
Summary of	E Results	for 1	.00 yea:	r Ret	urn Pe	eriod (+10)응)
	Storm	Max	Max	Max	Max	Status	
	Event	Level	Depth Co	ntrol	Volume (m ³)		
		(111)	(111) (1/5)	(
15	min Summer	4.134	1.574	658.8	29.7	ОК	
30	min Summer	4.337	1.777	708.0	32.4	O K	
60	min Summer	4.097	1.537	649.4	29.1	O K	
120	min Summer	3.566	1.006	496.0	17.1	O K	
180	min Summer	3.309	0.749	391.0	11.3	U K	
240	min Summer	3.116	0.556	252 4	9.1 6 9	0 K	
480	min Summer	3.042	0.482	206.2	5.3	O K	
600	min Summer	2.999	0.439	176.0	4.4	0 K	
720	min Summer	2.964	0.404	153.7	3.6	O K	
960	min Summer	2.904	0.344	123.1	2.6	O K	
1440	min Summer	2.847	0.287	90.1	1.8	O K	
2160	min Summer	2.811	0.251	65.6	1.4	ОК	
2880	min Summer	2.783	0.223	52.4	1.0	OK	
4320	min Summer	2.747	0.168	30.1	0.7	OK	
7200	min Summer	2.713	0.153	25.4	0.5	0 K	
8640	min Summer	2.702	0.142	22.1	0.4	0 K	
	Storm	Rain	Flooded	Disch	arge T	ime-Peak	
:	Event	(mm/hr)	Volume	Vol	ume	(mins)	
			(m³)	(m	3)		
15	min Summer	103 597	0.0	5	14 8	15	
.30	min Summer	69.587	0.0	6	591.5	22	
60	min Summer	44.560	0.0	8	85.7	38	
120	min Summer	27.503	0.0	10	93.3	68	
180	min Summer	20.407	0.0	12	216.8	96	
240	min Summer	16.403	0.0	13	304.1	126	
360	min Summer	12.073	0.0	14	39.7	186	
480 :	min Summer	9.697	0.0	15	941.8	246	
500 ± 720 ±	min Summer	ö.⊥/3 7 1∩4	0.0	1 G	024.0 394.4	300 366	
960	min Summer	5.689	0.0	18	309.1	484	
1440	min Summer	4.152	0.0	19	80.4	722	
2160	min Summer	3.023	0.0	21	63.1	1072	
2880	min Summer	2.411	0.0	22	.99.9	1444	
4320	min Summer	1.749	0.0	25	502.8	2156	
5760	min Summer	1.391	0.0	26	54.3	2856	
7200	min Summer	1.166	0.0	27	/9.8	3600	
8640	min Summer	1.009	0.0	28	000.U	4312	
	©198	82-201	/ XP Sc	⊥utic	ons		

CH2M						Page 2	
Ash House							
Falcon Road						4	
Exeter EX2 7LB						- Cum	
$D_{2} = 22/05/2019 = 17.09$	Dogi	anod h		61116		MICLO	
FILE COLLECTOR PIPE_C.SRCX	Chec	ked by	7			or an in a ge	
XP Solutions	Sour	ce Cor	itrol	2017.	1.2		
Summary of Results f	or 10)0 yea:	r Reti	ırn Pe	riod (+10%)		
Storm	Max	Max	Max	Max	Status		
Event	level 1 (m)	(m)	(1/e)	(m ³)			
	(111)	(111)	(1/3)	()			
10080 min Summer 2	2.693	0.133	19.6	0.4	0 K		
15 min Winter 4	1.527	1.967	751.1	33.1	O K		
30 min Winter 4	1.657	2.097	779.2	33.3	OK		
60 min Winter 3	3.951	1.391	611.2	25.8	O K		
120 min Winter a	2.33/ 1 2.120 /	0.111	412.8 312 7	11.9 0 c	OK		
240 min Winter 3	3.117	0.557	253 3	0.0 6 9	0 K		
360 min Winter 3	3.016	0.456	188.0	4.7	O K		
480 min Winter 2	2.959	0.399	151.4	3.6	0 K		
600 min Winter 2	2.913	0.353	127.7	2.8	O K		
720 min Winter 2	2.881	0.321	111.1	2.2	O K		
960 min Winter 2	2.846	0.286	89.4	1.8	O K		
1440 min Winter 2	2.810	0.250	65.2	1.3	0 K		
2160 min Winter 2	2.771	0.211	47.4	0.9	OK		
2880 min Winter 2	2.747	0.18/	37.9	0.7	OK		
4320 min Winter 2 5760 min Winter 2	2.721	0.101	27.5	0.5	OK		
7200 min Winter 2	2.688	0.128	18.3	0.4	0 K		
					• •		
Storm	Rain	Flooded	l Disch	arge T	ime-Peak		
Event (r	mm/hr)	Volume	Vol	ume	(mins)		
		(m³)	(m	³)			
10000	0 000	0.0		000 0	1060		
10080 min Summer	U.893	0.0	, 29	76 5	496U 14		
30 min Winter	69.587	0.0) 7	74.5	21		
60 min Winter	44.560	0.0) 9	91.9	38		
120 min Winter 2	27.503	0.0) 12	24.4	66		
180 min Winter 2	20.407	0.0) 13	62.8	96		
240 min Winter	16.403	0.0) 14	60.6	128		
360 min Winter	12.073	0.0) 16	512.4	186		
480 min Winter	9.697	0.0) 17	26.8	246		
600 min Winter 720 min Minter	8.1/3 7 10/	0.0) 18) 10	19.4 197 7	3U6 364		
960 min Winter	5.689	0.0) 20	126.2	484		
1440 min Winter	4.152	0.0) 22	18.0	726		
2160 min Winter	3.023	0.0) 24	22.7	1092		
2880 min Winter	2.411	0.0) 25	75.8	1428		
4320 min Winter	1.749	0.0) 28	03.2	2140		
5760 min Winter	1.391	0.0) 29	72.8	2912		
7200 min Winter	1.166	0.0) 31	13.4	3624		
©1982	-2017	XP So	lutio	ns			

CH2M						Page 3
Ash House						
Falcon Road						L.
Exeter EX2 7LB						Micro
Date 22/05/2018 17	:08	Desi	gned b	y GR06111	6	Dcainago
File COLLECTOR PIP	E_C.SRCX	Chec	cked by			Diamaye
XP Solutions		Sour	ce Cont	trol 2017	.1.2	
Summa	ry of Results	for 10	00 year	Return P	eriod (+10%)	
	Storm Event	Max Level 1 (m)	Max 1 Depth Co (m) (Max Max ntrol Volum l/s) (m ³)	Status e	
	8640 min Winter 10080 min Winter	2.680 2.673	0.120 0.113	15.9 0. 14.0 0.	3 ОК 3 ОК	
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
1	8640 min Winter	1.009	0.0	3234.6	4232	

СН2М	Page 4							
Ash House	· · · · · · · · · · · · · · · · · · ·							
Falcon Road	L.							
Exeter EX2 7LB	Micro							
Date 22/05/2018 17:08	Designed by GR061116							
File COLLECTOR PIPE_C.SRCX	Checked by							
XP Solutions	Source Control 2017.1.2							
Ra	Rainfall Details							
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10							
Time Area Diagram								
	ing (ming) such states (ming)							
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)							
0 4 0.890	4 8 0.880 8 12 0.880							
©1982-	-2017 XP Solutions							

СН2М		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:08	Designed by GR061116	Desinado
File COLLECTOR PIPE_C.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Pipe Structure

Diameter (m) 0.525 Length (m) 144.000 Slope (1:X) 100.000 Invert Level (m) 2.560

Pipe Outflow Control

Diameter (m)	0.525	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	2.560
Roughness k (mm)	0.600		

CH2M					Page 1				
Ash House									
Falcon Road					4				
Exeter EX2 7LB					- m				
$D_{2} = 22/05/2018 + 17.09$	Docian	d by CP(061116		Micro				
Date 22/05/2010 17:09	Designe	ed by GRU	001110		Drainage				
File BASIN_1.SRCX	Checke	d by			Brannaeje				
XP Solutions	Source	Control	2017.	1.2					
Summary of Results for 30 year Return Period (+10%)									
Storm	Max Max	Max	Max	Status					
Event	Level Dept	h Control	Volume						
	(111)	(1/5)	(1110)						
15 min Summer	4.968 0.46	8 27.6	981.2	O K					
30 min Summer	5.106 0.60	6 32.1	1294.0	O K					
60 min Summer	5.245 0.74	5 36.0	1619.2	O K					
120 min Summer	5.374 0.87	4 39.3	1931.6	ОК					
180 min Summer	5.436 0.93	6 40.8	2086.9	O K					
240 min Summer 360 min Summer	5.4/1 U.9/ 5 505 1 00	1 41.6 5 42.4	21/3.5	OK					
480 min Summer	5.518 1 01	5 42.4 8 42.7	2293 5	O K					
600 min Summer	5.526 1.02	6 42.9	2313.6	O K					
720 min Summer	5.530 1.03	0 42.9	2323.0	O K					
960 min Summer	5.529 1.02	9 42.9	2320.3	O K					
1440 min Summer	5.506 1.00	6 42.4	2262.8	O K					
2160 min Summer	5.453 0.95	3 41.2	2128.7	O K					
2880 min Summer	5.396 0.89	6 39.8	1985.2	O K					
4320 min Summer	5.288 0.78	8 37.1	1722.9	OK					
7200 min Summer	5.198 U.69 5 124 O 62	8 34.7 A 32.6	1335 0	OK					
8640 min Summer	5.063 0.56	3 30.7	1193.9	O K					
	0.000 0.00	000	1100.0	0 11					
Storm	Rain Flo	oded Disch	narge Ti	me-Peak					
Event	mm/hr) Vo	Lume Volu	ume	(mins)					
	(1	n ³) (m	³)						
15 min Summor	79 950	0 0 0	05 5	26					
30 min Summer	53.199	0.0 12	218.7	40					
60 min Summer	33.892	0.0 16	551.9	70					
120 min Summer	20.940	0.0 20)48.1	128					
180 min Summer	15.610	0.0 22	293.2	186					
240 min Summer	12.614	0.0 24	172.2	244					
360 min Summer	9.343	0.0 27	747.7	360					
480 min Summer	7.540	0.0 29	956.2	414					
600 min Summer	6.381 5 565	0.0 31	125.5	4/6					
960 min Summer	4.481	0.0 35	502.0	672					
1440 min Summer	3.298	0.0 38	336.3	946					
2160 min Summer	2.424	0.0 43	350.0	1360					
2880 min Summer	1.946	0.0 46	553.4	1760					
4320 min Summer	1.427	0.0 50	97.3	2548					
5760 min Summer	1.144	0.0 55	501.6	3288					
7200 min Summer	0.964	0.0 57	792.0	4040					
8640 min Summer	0.839	U.U 60	130.5	4/60					
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CH2M							Page 2		
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Ash House									
Falcon Road							4		
Exeter EX2 7LB							- Cu		
$D_{ate} 22/05/2018 17.09$		Desi	aned	hy GR	161116		MICLO		
		Choc	unca h	by One	501110		Drainaco		
FILE BASIN_I.SRCX			cked L	у . , , , , ,	0017	1 0			
XP Solutions		Sour	ce Co	ntrol	2017.	1.2			
G	f Desults	£)	0	- Det-	De.				
Summary of	L Results	IOF 3	u yea	r Retu	irn Pei	riod (+10%)			
	Storm	Max	Max	Max	Max	Status			
	Event	Level	Depth	Control	Volume				
		(m)	(m)	(1/s)	(m³)				
10080	min Summer	5 011	0 511	291	1076 0	0 K			
15	min Winter	5.021	0.521	29.4	1100.1	O K			
30	min Winter	5.174	0.674	34.0	1452.2	0 K			
60	min Winter	5.328	0.828	38.1	1819.2	O K			
120	min Winter	5.472	0.972	41.6	2175.5	O K			
180	min Winter	5.543	1.043	43.2	2356.8	O K			
240	min Winter	5.583	1.083	44.1	2460.8	O K			
360	min Winter	5.626	1.126	45.1	2572.8	O K			
480	min Winter	5.641	1.141	45.4	2611.5	O K			
600	min Winter	5.643	1.143	45.4	2616.9	O K			
720	min Winter	5.646	1.146	45.5	2622.7	O K			
960	min Winter	5.638	1.138	45.3	2602.8	O K			
1440	min Winter	5.596	1.096 1.012	44.4	2494.3	OK			
2100	min Winter	5 126	1.01Z 0.926	42.5	2060 5	O K			
4320	min Winter	5.273	0.773	36.7	1686.3	O K			
5760	min Winter	5.151	0.651	33.4	1397.4	0 K			
7200	min Winter	5.056	0.556	30.5	1178.4	ОК			
,		Dela				in a Daah			
	lvent	Rain (mm/br)	Volum		narge T	(ming)			
E.	wenc	((m ³)	(m	1 ³)	(1113)			
				•	•				
10080 :	min Summer	0.745	0	.0 62	238.5	5456			
15	min Winter	79.950	0	.0 10	019.8	26			
30 1	mın Winter	53.199	0	.0 13	369.1	40			
60 100	min Winter	33.892	0	.0 18	004.⊥ 207 7	68 12C			
100	min Winter	20.940	0	.0 22	∠サ/•/ 570 1	182			
240 -	min Winter	12 614	0	.0 2:	J1∠•⊥ 772 Δ	10Z 238			
240 3	min Winter	9.343	0	.0 २। .0 २।	080.5	350			
480	min Winter	7.540	0	.0 31	313.6	456			
600	min Winter	6.381	0	.0 35	502.9	498			
720	min Winter	5.565	0	.0 30	662.6	568			
960	min Winter	4.481	0	.0 39	922.0	722			
1440 :	min Winter	3.298	0	.0 42	287.8	1026			
2160 :	min Winter	2.424	0	.0 48	874.5	1460			
2880 :	min Winter	1.946	0	.0 52	214.8	1880			
4320	min Winter	1.427	0	.0 5	713.7	2684			
5760	mın Winter	1.144	0	.0 61	163.9	3456			
/200 1	min winter	U.964	0	.0 64	489.8	4184			
	01.007		VD ~	. 1 . 1					
	G100/		VD 0						

CH2M		Page 3
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:09	Designed by GR061116	
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storm Event			Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m³)	Status
8640	min W	inter	4.981	0.481	28.0	1009.4	ОК
10080	min W	inter	4.921	0.421	25.9	877.5	ОК

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)	
8640 min Winter	0.839	0.0	6765.3	4928	
10080 min Winter	0.745		6996.1	5648	

СН2М		Page 4
Ash House		
Falcon Road		4
Exeter EX2 7LB		Micco
Date 22/05/2018 17:09	Designed by GR061116	Desinado
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	
Ra	infall Details	
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10	
Tin	ne Area Diagram	
Tot	al Area (ha) 6.700	
Time (mins) Area Ti From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 4 2.233	4 8 2.233 8 12 2.233	
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CH2M		Page 5
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:09	Designed by GR061116	Desinado
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M		Page 1
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:10	Designed by GR061116	Desinado
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	
Summary of Results f	or 100 year Return Period (+10%)	
Storm Ma	x Max Max Max Status	
Event Lev (m	el Depth Control Volume) (m) (l/s) (m³)	

15	min	Summer	5.098	0.598	31.	8	1273.9		0	K
30	min	Summer	5.278	0.778	36.	9	1698.1		0	K
60	min	Summer	5.458	0.958	41.	3	2140.4		0	K
120	min	Summer	5.622	1.122	45.	0	2560.9		0	K
180	min	Summer	5.699	1.199	46.	6	2764.5		0	K
240	min	Summer	5.740	1.240	47.	4	2874.7	Flood	Ri	sk
360	min	Summer	5.784	1.284	48.	3	2991.7	Flood	Ri	sk
480	min	Summer	5.796	1.296	48.	5	3026.2	Flood	Ri	sk
600	min	Summer	5.802	1.302	48.	7	3041.5	Flood	Ri	sk
720	min	Summer	5.804	1.304	48.	7	3045.7	Flood	Ri	sk
960	min	Summer	5.798	1.298	48.	6	3031.7	Flood	Ri	sk
1440	min	Summer	5.768	1.268	48.	0	2948.8	Flood	Ri	sk
2160	min	Summer	5.701	1.201	46.	6	2770.2	Flood	Ri	sk
2880	min	Summer	5.630	1.130	45.	1	2581.1		0	Κ
4320	min	Summer	5.497	0.997	42.	2	2238.5		0	Κ
5760	min	Summer	5.384	0.884	39.	5	1955.7		0	Κ
7200	min	Summer	5.290	0.790	37.	2	1727.1		0	Κ
8640	min	Summer	5.212	0.712	35.	1	1540.8		0	Κ

	Storm		Rain	Flooded	Discharge	Time-Peak			
	Ever	nt	(mm/hr)	Volume	Volume	(mins)			
				(m³)	(m³)				
15	min	Summer	103.597	0.0	1186.4	26			
30	min	Summer	69.587	0.0	1602.3	41			
60	min	Summer	44.560	0.0	2182.1	70			
120	min	Summer	27.503	0.0	2699.7	128			
180	min	Summer	20.407	0.0	3006.7	186			
240	min	Summer	16.403	0.0	3222.9	244			
360	min	Summer	12.073	0.0	3557.1	362			
480	min	Summer	9.697	0.0	3806.7	448			
600	min	Summer	8.173	0.0	4006.8	504			
720	min	Summer	7.104	0.0	4173.8	564			
960	min	Summer	5.689	0.0	4441.1	692			
1440	min	Summer	4.152	0.0	4795.7	968			
2160	min	Summer	3.023	0.0	5430.8	1372			
2880	min	Summer	2.411	0.0	5769.4	1788			
4320	min	Summer	1.749	0.0	6254.5	2560			
5760	min	Summer	1.391	0.0	6693.9	3344			
7200	min	Summer	1.166	0.0	7006.6	4048			
8640	min	Summer	1.009	0.0	7270.0	4832			
		@1.0	00 0017	VD C-	1				
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CH2M					Page 2
Ash House					
Falcon Road					4
Exeter EX2 7LB					1 mm
Date 22/05/2018 17.10	Desic	med by G	R06111	6	MICLO
Filo BASTN 1 SPCY	Chock	ad by		- 0	Drainage
VD Colutions	Cilect	ver by	1 2015	1 1 0	
	SOULC			• 1 • 2	
Summary of Decult	a for 10		aturn 1	D_{ortiod} (110%)	
Summary of Results	5 101 100	J year Ke	ecurni	Period (+10%)	
Storm	Max Ma:	x Max	Max	Status	
Event	Level Dep	th Control	Volume		
	(m) (m)) (l/s)	(m³)		
10080 min Summer	5 147 0 6	४७ २२ २	1387 2	ОК	
15 min Winter	5.164 0.6	64 33.8	1428.3	O K	
30 min Winter	5.363 0.8	63 39.0	1905.3	ОК	
60 min Winter	5.561 1.0	61 43.6	2403.9	O K	
120 min Winter	5.744 1.2	44 47.5	2883.4	Flood Risk	
180 min Winter	5.831 1.3	31 49.2	3120.1	Flood Risk	
240 min Winter	5.879 1.3	79 50.2	3252.5	Flood Risk	
360 min Winter	5.932 1.4	32 51.2	3401.9	Flood Risk	
480 min Winter	5.952 1.4	52 51.5	3457.6	Flood Risk	
600 min Winter	5.954 1.4	54 51.6 50 51 5	3463.6	Flood Risk	
960 min Winter	5 939 1 4	30 51.3 39 51.3	3430.7	Flood Risk	
1440 min Winter	5.890 1.3	90 50.4	3283.4	Flood Risk	
2160 min Winter	5.789 1.2	89 48.4	3007.1	Flood Risk	
2880 min Winter	5.685 1.1	85 46.3	2727.1	0 K	
4320 min Winter	5.497 0.9	97 42.2	2238.8	O K	
5760 min Winter	5.343 0.8	43 38.5	1856.0	O K	
7200 min Winter	5.221 0.7	21 35.3	1563.2	0 K	
Storm	Rain .	Flooded Di	scharge	Time-Peak	
Event	(1111)	(m ³)	(m ³)	(mills)	
10080 min Summer	r 0.893	0.0	7487.2	5544	
15 min Winter	r 103.597	0.0	1333.1	26	
30 min Winter	c 69.587	0.0	1/93.1	40	
60 min Winter 120 min Winter	- 44.00U	0.0	244/.0	00 126	
120 min Winter	r = 27.303	0.0	3370 2	182	
240 min Winter	r 16.403	0.0	3611.9	240	
360 min Winter	r 12.073	0.0	3985.3	352	
480 min Winter	9.697	0.0	4263.5	462	
600 min Winter	r 8.173	0.0	4486.0	564	
720 min Winter	r 7.104	0.0	4671.2	590	
960 min Winter	r 5.689	0.0	4964.1	738	
1440 min Winter	r 4.152	0.0	5334.8	1044	
2160 min Winter	r 3.023	0.0	6085.0	1492	
2880 min Winter 4320 min Winter	2.411	0.0	0404.3 7007 5	1908 2729	
5760 min Winter	r 1.391	0.0	7499 2	3512	
7200 min Winter	r 1.166	0.0	7850.2	4256	
<u>@19</u>	82-2017	XP Solut	ions		
		00140			

CH2M		Page 3
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 22/05/2018 17:10	Designed by GR061116	
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storm Event		Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m ³)	Status	
8640	min	Winter	5.124	0.624	32.6	1334.9	ОК
10080	min	Winter	5.046	0.546	30.2	1155.3	ОК

	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640	min	Winter	1.009	0.0	8147.0	5008
10080	min	Winter	0.893	0.0	8394.8	5664

CH2M	Page 4
Ash House	
Falcon Road	~~
Exeter EX2 7LB	Micro
Date 22/05/2018 17:10	Designed by GR061116
File BASIN_1.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Ra	infall Details
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
Tin	ne Area Diagram
Tot	al Area (ha) 6.700
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)
0 4 2.233	4 8 2.233 8 12 2.233
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СН2М		Page 5
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:10	Designed by GR061116	Desinado
File BASIN_1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					- un
Date 22/05/2018 17:11	De	esigned b	v GR061116		MICIO
File BASIN 2.SBCX	CI	hecked by			Drainage
XP Solutions		ource Con	trol 2017	1 2	
		ource com	2017.	±•2	
Summary of	Results for	r 30 vear	Return Pe	riod (+10%)	
		r oo year	needin re	1100 (1100)	
St	torm Max	x Max	Max Max	Status	
E	vent Leve	el Depth Co	ntrol Volume		
	(m)) (m) (1/s) (m³)		
15 m:	in Summer 4.99	94 0.494	19.5 681.7	ОК	
30 m:	in Summer 5.13	36 0.636	22.4 899.1	ОК	
60 m:	in Summer 5.27	78 0.778	25.1 1124.7	O K	
120 m:	in Summer 5.40	08 0.908	27.2 1340.8	ОК	
180 m:	in Summer 5.47	/1 0.971	28.2 1447.9	O K	
240 m: 360 m·	in Summer 5.50	US 1.005 38 1 038	20.1 1501.3	OK	
480 m	in Summer 5.55	51 1.051	29.4 1587.5	0 K	
600 m.	in Summer 5.55	58 1.058	29.5 1599.7	0 K	
720 m:	in Summer 5.56	60 1.060	29.6 1604.7	0 K	
960 m.	in Summer 5.55	58 1.058	29.5 1600.1	O K	
1440 m:	in Summer 5.53	33 1.033	29.2 1556.2	O K	
2160 m:	in Summer 5.47	77 0.977	28.3 1459.6	O K	
2880 m:	in Summer 5.41	18 0.918	27.4 1358.0	ОК	
4320 m:	in Summer 5.30	08 0.808	25.6 11/4.9	OK	
7200 m	in Summer 5-14	40 0 640	22 5 904 4	OK	
8640 m	in Summer 5.07	76 0.576	21.2 805.9	ОК	
Ste	orm Rain	n Flooded	Discharge T	ime-Peak	
Eve	ent (mm/h	hr) Volume	Volume	(mins)	
		(m³)	(m³)		
15 min	n Summer 79.9	950 0.0	648.0	26	
30 min	n Summer 53.1	199 0.0	868.1	40	
60 mi	n Summer 33.8	892 0.0	1159.8	70	
120 min	n Summer 20.9	940 0.0	1436.3	128	
180 min	n Summer 15.6	610 0.0	1607.4	186	
240 mii 360 mii	n summer 12.6	014 U.U 3/3 0.0	1025 1	244 360	
480 mi	n Summer 75	540 0.0	2071.1	416	
600 mi	n Summer 6.3	381 0.0	2189.7	478	
720 min	n Summer 5.5	565 0.0	2290.2	540	
960 mi	n Summer 4.4	481 0.0	2454.5	674	
1440 min	n Summer 3.2	298 0.0	2691.5	948	
2160 min	n Summer 2.4	424 0.0	3033.3	1364	
2880 min	n Summer 1.9	946 0.0	3245.6	1764	
4320 mii	n Summer 1.4	42/ U.U 144 0.0	3559.U 3830 3	2002 3288	
7200 mi	n Summer 09	0.0 964 0.0	4033.3	4040	
8640 mii	n Summer 0.8	839 0.0	4205.5	4760	
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	01902 20				

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Cum
Date 22/05/2018 17.11	Desig	med hy	7 GRO	61116		MICTO
Eilo DACIN 2 CDCV	Chock	ad by	y OI(O	01110		Drainage
VD Calutiana	Check	eu by		2017	1 0	
XP Solutions	Sourc	ce Cont	trol	2017.	1.2	
Summary of Results :	for 30	year	Retu	rn Pe	riod (+10%)	
Storm	Max N	Max 1	Max	Max	Status	
Event 1	(m)	epth Col	ntroi 1/e)	volume (m ³)		
	(,	()	1,3,	(
10080 min Summer 5	5.022 0.	.522	20.1	723.4	O K	
15 min Winter 5	5.049 0.	.549	20.7	764.5	O K	
30 min Winter 5	5.206 0.	.706	23.8	1009.2	ОК	
60 min Winter 5	5.362 O.	.862	26.5	1264.0	O K	
120 min Winter 5	5.5U/ L. 5.570 1	.0078	∠४.४ २० ०	1636 3	OK	
240 min Winter 5	5.618 1	.070	29.0 30.4	1708 0	OK	
360 min Winter 5	5.661 1	.161	31.0	1785.0	O K	
480 min Winter 5	5.675 1.	.175	31.2	1811.1	0 K	
600 min Winter 5	5.676 1.	.176	31.2	1813.0	O K	
720 min Winter 5	5.678 1.	.178	31.3	1815.7	ОК	
960 min Winter 5	5.669 1.	.169	31.1	1799.8	O K	
1440 min Winter 5	5.626 1.	.126	30.5	1721.4	O K	
2160 min Winter 5	5.539 1.	.039	29.3	1567.8	ОК	
2880 min Winter 5	5.451 U. 5.205 O	.951	27.9	1414.7	OK	
4320 MIN WINter 5	5.295 U. 5.169 O	.795 669	23.3	115Z.5 950 5	OK	
7200 min Winter 5	5.070 0.	.570	23.1	797.1	O K	
					• •	
Storm	Rain I	Flooded	Disch	arge T	ime-Peak	
Event (r	mm/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	³)		
10000	0 745	0.0	A ~	240 0	FAFC	
LUU80 min Summer	U./45 79 950	0.0	43	128 2	2420 26	
30 min Winter	53.199	0.0	c	20.3	40	
60 min Winter	33.892	0.0	13	800.8	68	
120 min Winter 2	20.940	0.0	16	510.4	126	
180 min Winter	15.610	0.0	18	301.9	182	
240 min Winter	12.614	0.0	19	941.9	238	
360 min Winter	9.343	0.0	21	57.4	350	
480 min Winter	7.540	0.0	23	320.6	456	
600 min Winter 720 min Winter	0.381 5 565	0.0	24	153.2	504	
960 min Winter	4.481	0.0	20	48.0	722	
1440 min Winter	3.298	0.0	30	06.6	1028	
2160 min Winter	2.424	0.0	33	398.5	1468	
2880 min Winter	1.946	0.0	36	536.4	1880	
4320 min Winter	1.427	0.0	39	988.1	2684	
5760 min Winter	1.144	0.0	42	290.9	3456	
7200 min Winter	0.964	0.0	45	18.6	4184	
©1982-	-2017	XP Sol	lutio	ns		

CH2M		Page 3
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:11	Designed by GR061116	
File BASIN_2.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storm Event		Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m ³)	Status
8640	min Winter	4.992	0.492	19.4	678.9	ОК
10080	min Winter	4.929	0.429	18.0	586.5	ΟK

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.839	0.0	4712.3	4928
10080 min Winter	0.745		4876.4	5648

СН2М		Page 4
Ash House		
Falcon Road		4
Exeter EX2 7LB		Micro
Date 22/05/2018 17:11	Designed by GR061116	Desinado
File BASIN_2.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	
Ra	infall Details	
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSRWinter StormsYes30Cv (Summer)0.750and and WalesCv (Winter)0.84020.000Shortest Storm (mins)150.350Longest Storm (mins)10080YesClimate Change %+10	
Tin	ne Area Diagram	
Tot	al Area (ha) 4.660	
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 4 1.553	4 8 1.553 8 12 1.553	
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СН2М		Page 5
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:11	Designed by GR061116	Desinado
File BASIN_2.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						C
$D_{2} = 22/05/2018 = 17.12$		Design	ad by (2P0611	16	- MICrO
		Design	eu by c	JI(0 0 I I	10	Drainag
File BASIN_2.SRCX		Checke	a by			on an in a g
XP Solutions		Source	Contro	ol 201	7.1.2	
Summary of	Results fo	or 100	year Re	eturn	Period (+10%)	
Stor	rm Mav	r Mav	Mav	Max	St at 116	
Eve	nt Leve	l Depth	Control	Volume	Status	
200	(m)	(m)	(1/s)	(m ³)		
15 min	Summer 5.12	27 0.627	22.3	885.4	O K	
30 min	Summer 5.31	2 0.812	25.6	1180.3	O K	
60 min	Summer 5.49	93 0.993	28.6	1487.4	ОК	
120 min	Summer 5.65	b8 1.158	31.0	1779.2	OK	
180 min	Summer 5.73	34 1.234	32.0	1920.3	Flood Risk	
240 min 260 min	Summer 5.//	0 1 210	32.6	1996.5	Flood Risk	
360 min	Summer 5.81	10 1.310	33.Z	2077.5	Flood Risk	
400 min	Summer 5.03	DE 1 225	33.3 22 A	2100.0	Flood Risk	
720 min	Summer 5 83	25 1 225	33.4 33.4	2109.5	Flood Risk	
960 min	Summer 5 82	9 1 329	22.4	2098 7	Flood Risk	
1440 min	Summer 5.79	07 1.297	32.9	2037.5	Flood Risk	
2160 min	Summer 5.72	29 1.229	32.0	1910.1	Flood Risk	
2880 min	Summer 5.65	6 1.156	31.0	1776.9	ΟK	
4320 min	Summer 5.52	22 1.022	29.0	1536.8	O K	
5760 min	Summer 5.40	0.907	27.2	1340.0	O K	
7200 min	Summer 5.31	2 0.812	25.6	1180.4	O K	
8640 min	Summer 5.23	32 0.732	24.2	1050.4	O K	

	Storm		Rain	Flooded	Discharge	Time-Peak		
	Event		(mm/hr)	Volume	Volume	(mins)		
				(m³)	(m³)			
15	min	Summer	103.597	0.0	845.3	26		
30	min	Summer	69.587	0.0	1137.3	41		
60	min	Summer	44.560	0.0	1529.6	70		
120	min	Summer	27.503	0.0	1890.8	128		
180	min	Summer	20.407	0.0	2105.3	186		
240	min	Summer	16.403	0.0	2256.3	244		
360	min	Summer	12.073	0.0	2490.1	362		
480	min	Summer	9.697	0.0	2664.9	454		
600	min	Summer	8.173	0.0	2805.2	506		
720	min	Summer	7.104	0.0	2922.5	568		
960	min	Summer	5.689	0.0	3110.7	694		
1440	min	Summer	4.152	0.0	3360.6	970		
2160	min	Summer	3.023	0.0	3785.7	1384		
2880	min	Summer	2.411	0.0	4022.5	1788		
4320	min	Summer	1.749	0.0	4365.1	2560		
5760	min	Summer	1.391	0.0	4659.6	3344		
7200	min	Summer	1.166	0.0	4878.2	4104		
8640	min	Summer	1.009	0.0	5063.6	4840		
		@10	00 2017	VD Co	lutiona			
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CH2M					Page 2
Ash House					
Falcon Road					4
Exeter EX2 7LB					- m
Date 22/05/2018 17:12	Des	igned by	GR06113	16	- MICLO
File BASIN 2 SPCY	Cher	rked by	0110 0111	2.0	Drainage
VP Solutions	2011	rao Cont	rol 201	7 1 2	
	50U.		.101 201	/•⊥•∠	
Cummary of Deculta	for 1	00	Doturn	Portiod (1108)	
Summary of Results	101 1	00 year	Recuili	Period (+10%)	
Storm	Max M	Max Max	. Max	Status	
Event L	evel De	epth Conti	ol Volume		
	(m) ((m) (1/s	s) (m³)		
10080 min Summor 5	164 0	664 23	0 012 7	O K	
15 min Winter 5	.196 0.	. 696 2.	3.6 992.9	0 K	
30 min Winter 5	.398 0.	.898 2	.1 1324.5	0 K	
60 min Winter 5	.598 1.	.098 30	.1 1671.0	O K	
120 min Winter 5	.779 1.	.279 32	2.6 2004.1	Flood Risk	
180 min Winter 5	.865 1.	365 33	3.8 2168.4	Flood Risk	
240 min Winter 5	.913 1.	413 34	.4 2260.4	Flood Risk	
360 min Winter 5	.966 L.	.466 35	.1 2364.3	Flood Risk	
480 min Winter 5	.985 1. 987 1	485 35 487 39	3 2403.1	Flood Risk	
720 min Winter 5	.982 1.	482 35	5.3 2395.9	Flood Risk	
960 min Winter 5	.971 1.	471 35	.1 2374.2	Flood Risk	
1440 min Winter 5	.921 1.	421 34	.5 2275.8	Flood Risk	
2160 min Winter 5	.820 1.	320 33	8.2 2081.2	Flood Risk	
2880 min Winter 5	.715 1.	.215 31	.8 1884.4	Flood Risk	
4320 min Winter 5	.525 1.	.025 29	1542.2	O K	
5760 min Winter 5 7200 min Winter 5	.368 U. 243 O	.868 ZK 743 24	0.6 12/4.2 1 4 1068 7	0 K	
	.210 0.	.,15 2		0 11	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
10080 min Summer	0.893	0.0	5218.7	5552	
15 min Winter	103.597	0.0	948.3	26	
30 min Winter	69.587	0.0	1271.0	40	
60 min Winter	44.560	0.0	1714.8	68	
120 min Winter	27.503	0.0	2119.1	126	
180 min Winter 240 min Winter	20.407		∠359.0 2527 °	10Z	
360 min Winter	12.073	3 0.0	2.789.0	354	
480 min Winter	9.697	0.0	2983.8	462	
600 min Winter	8.173	0.0	3139.8	566	
720 min Winter	7.104	0.0	3269.8	596	
960 min Winter	5.689	0.0	3475.4	740	
1440 min Winter	4.152	0.0	3731.7	1046	
2160 min Winter 2880 min Winter	3.023 2 /111	0.0	4241.1 4506 /	⊥4 <i>9</i> ∠ 1912	
4320 min Winter	1.749	0.0	4889.7	2728	
5760 min Winter	1.391	0.0	5219.7	3512	
7200 min Winter	1.166	0.0	5464.9	4256	
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L					

CH2M		Page 3
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:12	Designed by GR061116	
File BASIN_2.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

	Storm Event		Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m ³)	Status	
8640	min	Winter	5.142	0.642	22.6	908.6	ОК	
10080	min	Winter	5.061	0.561	20.9	782.4	ОК	

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Win	nter 1.009	0.0	5673.5	5008
10080 min Win	nter 0.893		5849.7	5744

CH2M		Page 4
Ash House		
Falcon Road		Y
Exeter EX2 7LB		Micro
Date 22/05/2018 17:12	Designed by GR061116	Desinado
File BASIN_2.SRCX	Checked by	Diamada
XP Solutions	Source Control 2017.1.2	
Ra	infall Details	
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 100 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10	
Tin	ne Area Diagram	
Tot	al Area (ha) 4.660	
Time (mins) Area T: From: To: (ha) Fr	om: To: (ha) From: To: (ha)	
0 4 1.553	4 8 1.553 8 12 1.553	
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СН2М		Page 5
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 22/05/2018 17:12	Designed by GR061116	
File BASIN_2.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	·

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M									Page 1			
Ash House												
Falcon Road									4			
Fyster FX	2 7T.B								- Com			
Data 20/05/	2010 10.2	1		Dear	anad	br CDOC	1116		Micro			
Date 29/05/	2018 19:3	4		Des		oy grug)1110		Drainage			
File Filter	drain.SR	.CX		Cheo	cked b	У			brainage			
XP Solution	S			Soui	rce Co	ntrol 2	2017.1.	2				
	Summary of Results for 30 year Return Period (+10%)											
	Half Drain Time : 80 minutes.											
	Storm	May	Max	Max		May	Max	May	Status			
	Event	Level	Depth	Infiltra	tion Co	max ontrol Σ	Outflow	Volume	Status			
		(m)	(m)	(1/s) (1/s)	(1/s)	(m ³)				
15	min Summer	7.469	0.869		0.0	2.3	2.3	13.0	O K			
30	min Summer	7.620	1.020		0.0	2.3	2.3	16.4	U K Flood Pisk			
120	min Summer	7 707	1 107		0.0	2.3	2.3	18.3	Flood Risk			
180	min Summer	7.676	1.076		0.0	2.3	2.3	17.6	O K			
240	min Summer	7.637	1.037		0.0	2.3	2.3	16.7	O K			
360	min Summer	7.553	0.953		0.0	2.3	2.3	14.9	O K			
480	min Summer	7.468	0.868		0.0	2.3	2.3	12.9	O K			
600	min Summer	7.389	0.789		0.0	2.3	2.3	11.1	O K			
720	min Summer	7.318	0.718		0.0	2.3	2.3	9.3	ОК			
960	min Summer	/.180	0.580		0.0	2.2	2.2	6.3	OK			
2160	min Summer	6 600	0.321		0.0	2.2	2.2	2.2	0 K 0 K			
2880	min Summer	6.600	0.000		0.0	1.7	1.7	0.0	0 K			
4320	min Summer	6.600	0.000		0.0	1.2	1.2	0.0	O K			
5760	min Summer	6.600	0.000		0.0	1.0	1.0	0.0	O K			
7200	min Summer	6.600	0.000		0.0	0.8	0.8	0.0	0 K			
		Stor	m	Rain	Flooded	d Dischar	rge Time	-Peak				
		Even	ıt	(mm/hr)	Volume	Volum	ie (mi	ins)				
					(1110)	(111°)						
	1	5 min	Summer	79.950	0.0) 15	5.8	21				
	3	30 min	Summer	53.199	0.0) 21	1.0	34				
	6	50 min	Summer	33.892	0.0) 20	6.6	62				
	12	20 min	Summer	20.940	0.0	J 33	J.⊥ ⊆ 0	96				
	18	10 min	Summer	12 614	0.0) 20) 20	97	164				
	36	50 min	Summer	9.343	0.0) 44	4.1	232				
	48	30 min	Summer	7.540	0.0) 47	7.5	300				
	60	00 min	Summer	6.381	0.0) 50	0.2	364				
	72	20 min	Summer	5.565	0.0) 52	2.6	426				
	96	50 min	Summer	4.481	0.0) 50	6.4	548				
	144	10 min	Summer	3.298	0.0) 62	2.3	772				
	216	ou min	Summor	2.424 1 016	0.0	ידי ך זידי ך	5./ 3.6	0				
	432	20 min	Summer	1.427	0.0) 7.) 8().9	0				
	576	50 min	Summer	1.144	0.0) 80	6.5	Ũ				
	720)0 min	Summer	0.964	0.0) 91	1.1	0				
			©198	32-2017	XP So	olution	S					

CH2M		Page 2
Ash House		
Falcon Road		Y.
Exeter EX2 7LB		Micro
Date 29/05/2018 19:34	Designed by GR061116	Desinado
File Filter drain.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min S	Summer	6.600	0.000	0.0	0.7	0.7	0.0	ОК
10080	min s	Summer	6.600	0.000	0.0	0.6	0.6	0.0	O K
15	min N	Winter	7.552	0.952	0.0	2.3	2.3	14.8	O K
30	min N	Winter	7.733	1.133	0.0	2.3	2.3	18.9	Flood Risk
60	min N	Winter	7.858	1.258	0.0	2.3	2.3	21.7	Flood Risk
120	min N	Winter	7.859	1.259	0.0	2.3	2.3	21.7	Flood Risk
180	min N	Winter	7.811	1.211	0.0	2.3	2.3	20.7	Flood Risk
240	min N	Winter	7.749	1.149	0.0	2.3	2.3	19.3	Flood Risk
360	min N	Winter	7.614	1.014	0.0	2.3	2.3	16.2	O K
480	min N	Winter	7.478	0.878	0.0	2.3	2.3	13.2	O K
600	min N	Winter	7.357	0.757	0.0	2.3	2.3	10.3	O K
720	min N	Winter	7.246	0.646	0.0	2.2	2.2	7.7	O K
960	min N	Winter	7.016	0.416	0.0	2.2	2.2	3.4	O K
1440	min N	Winter	6.600	0.000	0.0	2.0	2.0	0.0	O K
2160	min N	Winter	6.600	0.000	0.0	1.5	1.5	0.0	O K
2880	min N	Winter	6.600	0.000	0.0	1.2	1.2	0.0	O K
4320	min N	Winter	6.600	0.000	0.0	0.9	0.9	0.0	O K
5760	min N	Winter	6.600	0.000	0.0	0.7	0.7	0.0	O K

	Stor	m	Rain	Floc	ded	Discharq	je	Time-Peak	
	Even	t	(mm/hr)	Vol	ume	Volume		(mins)	
				(m	3)	(m³)			
8640	min	Summer	0.839		0.0	95.	.1	0	
10080	min	Summer	0.745		0.0	98.	.6	0	
15	min	Winter	79.950		0.0	17.	.6	21	
30	min	Winter	53.199		0.0	23.	.5	34	
60	min	Winter	33.892		0.0	29.	. 9	62	
120	min	Winter	20.940		0.0	37.	.0	104	
180	min	Winter	15.610		0.0	41.	.4	140	
240	min	Winter	12.614		0.0	44.	.4	178	
360	min	Winter	9.343		0.0	49.	.4	252	
480	min	Winter	7.540		0.0	53.	.1	322	
600	min	Winter	6.381		0.0	56.	.2	388	
720	min	Winter	5.565		0.0	59.	.0	450	
960	min	Winter	4.481		0.0	63.	.2	562	
1440	min	Winter	3.298		0.0	69.	. 8	0	
2160	min	Winter	2.424		0.0	77.	.0	0	
2880	min	Winter	1.946		0.0	82.	.4	0	
4320	min	Winter	1.427		0.0	90.	.6	0	
5760	min	Winter	1.144		0.0	96.	. 9	0	
		@198	2-2017	YD	901	utions			
		0190		ΛĽ	201	Lucions			

CH2M		Page 3
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micro
Date 29/05/2018 19:34	Designed by GR061116	Desinado
File Filter drain.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
7200	min W	Vinter	6.600	0.000	0.0	0.6	0.6	0.0	ОК
8640	min W	Vinter	6.600	0.000	0.0	0.5	0.5	0.0	ΟK
10080	min W	Vinter	6.600	0.000	0.0	0.5	0.5	0.0	ОК

Storm	Rain	Flooded	Discharge	Time-Peak
Event	(mm/nr)	(m ³)	(m ³)	(mins)
7200 min Winter	0.964	0.0	102.0	0
8640 min Winter	0.839	0.0	106.5	0
10080 min Winter	0.745	0.0	110.4	0

CH2M										Page 1
Ash House										
Falcon Road										4
Exeter EX	2 71.B									- Cum
Date 29/05/	2018 19•3	6		Des	ianed	by GRO	6111	6		MICrO
Filo Filtor	drain SP	CV		Cho	akod h	by Give	0111	0		Drainage
VD Colution		.0.		Cned	red L	y 	2017	1 1	2	
AP SOLUCION	5			5001			2017	• 1 • 2	<u> </u>	
	Summary	of Re	esulte	for 1	00 vez	ar Reti	ırn F	Peri	od (+'	10%)
	<u>o anniar y</u>	01 10	Uplf	Drain Ti		10 minut		011	<u>o a (</u>	<u> </u>
			патт		lille ; I	19 minut				
	Storm	Max	Max	Max	tion C	Max ontrol 5	Max tout f	Elow '	Max	Status
	livenc	(m)	(m)	(1/s)	(1/s)	(1/s	5)	(m ³)	
15	min Summer	7.671	1.071		0.0	2.3		2.3	17.5	ОК
30	min Summer	7.899	1.299		0.0	2.3		2.3	22.6	Flood Risk
60	min Summer	8.002	1.402		0.0	2.4		2.4	26.5	FLOOD
120	min Summer	8.002	1.402		0.0	2.4		2.4	27.3	FLOOD
180	min Summer	8.001	1.401		0.0	2.4		2.4	26.3	FLOOD
240	min Summer	8.000	1.400		0.0	2.4		2.4	25.2	FLOOD
360	min Summer	7.924	1.324		0.0	2.3		2.3	23.2	Flood Risk
480	min Summer	7 735	1 135		0.0	2.3		2.3	19 0	Flood Risk
720	min Summer	7.644	1.044		0.0	2.3		2.3	16.9	0 K
960	min Summer	7.474	0.874		0.0	2.3		2.3	13.1	0 K
1440	min Summer	7.213	0.613		0.0	2.2		2.2	7.0	O K
2160	min Summer	6.873	0.273		0.0	2.2		2.2	1.6	O K
2880	min Summer	6.600	0.000		0.0	2.1		2.1	0.0	O K
4320	min Summer	6.600	0.000		0.0	1.5		1.5	0.0	O K
5760	min Summer	6.600	0.000		0.0	1.2		1.2	0.0	O K
7200	MIII JUMMEI	0.000	0.000		0.0	1.0		1.0	0.0	U R
		Stor	m	Rain	Floode	d Discha	arge	Time-	Peak	
		Ever	IT	(mm/nr)	(m ³)	e Volu (m ³	me)	(m1)	ns)	
	1	15 min	Summer	103.597	0.	0 2	20.4		21	
	3	30 min	Summer	69.587	0.	0 2	27.4		35	
	e	50 min	Summer	44.560	1.	6	35.0		62	
	12	20 min	Summer	27.503	2.	3 4	43.4		108	
	18	30 min	Summer	20.407	1.	4 4	48.3		140	
	24	10 min	Summer	16.403	0.	3 !	51.7		172	
	30	20 min	Summer	9 697	0.	0 :	50.9 51 2		242 310	
	60)0 min	Summer	8.173	0.	0	54.3		376	
	72	20 min	Summer	7.104	0.	0	67.2		442	
	96	50 min	Summer	5.689	0.	0 .	71.6		568	
	144	10 min	Summer	4.152	0.	0	78.5		808	
	216	50 min	Summer	3.023	0.	0 8	35.7		1132	
	288	30 min	Summer	2.411	0.	0 9	91.1		0	
	432	20 min	Summer	1.749	0.	0 1	99.2 NE 0		0	
	576)0 min	Summer	1.166	0.	0 11	10.1		0	
			©19	82-2017	7 XP S	olutio	ns			

CH2M		Page 2
Ash House		
Falcon Road		Le
Exeter EX2 7LB		Micco
Date 29/05/2018 19:36	Designed by GR061116	
File Filter drain.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

	Storm Event	n :	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640	min :	Summer	6.600	0.000	0.0	0.9	0.9	0.0	ОК
10080	min :	Summer	6.600	0.000	0.0	0.8	0.8	0.0	ОК
15	min N	Winter	7.779	1.179	0.0	2.3	2.3	20.0	Flood Risk
30	min N	Winter	8.001	1.401	0.0	2.4	2.4	26.0	FLOOD
60	min N	Winter	8.006	1.406	0.0	2.4	2.4	30.9	FLOOD
120	min N	Winter	8.008	1.408	0.0	2.4	2.4	32.7	FLOOD
180	min N	Winter	8.006	1.406	0.0	2.4	2.4	31.2	FLOOD
240	min N	Winter	8.005	1.405	0.0	2.4	2.4	29.7	FLOOD
360	min N	Winter	8.002	1.402	0.0	2.4	2.4	26.5	FLOOD
480	min N	Winter	7.922	1.322	0.0	2.3	2.3	23.2	Flood Risk
600	min N	Winter	7.774	1.174	0.0	2.3	2.3	19.8	Flood Risk
720	min N	Winter	7.633	1.033	0.0	2.3	2.3	16.7	ОК
960	min N	Winter	7.385	0.785	0.0	2.3	2.3	11.0	ОК
1440	min N	Winter	6.968	0.368	0.0	2.2	2.2	2.8	O K
2160	min N	Winter	6.600	0.000	0.0	1.9	1.9	0.0	O K
2880	min N	Winter	6.600	0.000	0.0	1.5	1.5	0.0	O K
4320	min N	Winter	6.600	0.000	0.0	1.1	1.1	0.0	O K
5760	min N	Winter	6.600	0.000	0.0	0.9	0.9	0.0	O K

	:	Stor	m	Rain	Flooded	Discharge	Time-Peak
	1	Even	t	(mm/hr)	Volume	Volume	(mins)
					(m³)	(m³)	
86	640	min	Summer	1.009	0.0	114.4	0
100	080	min	Summer	0.893	0.0	118.2	0
	15	min	Winter	103.597	0.0	22.9	22
	30	min	Winter	69.587	1.0	30.6	35
	60	min	Winter	44.560	5.8	39.4	62
1	120	min	Winter	27.503	7.6	48.4	118
1	180	min	Winter	20.407	6.1	54.1	150
2	240	min	Winter	16.403	4.6	57.9	188
3	360	min	Winter	12.073	1.6	63.8	262
4	480	min	Winter	9.697	0.0	68.4	336
6	600	min	Winter	8.173	0.0	72.1	406
-	720	min	Winter	7.104	0.0	75.3	474
9	960	min	Winter	5.689	0.0	80.2	600
14	440	min	Winter	4.152	0.0	87.8	816
21	160	min	Winter	3.023	0.0	96.0	0
28	380	min	Winter	2.411	0.0	102.1	0
43	320	min	Winter	1.749	0.0	111.1	0
57	760	min	Winter	1.391	0.0	117.8	0
			@100	2 2017	VD Col	utiona	
			0198	52-2017	AP SOI	utions	

CH2M		Page 3
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micro
Date 29/05/2018 19:36	Designed by GR061116	Desinado
File Filter drain.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200	min Wi	inter	6.600	0.000	0.0	0.7	0.7	0.0	ОК
8640	min Wi	inter	6.600	0.000	0.0	0.6	0.6	0.0	ΟK
10080	min Wi	inter	6.600	0.000	0.0	0.6	0.6	0.0	ОК

Storm	Rain	Flooded	Discharge	Time-Peak
Event	(mm/hr)	Volume	Volume	(mins)
		(m³)	(m³)	
7000 min Winton	1 1	0 0	100 /	0
7200 MIII WINCEL	1.100	0.0	123.4	0
8640 min Winter	1.009	0.0	128.2	0
10080 min Winter	0.893	0.0	132.4	0



	This drawi Architects drawings o Engineer.	ing is to be r , Engineers ar and specificat	ead in con nd Speciali ions. If in	junction wi st Manufac doubt plea:	th all relevant turer's se consult the
	0	5	10	15	20
	SCA	LE 1:250 (A	1)	ME	ETRES
	This map is reprodu with the permission	ced from Ordnance Su of the Controller of H	rvey® material by er Majesty's Stati convright and ma	Halcrow on behal onery Office, ©Crov	f of North Somerset Cour wn copyright.
	Licence Number: 100	023397		y lead to prosecu	tion of civil proceeding a.
	1. Th wit 2. Dra yea 3. Ex 3. Ex 3. Ex 4. All 5. Th 5. Th top 6. Ou baa 7. Pro sul	is drawing a th the Drain ainage syst ar return pe owance. ceedance f ar return pe owance. dimension dimension biographical utfalls shoul sis and quip oposed drai bjected to F scharge poi	should be age Stra em desig eriod plus low desig riod plus s are in r e layout is survey. d be mor oped with inage con Railway N nts.	e read in tegy Rep on based s climate on based s climate netres un s based of nitored or n shut-off ncept to b	conjunction ort. on 1:30 change on 1:100 change nless noted on a n a regular valves oe consent for
			Propose Propose collector Tempor Propose Red line Propose	ed catchpit ed pipeline ed Runoff ary compour ed fence boundary ed road kerb	nd
	A GRM Rev By	Chkd Apprvd C Chkd North East Som Courcils working toget	Date	Descript	ion
	CH2M HI 1 The Squ Tel +44 (0 www.ch2m Project	LLU are Temple Quay Brist 117 910 2580 Fax +4 0.com	tol BS1 6DG 44 (0)117 910 25 HEAD BR		
		METR		PHASE 1	
	Drawing	CLA ERMANE CONSTR	NAGE NT NE ⁻ RUCTIC	ROAD FWORK ON COM	
	Drawn by: Checked b	GRIVI			Date: 29/06/2018
]	Approved Drawing N	by: lo.			Date: Revision
ATION	46	7470.BQ	.04.20-	DS-C4	A

Drawing Scale: 1:250 @ A1



	 Notes: This drawing should be read in conjunction with the Drainage Strategy Report. Drainage system design based on 1:30 year return period plus climate change allowance. Exceedance flow design based on 1:100 year return period plus climate change allowance. All dimensions are in metres unless noted otherwise. The indicative layout is based on a topographical survey. Outfalls should be monitored on a regular basis and quipped with shut-off valves
	KEY: O Proposed catchpit Proposed bypass oil seperator Proposed pipeline Proposed ditch Proposed ditch Red line boundary Silt pollution control Silt pollution control
	Proposed storage Sub-catchment B Exceedance route Filter Drain Highway works
	Network Rail works Right to be Acquired Permanently Proposed road kerb Grasscrete & dropped kerb
	 Proposed fence Trees to be retained Proposed tree Proposed hedge
	FOR INFORMATION A DFS - 15/05/2018 FOR INFORMATION Rev By Chkd Apprvd Date Description
	bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport CH2M HILL 1 The Square Temple Quay Bristol BS1 6DG Tel +44 (0)117 910 2580 Fax +44 (0)117 910 2581 www.ch2m.com Value Project Project PORTISHEAD BRANCH LINE METROWEST PHASE 1)
in conjunction with all relevant Specialist Manufacturer's S. If in doubt please consult the 30 40 50	Drawing C9 HAM GREEN COMPOUND DRAINAGE STRATEGY Drawn by: MA
METRES material by Halcrow on behalf of North Somerset Council jesty's Stationery Office, ©Crown copyright. right and may lead to prosecution or civil proceedings.	Checked by: Date: Approved by: - Drawing No. Revision 467470.BQ.04.20-DS-C9 A Drawing Scale: 1:250 @ A1

CH2M							Page 1
Ash House							
Falcon Road							4
Exeter EX2 7LB							Mirco
Date 02/07/2018 16:	31	Desi	gned b	y MA0479	950		
File DITCH PERMANEN	IT.SRCX	Chec	ked bv	-			Urainage
XP Solutions		Sour	ce Con	trol 201	7.1.	2	
Summary	of Results	s for 3) year	Return	Peri	od (+4	40%)
			- <u>+</u>				<u> </u>
	Half	Drain Tir	ne : 308	minutes.			
Storm	Max Max	Max	M	lax Ma	ах	Max	Status
Event	Level Depth	Infiltra	tion Con	trol Σ Out	flow	Volume	
	(m) (m)	(1/s)) (1	./s) (1/	s)	(m³)	
15 min Summer	5.642 0.442		0.0	1.8	1.8	31.0	ОК
30 min Summer	5.695 0.495		0.0	1.9	1.9	40.6	ΟK
60 min Summer	5.740 0.540		0.0	2.0	2.0	49.8	Flood Risk
120 min Summer	5.775 0.575		0.0	2.0	2.0	57.3	Flood Risk
180 min Summer	5.786 0.586		0.0	2.0	2.0	59.7	Flood Risk
240 min Summer 360 min Summer	5.788 0.588		0.0	2.0	2.0	60.2 59 9	Flood Risk
480 min Summer	5 783 0 583		0.0	2.0	2.0	59.9	Flood Risk
600 min Summer	5.777 0.577		0.0	2.0	2.0	57.8	Flood Risk
720 min Summer	5.771 0.571		0.0	2.0	2.0	56.4	Flood Risk
960 min Summer	5.757 0.557		0.0	2.0	2.0	53.4	Flood Risk
1440 min Summer	5.730 0.530		0.0	1.9	1.9	47.7	Flood Risk
2160 min Summer	5.691 0.491		0.0	1.9	1.9	39.9	O K
2880 min Summer	5.655 0.455		0.0	1.8	1.8	33.3	O K
4320 min Summer	5.590 0.390		0.0	1.6	1.6	23.1	OK
5760 min Summer	5.535 0.335		0.0	1.5	1.5	16.2	O K
8640 min Summer	5.469 0.269		0.0	1.4	1.4 1.3	11.0 8.4	O K O K
10080 min Summer	5.419 0.219		0.0	1.2	1.2	6.2	O K
15 min Winter	5.665 0.465		0.0	1.8	1.8	34.9	O K
30 min Winter	5.721 0.521		0.0	1.9	1.9	45.8	Flood Risk
	Storm	Rain	Flooded	Discharge	Time	-Peak	
	Event	(mm/hr)	Volume	Volume	(mi	ns)	
			(m³)	(m³)			
	15 min Summer	101.754	0.0	32.8		23	
	30 min Summer	67.708	0.0	43.7		37	
	60 min Summer	43.136	0.0	55.6		66	
12	20 min Summer	26.651	0.0	68.8		124	
18	80 min Summer	19.868	0.0	76.9		182	
24	40 min Summer	16.054	0.0	82.8		228	
36	60 min Summer	11.891	0.0	92.0		286	
48	80 min Summer 00 min Summer	9.596	0.0	99.0		350	
7	20 min Summer	7.083	0.0	104.8 109 6		490	
96	60 min Summer	5.703	0.0	117.7		626	
144	40 min Summer	4.198	0.0	130.0		898	
216	60 min Summer	3.085	0.0	143.3		1296	
288	80 min Summer	2.477	0.0	153.4		1672	
432	20 min Summer	1.816	0.0	168.7		2384	
576	60 min Summer	1.456	0.0	180.3		3112	
/20	00 min Summer 40 min Summer	1 067	0.0	100 J		3010 4406	
1005	80 min Summer	0.948	0.0	205.6		5240	
	15 min Winter	101.754	0.0	36.8		23	
:	30 min Winter	67.708	0.0	48.9		37	

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CH2M					Page 2
Ash House					
Falcon Road					Y.
Exeter EX2 7LB					Mirro
Date 02/07/2018 16:31	Design	ned by M	A047950		
File DITCH PERMANENT.SRCX	Checke	ed by			Urainage
XP Solutions	Source	Contro	1 2017 1	2	
	Doured	concro	1 2017.1	• 2	
Summary of Results	for 30	vear Ret	turn Peri	od (+	40%)
		1			
Storm Max Max	Max	Max	Max	Max	Status
Event Level Depth	Infiltrati	on Control	Σ Outflow	Volume	
(m) (m)	(1/s)	(1/s)	(1/s)	(m³)	
60 min Winter 5.771 0.571	0	.0 2.0	2.0	56.4	Flood Risk
120 min Winter 5.811 0.611	0	.0 2.1	2.1	65.5	Flood Risk
180 min Winter 5.825 0.625	0	.0 2.1	. 2.1	68.9	Flood Risk
360 min Winter 5.827 0.627	0	.0 2.1	2.1	69.4	Flood Risk
480 min Winter 5.822 0.622	0	.0 2.1	. 2.1	68.2	Flood Risk
600 min Winter 5.815 0.615	0	.0 2.1	2.1	66.5	Flood Risk
720 min Winter 5.806 0.606	0	.0 2.1	2.1	64.5	Flood Risk
960 min Winter 5.787 0.587	0	.0 2.0	2.0	59.9	Flood Risk
1440 min Winter 5.746 0.546	0	.0 2.0	2.0	51.0	Flood Risk
2160 min Winter 5.688 0.488	0	.0 1.9	· 1.9	39.3	O K
4320 min Winter 5.542 0.342	0	.0 1.5	i.7	17.1	0 K
5760 min Winter 5.468 0.268	0	.0 1.4	1.4	9.8	O K
7200 min Winter 5.413 0.213	0	.0 1.2	1.2	5.8	O K
8640 min Winter 5.372 0.172	0	.0 1.1	1.1	3.6	O K
10080 min Winter 5.342 0.142	0	.0 1.0	1.0	2.4	O K
Storm Event	Rain F] (mm/hr) V	looded Disc olume Vo (m³) (charge Time olume (m. m³)	-Peak ins)	
60 min Winter	12 126	0 0	60.0	61	
120 min Winter	26.651	0.0	77.0	122	
180 min Winter	19.868	0.0	86.1	178	
240 min Winter	16.054	0.0	92.8	232	
360 min Winter	11.891	0.0	103.1	326	
480 min Winter	9.596	0.0	110.9	376	
600 min Winter 720 min Winter	8.⊥∠⊥ 7 ∩83	0.0	122 8	452 530	
960 min Winter	5.703	0.0	131.8	680	
1440 min Winter	4.198	0.0	145.6	968	
2160 min Winter	3.085	0.0	160.4	1368	
2880 min Winter	2.477	0.0	171.8	1760	
4320 min Winter	1.816	0.0	188.9 201 0	2468	
7200 min Winter	1.227	0.0	201.9	3816	
8640 min Winter	1.067	0.0	222.0	4496	
10080 min Winter	0.948	0.0	230.2	5152	
©198	2-2017 X	P Soluti	ions		

CH2M		Page 3
Ash House		
Falcon Road		4
Exeter EX2 7LB		Misco
Date 02/07/2018 16:31	Designed by MA047950	
File DITCH_PERMANENT.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	
Ra:	infall Details	
Rainfall Model Return Period (years) Region Engl. M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 11 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40	5 0 5 0 0
Tim	ne Area Diagram	
Tot	al Area (ha) 0.172	
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)	
0 3 0.057	3 6 0.057 6 9 0.058	

CH2M		Page 4
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 02/07/2018 16:31	Designed by MA047950	Desinado
File DITCH_PERMANENT.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Swale Structure

 Infiltration Coefficient Base (m/hr)
 0.00000
 Length (m)
 190.0

 Infiltration Coefficient Side (m/hr)
 0.00000
 Side Slope (1:X)
 1.0

 Safety Factor
 2.0
 Slope (1:X)
 400.0

 Porosity
 1.00
 Cap Volume Depth (m)
 0.000

 Invert Level (m)
 5.200
 Cap Infiltration Depth (m)
 0.000

 Base Width (m)
 0.5
 0.5
 0.000

Orifice Outflow Control

Diameter (m) 0.036 Discharge Coefficient 0.600 Invert Level (m) 5.200 $\,$

CH2M							Page 1
Ash House							
Falcon Road							4
Exeter EX2 7LB							- m
Date 02/07/2018 16:30 Designed by MA047950					MICIO		
File CELLULARSTORACE SPCY Checked by					Drainage		
XP Solutions	biten	Sour	ce Con	trol 201	7 1	2	
AP SOLUCIOUS		SOUL		LIUI 201	. / • ⊥ •	2	
Summary of	Pequite	for 30) voar	Poturn	Dori	od (+)	408)
<u>Builling of</u>	REBUIES	101 50	y y car	Recurn		ou (i	10.07
	Half I	rain Tim	ie : 145	minutes.			
Storm M	lax Max	Max	м	ax Ma	x	Max	Status
Event Le	evel Depth :	Infiltrat	ion Con	trol Σ Out	flow	Volume	
	(m) (m)	(1/S)	(1	/S) (1/	S)	(m³)	
15 min Summer 5.	561 0.761		0.0	1.8	1.8	21.7	O K
30 min Summer 5.	566 0.766		0.0	1.8	1.8	21.8	ОК
60 min Summer 5.	578 U.778		U.U 0 0	⊥.8 1 9	⊥.8 1 0	22.2	O K
180 min Summer 5	637 0 837		0.0	1.9	1.9 1.9	∠3.0 23.8	OK
240 min Summer 5.	.680 0.880		0.0	2.0	2.0	25.1	ОК
360 min Summer 5.	783 0.983		0.0	2.1	2.1	28.0	Flood Risk
480 min Summer 5.	.840 1.040		0.0	2.2	2.2	29.6	Flood Risk
600 min Summer 5.	.878 1.078		0.0	2.2	2.2	30.7	Flood Risk
720 min Summer 5.	.905 1.105		0.0	2.3	2.3	31.5	Flood Risk
1440 min Summer 5.	807 1.007		0.0	2.3	2.3	28.7	Flood Risk
2160 min Summer 5.	.594 0.794		0.0	1.8	1.8	22.6	0 K
2880 min Summer 5.	.580 0.780		0.0	1.8	1.8	22.2	ОК
4320 min Summer 5.	.569 0.769		0.0	1.8	1.8	21.9	O K
5760 min Summer 5.	.564 0.764		0.0	1.8	1.8	21.8	ОК
7200 min Summer 5.	561 U.761		0.0	1.8	1.8 1.8	21.7	O K O K
10080 min Summer 5.	.557 0.757		0.0	1.8	1.8	21.0	ОК
15 min Winter 5.	562 0.762		0.0	1.8	1.8	21.7	ОК
30 min Winter 5.	.569 0.769		0.0	1.8	1.8	21.9	ОК
5	Storm	Rain	Flooded	Discharge	Time	-Peak	
1	Ivent	(mm/hr)	Volume	Volume	(mi	ns)	
			(m ³)	(m ³)			
15	min Summer	101.754	0.0	93.0		580	
30	min Summer	67.708	0.0	95.0		580	
60	min Summer	43.136	0.0	97.4		502	
120	min Summer	20.651 19 868	0.0	99.8 101 2		500 500	
240	min Summer	16.054	0.0	101.3		408	
360	min Summer	11.891	0.0	104.1		364	
480	min Summer	9.596	0.0	105.4		410	
600	min Summer	8.121	0.0	106.5		430	
720	min Summer	5 702	0.0	107.4		490 584	
1440	min Summer	4.198	0.0	111.2		794	
2160	min Summer	3.085	0.0	113.7		584	
2880	min Summer	2.477	0.0	115.5		584	
4320	min Summer	1.816	0.0	118.4		584	
5760	min Summer	⊥.456 1 207	0.0	120.5		584 584	
8640	min Summer	1.067	0.0	123.8		576	
10080	min Summer	0.948	0.0	125.2		576	
15	min Winter	101.754	0.0	93.7		580	
30	min Winter	67.708	0.0	96.0		580	

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CH2M				Page 2				
Ash House								
Falcon Road								
Exeter EX2 7LB	Mirro							
Date 02/07/2018 16:30								
File CELLULARSTORAGE.SRCX	Drainage							
XP Solutions Source Control 2017 1 2								
Summary of Results	s for 30 y	ear Return 1	Period (+4	10%)				
	1			<u> </u>				
Storm Max Max	Max	Max Ma	x Max	Status				
Event Level Depth	Infiltratio	n Control Σ Out	flow Volume					
(m) (m)	(1/8)	(1/5) (1/	s) (m ³)					
60 min Winter 5.584 0.784	0.	0 1.8	1.8 22.3	O K				
120 min Winter 5.617 0.817	0.		1.9 23.3	ОК				
240 min Winter 5.704 0.904	0.	0 2.0	1.7 24.4 2.0 25.8	Flood Risk				
360 min Winter 5.825 1.025	0.	0 2.2	2.2 29.2	Flood Risk				
480 min Winter 5.884 1.084	0.	0 2.2	2.2 30.9	Flood Risk				
600 min Winter 5.920 1.120	0.	0 2.3	2.3 31.9	Flood Risk				
720 min Winter 5.941 1.141 960 min Winter 5.928 1 128	U. 0	∪ <u> </u>	2.3 $32.52.3$ 32.2	Flood Risk				
1440 min Winter 5.796 0.996	0.	0 2.1	2.1 28.4	Flood Risk				
2160 min Winter 5.609 0.809	0.	0 1.9	1.9 23.1	O K				
2880 min Winter 5.587 0.787	0.	0 1.8	1.8 22.4	ОК				
4320 min Winter 5.574 0.774 5760 min Winter 5.567 0.767	0.	U 1.8 0 1.8	1.8 22.1	O K O K				
7200 min Winter 5.562 0.762	0.	0 1.8	1.8 21.7	O K				
8640 min Winter 5.559 0.759	0.	0 1.8	1.8 21.6	ОК				
10080 min Winter 5.556 0.756	0.	0 1.8	1.8 21.6	O K				
Storm Event	Rain Flo (mm/hr) Vo (:	ooded Discharge lume Volume m³) (m³)	Time-Peak (mins)					
60 min Wintow	42 126	0 0 00 6	E O O					
120 min Winter	43.136 26.651	0.0 98.8	502					
180 min Winter	19.868	0.0 103.0	410					
240 min Winter	16.054	0.0 104.3	390					
360 min Winter	11.891 9 596	U.U 106.2	356 410					
600 min Winter	8.121	0.0 108.8	452					
720 min Winter	7.083	0.0 109.9	502					
960 min Winter	5.703	0.0 111.5	620					
1440 min Winter 2160 min Winter	4.198 3 085	0.0 114.1 0.0 116 0	786 648					
2880 min Winter	2.477	0.0 119.0	584					
4320 min Winter	1.816	0.0 122.1	584					
5760 min Winter	1.456	0.0 124.5	584					
7200 min Winter 8640 min Winter	1.227 1.067	U.U 126.5	584 584					
10080 min Winter	0.948	0.0 129.7	584					
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		-						

CH2M		Page 3
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 02/07/2018 16:30	Designed by MA047950	Drainario
File CELLULARSTORAGE.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	
<u>Ra:</u>	infall Details	
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.75(and and Wales Cv (Winter) 0.84(20.000 Shortest Storm (mins) 19 0.350 Longest Storm (mins) 1008(Yes Climate Change % +4(5) 5)
Tim	ne Area Diagram	
Tot	al Area (ha) 0.032	
Time (mins) Area Ti From: To: (ha) Fr	ime (mins) Area Time (mins) Area com: To: (ha) From: To: (ha)	
0 3 0.011	3 6 0.011 6 9 0.010	

CH2M		Page 4		
Ash House				
Falcon Road		L.		
Exeter EX2 7LB		Micro		
Date 02/07/2018 16:30	Designed by MA047950	Dcainago		
File CELLULARSTORAGE.SRCX	Checked by	Diamaye		
XP Solutions	Source Control 2017.1.2			
Model Details				
Storage is Online Cover Level (m) 6.000				
Cellular Storage Structure				

Invert Level (m) 4.800 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m) Area (m²) Inf. Area (m²) Depth (m) Area (m²) Inf. Area (m²)

0.000	30.0	0.0	1.201	0.0	0.0
1.200	30.0	0.0			

Orifice Outflow Control

Diameter (m) 0.034 Discharge Coefficient 0.600 Invert Level (m) 5.000


CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					- m
Date 02/07/2018 15:57	Dest	aned h	WA047	950	MICIO
File PASTN SPCY	Chor	skod by		550	Drainage
FILE BASIN. SRCA		zked by	1 0 0 1	1 7 1 0	
XP Solutions	Soui	rce Con	trol 20.	17.1.2	
		<u>.</u>			
Summary of Results	s for 3	0 year	Return	<u>Period (+10%)</u>	<u> </u>
Storm	Max	Max Dopth Co	Max Ma	x Status	
Event	(m)	(m) ((1/s) (m ²	3)	
	()	(,	, _,		
15 min Summer	13.997	0.497	29.0 925	5.2 ОК	
30 min Summer	14.142	0.642	33.6 1220	0.0 OK	
120 min Summer	14.417	0.917	40.9 181	3.6 OK	
180 min Summer	14.478	0.978	42.3 1953	3.3 OK	
240 min Summer	14.511	1.011	43.1 202	7.7 ОК	
360 min Summer	14.540	1.040	43.8 2094	4.9 OK	
480 min Summer 600 min Summer	14.553	1.059	44.0 2124	4.4 UK 8.9 OK	
720 min Summer	14.561	1.061	44.2 2143	3.4 ОК	
960 min Summer	14.556	1.056	44.1 2130	0.8 ОК	
1440 min Summer	14.525	1.025	43.4 2059	9.2 ОК	
2160 min Summer	14.461	0.961	41.9 1914	4.5 ОК	
4320 min Summer	- 14.396	0.896	40.4 1768 37 4 1513	8.3 OK 21 OK	
5760 min Summer	14.183	0.683	34.8 130	7.1 ОК	
7200 min Summer	14.106	0.606	32.5 1140	6.2 ОК	
8640 min Summer	14.042	0.542	30.5 1015	5.8 ОК	
10080 min Summer	13.990	0.490	28.7 911	1.0 OK	
30 min Winter	14.055	0.555	35.6 136	9.5 OK	
60 min Winter	14.372	0.872	39.8 1714	4.0 OK	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
15 min 0	70 050	0.0	076 0	20	
30 min Summer	53.199	0.0	0/0.9 1179.0	44	
60 min Summer	33.892	0.0	1578.0	72	
120 min Summer	20.940	0.0	1955.5	128	
180 min Summer	15.610	0.0	2189.1	186	
240 min Summer 360 min Summer	12.014 9.343	0.0	∠359.8 2623.0	∠44 344	
480 min Summer	7.540	0.0	2822.6	398	
600 min Summer	6.381	0.0	2985.0	462	
720 min Summer	5.565	0.0	3122.6	526	
960 min Summer	4.481	0.0	3348.2	662 936	
2160 min Summer	2.424	0.0	4136.9	1344	
2880 min Summer	1.946	0.0	4426.2	1740	
4320 min Summer	1.427	0.0	4851.2	2512	
5760 min Summer	1.144	0.0	5225.3	3240	
8640 min Summer	0.839	0.0	5735.8	4688	
10080 min Summer	0.745	0.0	5930.2	5448	
15 min Winter	79.950	0.0	986.9	30	
30 min Winter	53.199	0.0	1324.2	43	
60 min Winter	33.892	0.0	1//0.5	12	
©198	82-2017	XP Sol	lutions		

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						N I I I I I I I I I I I I I I I I I I I
Date 02/07/2018 15:57	Des	igned]	ov MAC)47950)	MICIO
File BASIN SRCX	Che	cked by	.7			Uraina
VP Solutions	C	rae Cor	$\frac{y}{2}$	2017	1 0	
XI SOLUCIONS	500		ICIOI	2017.	, ⊥ . ∠	
Summary of Re	sults for	30 vear	Retu	rn Po	rid(+10)	
<u>Building of Re</u>	SUICS IOI	JU year	necu		1100 (1108)	-
Stor	m Max	Max	Max	Max	Status	
Even	t Level	Depth C	ontrol	Volume		
	(m)	(m)	(1/s)	(m³)		
120 min	Winter 14.518	1.018	43.3	2044.5	ОК	
120 min	Winter 14.589	1.089	44.8	2208.4	O K	
240 min	Winter 14.627	1.127	45.7	2299.3	O K	
360 min	Winter 14.665	1.165	46.5	2389.7	0 K	
480 min	Winter 14.675	1.175	46.7	2412.4	O K	
600 min	Winter 14.677	1.177	46.8	2418.1	O K	
720 min	Winter 14.677	1.177	46.7	2416.5	OK	
960 Min 1440 min	Winter 14.663	1 103	40.4 45 3	2256 2	OK	
2160 min	Winter 14 511	1 011	43.3	2028 3	0 K	
2880 min	Winter 14.415	0.915	40.8	1810.6	0 K	
4320 min	Winter 14.251	0.751	36.6	1450.6	O K	
5760 min	Winter 14.124	0.624	33.0	1182.8	O K	
7200 min	Winter 14.027	0.527	30.0	984.9	0 K	
8640 min	Winter 13.952	0.452	27.4	836.1	ОК	
Storr	n Rain	Flooded	l Discha	arge Ti	me-Peak	
Event	t (mm/hr)) Volume	Volu (m3	ime	(mins)	
		(m°)	(m°)		
120 min	Winter 20.94	0.0) 21	93.2	128	
180 min	Winter 15.61	0.0	24	54.8	184	
240 min	Winter 12.61	4 0.0	26	45.9	240	
360 min 400 min	Winter 9.34		, 294 , 214	4U.J 63 9	35U 450	
400 IIIII 600 min	Winter 6.38		, 31)) 33,	45.6	484	
720 min	Winter 5.56	5 0.0) 34	99.4	560	
960 min	Winter 4.48	1 0.0) 37	51.4	714	
1440 min	Winter 3.29	в о.С) 413	17.4	1014	
2160 min	Winter 2.42	4 0.0	463	35.4	1448	
2880 min	Winter 1.94	6 0.0) 49:	59.7	1856	
4320 min	Winter 1.42	/ 0.0) 543	38.5	2644	
5/60 min 7200 min	Winter 1.14	± U.() 58:) 61:	54.U 61 3	34UU 4112	
/200 Min 8640 min	Winter 0.95	- U.U 9 0 0	, 010) 64'	04.3 27.7	4848	
10080 min	Winter 0.74	5 0.0) 664	49.2	5552	

CH2M		Page 3
Ash House		
Falcon Road		4
Exeter EX2 7LB		Mirco
Date 02/07/2018 15:57	Designed by MA047950	Desinado
File BASIN.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	
<u></u>	ainfall Details	
Rainfall Model Return Period (years)	FSR Winter Storms Yes	
Region En	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.000 Shortest Storm (mins) 15	
Summer Storms	Yes Climate Change % +10	
	-	
<u> </u>	ime Area Diagram	
Т	otal Area (ha) 6.360	
Time (mins) Area Time (mir From: To: (ha) From: To	ns) Area Time (mins) Area Time (mins) . : (ha) From: To: (ha) From: To:	Area (ha)
0 4 1.590 4	8 1.590 8 12 1.590 12 16 1	590
©1982	2-2017 XP Solutions	

CH2M		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 02/07/2018 15:57	Designed by MA047950	Desinado
File BASIN.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 15.000

Tank or Pond Structure

Invert Level (m) 13.500

Depth (m) Area (m²) Depth (m) Area (m²)

0.000 1728.0 1.500 2601.0

Orifice Outflow Control

Diameter (m) 0.146 Discharge Coefficient 0.600 Invert Level (m) 13.500



CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					m
Date 25/06/2018 13:52	Desi	aned h	V MA0479	950	MICIO
File PACINI PD1 · F CDCY	Chog	kod by	y MAOI/2	50	Drainage
FILE BASINI_RPI/S.SRCA	Chec	ked by			
XP Solutions	Sour	ce Con	trol 201	17.1.2	
Summary of Results	tor 5	year	Return I	Period (+10%)	
Storm	Max Lovol I	Max N	Max Max	c Status	
Event	(m)	(m) (]	L/s) (m ³)	
15 min Summer	4.824 0).324	22.0 665	.7 ОК	
30 min Summer	4.915 (5 007 ().415	25.7 863	.8 OK	
120 min Summer	5.096 0	.596	31.7 1269	.2 O K	
180 min Summer	5.140 0	0.640	33.1 1372	.4 ОК	
240 min Summer	5.166 0	0.666	33.8 1432	.0 ОК	
360 min Summer	5.191 (5.206 ().691) 706	34.5 1490	.8 OK	
600 min Summer	5.200 C).715	35.2 1547	.5 OK	
720 min Summer	5.220 0	0.720	35.3 1559	.8 ОК	
960 min Summer	5.222 0	.722	35.4 1564	.8 ОК	
1440 min Summer	5.209 (5.171 (0.709	35.0 1532	.6 OK	
2880 min Summer	5.171 ().630	32.8 1349	.4 OK .9 OK	
4320 min Summer	5.054 0	.554	30.5 1175	.2 O K	
5760 min Summer	4.992 (0.492	28.4 1033	.7 ОК	
7200 min Summer	4.940 ().440	26.6 919	.6 O K	
10080 min Summer	4.898 (4.863 ().398	25.0 826	.5 OK	
15 min Winter	4.861 0	.361	23.6 746	.2 O K	
30 min Winter	4.963 0	0.463	27.4 969	.4 ОК	
60 min Winter !	5.066 0	0.566	30.8 1201	.3 ОК	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event (1	mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
15 min Summer	54.369	0.0	599.3	26	
30 min Summer	35.674	0.0	802.2	40	
60 min Summer	22.554	0.0	1088.1	68	
120 min Summer	10 476	0.0	1354.0 1528 2	126	
240 min Summer	8.532	0.0	1661.7	242	
360 min Summer	6.379	0.0	1866.1	318	
480 min Summer	5.186	0.0	2023.6	382	
600 min Summer 720 min Summer	4.414 3.869	0.0	2153.4 2264 4	444 512	
960 min Summer	3.142	0.0	2448.6	650	
1440 min Summer	2.342	0.0	2724.1	924	
2160 min Summer	1.744	0.0	3124.7	1328	
4320 min Summer	1.415 1.054	0.0	3377.4	1732 2504	
5760 min Summer	0.855	0.0	4108.0	3232	
		0 0	1262 1	3968	
7200 min Summer	0.727	0.0	4302.1	5500	
7200 min Summer 8640 min Summer	0.727	0.0	4362.1	4672	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter	0.727 0.637 0.569 54.369	0.0	4302.1 4576.0 4753.2 677 6	4672 5440 26	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter	0.727 0.637 0.569 54.369 35.674	0.0 0.0 0.0 0.0 0.0	4362.1 4576.0 4753.2 677.6 904.4	4672 5440 26 40	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter 60 min Winter	0.727 0.637 0.569 54.369 35.674 22.554	0.0 0.0 0.0 0.0 0.0	4362.1 4576.0 4753.2 677.6 904.4 1222.7	4672 5440 26 40 68	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter 60 min Winter	0.727 0.637 0.569 54.369 35.674 22.554 -2017	0.0 0.0 0.0 0.0 0.0 0.0	4302.1 4576.0 4753.2 677.6 904.4 1222.7	4672 5440 26 40 68	

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- m
$D_{2} = 25/06/2018 = 13.52$	Deg	ianed	hy MA	04795	0	MICLO
	Des		by MA	101/25	0	Drainago
FILE BASINI_RPI/5.SRCA	Che	скеа .	by . 7		1.0	J
XP Solutions	Sou	rce C	ontrol	. 2017	.1.2	
	-	_				
Summary of Results	for	5 yea:	r Retu	ırn Pe	riod (+10%)	-
					-	
Storm	Max Level	Max Depth	Max	Max Volume	Status	
20000	(m)	(m)	(1/s)	(m ³)		
120 min Winter	5.165	0.665	33.8	1430.1	ОК	
240 min Winter	5.210	0.716	35.2	1622 7	0 K	
360 min Winter	5.276	0.776	36.8	1694.6	0 K	
480 min Winter	5.287	0.787	37.1	1720.5	O K	
600 min Winter	5.295	0.795	37.3	1739.9	ОК	
720 min Winter	5.298	0.798	37.4	1746.3	O K	
960 min Winter	5.293	0.793	37.2	1733.7	O K	
1440 min Winter	5.261	0.761	36.4	1658.6	O K	
2160 min Winter	5.199	0.699	34.7	1509.5	ОК	
2880 min Winter	5.136	0.636	32.9	1361.7	OK	
5760 min Winter	5.027 4 943	0.527	29.0	925 5	OK	
7200 min Winter	4.879	0.379	24.3	785.3	0 K	
8640 min Winter	4.830	0.330	22.3	678.8	ОК	
10080 min Winter	4.792	0.292	20.5	596.9	ОК	
Storm Event	Rain (mm/hr)	Flood Volum	ed Disch ne Vol	harge T .ume	ime-Peak (mins)	
		(m³)) (m	13)		
120 min Winter	13.956	5 0	.0 15	520.5	124	
180 min Winter	10.476	5 0	.0 17	715.7	180	
240 min Winter	8.532	2 0	.0 18	865.2	238	
360 min Winter	6.379	0	.0 20	094.1	344	
480 min Winter	5.186	o 0	.0 22	270.5	400	
600 min Winter	4.414 2 060		.0 24	415./	4/U 5/8	
960 min Winter	3.142	200	.0 2'	746.1	702	
1440 min Winter	2.342	2 0	.0 30	053.4	1000	
2160 min Winter	1.744	Ł O	.0 35	502.4	1428	
2880 min Winter	1.415	5 0	.0 37	785.8	1828	
4320 min Winter	1.054	Ł 0	.0 42	211.0	2604	
5760 min Winter	0.855	5 0	.0 46	602.9	3352	
7200 min Winter	0.727	0	.0 48	888.3	4104	
8640 min Winter	0.637		.0 52	129.6 222 2	4832	
10080 min Winter	0.569	, 0	.0 5.	334.3	5544	

CH2M	Page 3						
Ash House Falcon Road Exeter EX2 7LB	L'un						
Date 25/06/2018 13:52	Designed by MA047950 MILLU						
File BASIN1_RP1;5.SRCX	Checked by						
XP Solutions	Source Control 2017.1.2						
Rainfall DetailsRainfall ModelFSRWinter StormsYesReturn Period (years)5Cv (Summer)0.750Region England and WalesCv (Winter)0.840M5-60 (mm)20.000 Shortest Storm (mins)15							
Summer Storms	Yes Climate Change % +10						
<u>Time Area Diagram</u> Total Area (ha) 6.700							
Time (mins) Area T	ime (mins) Area Time (mins) Area						
From: To: (ha) Fr	om: To: (ha) From: To: (ha)						
0 4 2.233	4 8 2.233 8 12 2.233						

СН2М		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 13:52	Designed by MA047950	Desinado
File BASIN1_RP1;5.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					m
Date 25/06/2018 13:54	Degio	med h	V MANA79	50	MICLO
	Charl	ad be	y MAUT/J	50	Drainage
FILE BASINZ_RPI/5.SRCX	Check	kea by	1 0 0 1	- 1 0	J
XP Solutions	Sourc	ce Con	trol 201	7.1.2	
Summary of Results	for 5	year 1	Return P	eriod (+10%)	_
Storm	Max M	Max M	lax Max	Status	
Event	(m) (eptn Con (m) (1	/s) (m ³)	e	
	()	(/ (-	.,,		
15 min Summer	4.843 0.	.343	15.7 462.	1 ОК	
30 min Summer	4.938 O. 5 034 0	.438 534	18.2 599.	V OK	
120 min Summer	5.0340. 5.1240	. 624	20.4 /41.	, <u> </u>	
180 min Summer	5.169 0.	.669	23.1 950.	0 ОК	
240 min Summer	5.194 0.	.694	23.5 990.	3 ОК	
360 min Summer	5.218 0.	.718	24.0 1029.	0 0 K	
480 min Summer	5.232 U. 5.241 ∩	. <i>132</i> .741	∠4.2 1051. 24.4 1064	4 OK	
720 min Summer	5.245 0.	.745	24.5 1071.	5 O K	
960 min Summer	5.245 0.	.745	24.5 1072.	0 ОК	
1440 min Summer	5.229 0.	.729	24.2 1045.	5 O K	
2160 min Summer	5.189 U. 5 145 O	.689 645	23.4 981. 22.6 913	3 OK 4 OK	
4320 min Summer	5.066 0.	.566	21.0 791.	о к 0 о к	
5760 min Summer	5.001 0.	.501	19.6 692.	3 ОК	
7200 min Summer	4.947 0.	.447	18.4 612.	7 O K	
8640 min Summer	4.903 0. 4 866 0	.403 366	17.3 547. 16.4 494		
15 min Winter	4.882 O.	.382	16.8 518.	2 O K	
30 min Winter	4.988 0.	.488	19.4 673.	1 ОК	
60 min Winter !	5.094 0.	.594	21.6 833.	8 O K	
Storm	Rain H	Flooded	Discharge	Time-Peak	
Event (1	mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
15 min Summer	54.369	0 0	430 B	26	
30 min Summer	35.674	0.0	575.5	40	
60 min Summer	22.554	0.0	766.5	68	
120 min Summer	13.956	0.0	952.1	126	
180 min Summer	10.476 8.532	0.0	1073.8 1167 0	⊥84 242	
360 min Summer	6.379	0.0	1309.9	318	
480 min Summer	5.186	0.0	1420.1	382	
600 min Summer	4.414	0.0	1511.0	444	
960 min Summer	3.869	0.0	1718 F	512 650	
1440 min Summer	2.342	0.0	1913.7	926	
2160 min Summer	1.744	0.0	2180.5	1328	
2880 min Summer	1.415	0.0	2357.3	1732	
4320 min Summer 5760 min Summer	1.054	0.0	2623.5 2860 0	2508 3232	
7200 min Summer	0.727	0.0	3038.6	3968	
8640 min Summer	0.637	0.0	3189.5	4680	
10080 min Summer	0.569	0.0	3316.2	5440	
15 min Winter	54.369 35.674	U.O 0 0	487.8 647 2	26 40	
60 min Winter	22.554	0.0	860.4	68	
61000	0017	VD 0-7	and the second second		

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Cu
$D_{2} = 25/06/2018 = 13.54$	Dec	igned k		17050	1	MICLO
	Des	I J J J	Jy MAU-	1/950)	Drainad
File BASINZ_RP175.SRCX	Cne	скеа ру	[J
XP Solutions	Sou	rce Cor	ntrol 2	2017.	.1.2	
Summary of Result	s for	5 year	Returr	ı Pei	riod (+10%)
Storm	Max	Max Donth Co	Max	Max	Status	
Event	(m)	(m) (l/s)	(m ³)		
	((_,_,	()		
120 min Winte	er 5.195	0.695	23.6	991.7	ОК	
180 min Winte 240 min Winte	r 5.247	0.747	24.5 10	122 5	OK	
360 min Winte	r 5.307	0.807	25.6 1	171.7	O K	
480 min Winte	er 5.316	0.816	25.7 1	187.9	ОК	
600 min Winte	er 5.324	0.824	25.8 1	199.8	ОК	
720 min Winte	er 5.325	0.825	25.9 12	202.8	ΟK	
960 min Winte	er 5.319	0.819	25.8 1	191.5	ОК	
1440 min Winte	er 5.285	0.785	25.2 1	135.7	ОК	
2160 min Winte	r 5.218	0.718	24.0 10	028.5	OK	
4320 min Winte	r 5.039	0.539	20.5	749.2	0 K	
5760 min Winte	er 4.951	0.451	18.5 0	518.4	ОК	
7200 min Winte	er 4.884	0.384	16.8	520.6	ОК	
8640 min Winte	er 4.832	0.332	15.4 4	446.2	ОК	
Storm	Rain	Flooded	l Dischar	rge Ti	ime-Peak	
Event	(mm/hr)	Volume	Volum	e	(mins)	
		(m ³)	(m ³)			
120 min Winter	13.956	5 0.0	1068	3.3	124	
180 min Winter	10.476	5 0.0	1204	4.5	180	
240 min Winter	8.532	2 0.0	1309	9.0	238	
360 min Winter	6.379 6 E 104	o .0 ک	1469	9.U D 4	346	
400 min Winter 600 min Winter	- 5.180 c 4.414	L 0.0	1694	4.2	470	
720 min Winter	3.869	0.0	1781	1.4	548	
960 min Winter	3.142	2 0.0	1926	5.4	702	
1440 min Winter	2.342	2 0.0	2143	3.9	1000	
2160 min Winter	1.744	L 0.0	2443	3.3	1428	
2880 min Winter			264]	L.6 1 7	1844 2604	
4320 MINTER 5760 min Winter	- 1.054 c 0.855	5 0.0	, 2941 1 3204	5.1	3352	
7200 min Winter	0.727	7 0.0	3404	4.5	4104	
8640 min Winter	0.637	0.0	3574	1.3	4840	
10080 min Winter	0.569	0.0	3718	3.6	5544	
	- 0.505				5511	

CH2M	Page 3
Ash House	
Falcon Road	L.
Exeter EX2 7LB	Mirco
Date 25/06/2018 13:54	Designed by MA047950
File BASIN2_RP1;5.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Ra	ainfall Details
Rainfall Model	FSR Winter Storms Yes
Return Period (years)	5 Cv (Summer) 0.750
Region Eng	land and Wales Cv (Winter) 0.840
M5-60 (mm) Ratio R	0.350 Longest Storm (mins) 15
Summer Storms	Yes Climate Change % +10
Ti	me Area Diagram
То	tal Area (ha) 4.660
Time (mins) Area	Time (mins) Area Time (mins) Area
From: To: (ha) F	rom: To: (ha) From: To: (ha)
0 4 1.553	4 8 1.553 8 12 1.553

СН2М		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 13:54	Designed by MA047950	Desinado
File BASIN2_RP1;5.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					m
$D_{2} = 25/06/2018 + 13.46$	Degi	aned h	MA0479	50	MICLO
File PACINI PD1.10 CPCV	Choo	kod by	y MAO179.	50	Drainage
FILE BASINI_RPI/IU.SRCA	Chec	Ked by	1 0 0 1 1	7 1 0	2
XP Solutions	Sour	ce Con	trol 201	7.1.2	
		_			
Summary of Results f	or 1) year	Return P	eriod (+10%)
Ch aver	M		()(6 + + + + + =	
Event I	max Level I	Max r Depth Cor	nax Max	e	
	(m)	(m) (]	L/s) (m ³)	-	
		254	04.1 550	4	
15 min Summer 4 30 min Summer 4	4.874 (1981 ().374	24.1 773.	4 OK 0 OK	
60 min Summer 5	5.089 ().589	31.5 1255.	о к 1 ок	
120 min Summer 5	5.192 (.692	34.5 1493.	2 ОК	
180 min Summer 5	5.243 (.743	35.9 1614.	1 ОК	
240 min Summer 5 360 min Summer 5	5.272 (5.299 ().772	36.7 1683. 37.4 1740	т ОК 2. Ок	
480 min Summer 5	5.314 ().814	37.8 1785.	1 ОК	
600 min Summer 5	5.323 (.823	38.0 1806.	б ОК	
720 min Summer 5	5.328 (.828	38.1 1818.	4 ОК	
960 min Summer 5	5.329 (5.312 ().829) 812	38.2 1821. 37 7 1780	20K 60K	
2160 min Summer 5	5.269 ().769	36.6 1677.	5 ОК	
2880 min Summer 5	5.223 (.723	35.4 1565.	8 ОК	
4320 min Summer 5	5.135 (.635	32.9 1361.	5 ОК	
5760 min Summer 5	5.063 (0.563	30.7 1193.	9 ОК 7 ОК	
8640 min Summer 4	4.954 ().454	27.1 949.	4 O K	
10080 min Summer 4	4.913 (0.413	25.6 860.	0 ОК	
15 min Winter 4	4.917 ().417	25.7 867.	ООК	
30 min Winter 5	5.036 (5.157 ().536	29.9 1133. 33 5 1410	4 OK 5 OK	
	5.157		55.5 1110.	5 0 10	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event (1	/ 111)	(m ³)	(m ³)	(mins)	
		(()		
15 min Summer 6	63.115	0.0	704.2	26	
30 min Summer 4	41.638	0.0	944.5	40	
120 min Summer	16.328	0.0	1589.8	126	
180 min Summer 1	12.224	0.0	1788.7	184	
240 min Summer	9.925	0.0	1938.4	242	
360 min Summer 480 min Summer	7.394 5.994	0.0	∠⊥68.2 2344 1	336 392	
600 min Summer	5.090	0.0	2488.1	454	
720 min Summer	4.453	0.0	2610.8	520	
960 min Summer	3.604	0.0	2813.4	658	
1440 min Summer 2160 min Summer	2.673	0.0	3112.1 3551 6	932 1344	
2880 min Summer	1.601	0.0	3823.5	1736	
4320 min Summer	1.185	0.0	4226.2	2512	
5760 min Summer	0.957	0.0	4599.6	3240	
7200 min Summer 8640 min Summer	U.811 0.708	0.0	4868.0 5093 9	3968 4688	
10080 min Summer	0.632	0.0	5280.8	5448	
15 min Winter 6	63.115	0.0	794.9	26	
30 min Winter	41.638	0.0	1063.3	40	
60 min winter 2	20.403	0.0	143/.1	00	

						Page 2
Ash House						
Falcon Road						4
Eveter FX2 7LB						- m
	Dee		147	04705	0	Micro
Date 25/06/2018 13:46	Des	ignea i	у ма	04/95	0	Drainage
File BASIN1_RP1;10.SRCX	Che	cked by	!			Brannage
XP Solutions	Sou	rce Coi	ntrol	2017	.1.2	
Summary of Results	for 1	.0 year	Retu	ırn Pe	eriod (+109	e)
Storm	Max	Max	Max	Max	Status	
Event	Level	Depth Co	ntrol	Volume		
	(m)	(m) (1/s)	(m³)		
120 min Winter	5.271	0.771	36.7	1682.2	ОК	
180 min Winter	5.330	0.830	38.2	1823.3	ОК	
240 min Winter	5.364	0.864	39.0	1906.7	O K	
360 min Winter	5.398	0.898	39.9	1992.0	O K	
480 min Winter	5.410	0.910	40.2	2020.1	ОК	
600 min Winter	5.410 5.410	0.910	40.3	2036.7	OK	
960 min Winter	5.419	0.919	40.4	2043.3	OK	
1440 min Winter	5.378	0.878	39.4	1941.6	0 K	
2160 min Winter	5.307	0.807	37.6	1769.0	O K	
2880 min Winter	5.236	0.736	35.7	1597.3	ОК	
4320 min Winter	5.111	0.611	32.2	1305.3	O K	
5760 min Winter	5.014	0.514	29.2	1083.3	O K	
7200 min Winter	4.939	0.439	26.6	916.3	O K	
8640 min Winter	4.881	0.381	24.4	788.8	ОК	
10000 mill winter	1.055	0.555	22.3	090.1	0 K	
Storm	Rain	Flooded	Disch	arge T	ime-Peak	
Event (mm/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	³)		
120 min Winter	16.328	0.0	17	84.6	124	
180 min Winter	12.224	0.0	20	07.3	182	
240 min Winter	9.925	0.0	21	75.0	238	
	7.394	. 0.0	24	32.3	348	
360 min winter				00 1		
480 min Winter 480 min Winter	5.994	0.0	26	29.1	444	
480 min Winter 600 min Winter	5.994	0.0	26 27	90.2	444 478	
480 min Winter 480 min Winter 600 min Winter 720 min Winter	5.994 5.090 4.453	0.0 0.0	26 27 29	90.2 27.5	444 478 554	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter	5.994 5.090 4.453 3.604		26 27 29 31	29.1 790.2 27.5 .53.9	444 478 554 710	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter	5.994 5.090 4.453 3.604 2.673 1.981		26 27 29 31 34	29.1 290.2 27.5 .53.9 185.9	444 478 554 710 1010 1436	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601		26 27 29 31 34 39 42	29.1 290.2 27.5 53.9 85.9 80.5 285.4	444 478 554 710 1010 1436 1848	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185		26 27 29 31 34 39 42 47	29.1 290.2 27.5 .53.9 85.9 980.5 285.4 239.7	444 478 554 710 1010 1436 1848 2640	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957		26 27 29 31 34 39 42 47 51	29.1 790.2 27.5 .53.9 885.9 885.9 885.4 739.7 .53.5	444 478 554 710 1010 1436 1848 2640 3400	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811		26 27 29 31 34 39 42 47 51 54	29.1 790.2 27.5 53.9 85.9 880.5 285.4 739.7 .53.5 854.8	444 478 554 710 1010 1436 1848 2640 3400 4112	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708	0.0 0.0	26 27 29 31 34 39 42 47 51 54 57	29.1 290.2 27.5 53.9 85.9 885.4 239.7 53.5 85.4 239.7 53.5	444 478 554 710 1010 1436 1848 2640 3400 4112 4848	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708 0.632	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	26 27 29 31 34 39 42 47 51 54 57 59	29.1 290.2 27.5 53.9 85.9 80.5 239.7 -53.5 85.4 239.7 -53.5 85.4 209.5 923.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708 0.632		26 27 29 31 34 39 42 47 51 54 57 59	290.2 290.2 27.5 53.9 885.9 885.4 239.7 553.5 54.8 209.5 223.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708 0.632		260 260 270 290 290 311 344 399 390 422 477 477 511 544 577 59	290.2 290.2 27.5 253.9 285.9 280.5 285.4 239.7 253.5 254.8 209.5 223.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.185 0.957 0.811 0.708 0.632		26 27 29 31 34 39 42 47 51 54 57 59	290.2 207.5 53.9 280.5 285.4 299.7 53.5 54.8 209.5 223.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708 0.632		26 27 29 31 34 39 42 47 51 54 57 59	290.2 227.5 53.9 185.9 180.5 1885.4 239.7 53.5 54.8 023.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	
480 min Winter 480 min Winter 600 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	5.994 5.090 4.453 3.604 2.673 1.981 1.601 1.185 0.957 0.811 0.708 0.632		26 27 29 31 34 39 42 47 51 54 57 59	290.2 227.5 53.9 185.9 180.5 185.4 39.7 53.5 154.8 209.5 223.3	444 478 554 710 1010 1436 1848 2640 3400 4112 4848 5552	

CH2M	Page 3
Ash House	
Falcon Road	L.
Exeter EX2 7LB	Micco
Date 25/06/2018 13:46	Designed by MA047950
File BASIN1_RP1;10.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Rai	infall Details
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 10 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
Tim	e Area Diagram
Tota	al Area (ha) 6.700
Time (mins) Area Ti From: To: (ha) Fr	ime (mins) Area Time (mins) Area om: To: (ha) From: To: (ha)
0 4 2.233	4 8 2.233 8 12 2.233

СН2М		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 13:46	Designed by MA047950	Desinado
File BASIN1_RP1;10.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						m
Date 25/06/2018 13:55	Degi	aned h	V MA	04795	0	MICIO
File PACIN2 PD1.10 CPCV	Chog	kod by	y 1°11 1	01/99	0	Drainage
FILE BASINZ_RPI/IU.SRCA	Chec	Ked by		0015	1 0	,
XP Solutions	Sour	ce Con	trol	2017	.1.2	
		_	- .	-		
Summary of Results f	or 10) year	Retu	irn Pe	eriod (+10%)	-
Event I	Max .evel D	Max r Depth Cor	trol	Volume	Status	
	(m)	(m) (]	/s)	(m ³)		
15 min Summer 4 30 min Summer 5	1.895 0 5 007 0	.395 507	17.1	537.1	OK	
60 min Summer 5	5.0070	0.618	22.1	871.3	0 K	
120 min Summer 5	5.223 0	.723	24.1	1035.5	O K	
180 min Summer 5	5.274 0	.774	25.0	1118.4	O K	
240 min Summer 5	5.303 0	.803	25.5	1165.3	ОК	
480 min Summer 5	5.329 U 5.343 O	1.829	25.9	1209.3	OK	
600 min Summer 5	5.351 0	0.851	26.3	1245.3	O K	
720 min Summer 5	5.355 0	.855	26.4	1251.9	O K	
960 min Summer 5	5.354 0	.854	26.4	1251.0	O K	
1440 min Summer 5	5.335 0	0.835	26.0	1218.7	OK	
2160 min Summer 5 2880 min Summer 5	5.289 0	.789	25.3	1064.2	O K	
4320 min Summer 5	5.150 0	.650	22.7	921.3	ОК	
5760 min Summer 5	5.075 0	.575	21.2	804.3	O K	
7200 min Summer 5	5.013 0	.513	19.9	710.9	O K	
8640 min Summer 4	1.962 0 1 010 0	110	18.7	634.2	OK	
15 min Winter 4	1.919 0 1.940 0	0.419	18.2	571.0 602.3	0 K	
30 min Winter 5	5.064 0	.564	21.0	787.3	O K	
60 min Winter 5	5.187 0	.687	23.4	979.4	O K	
Storm	Rain	Flooded	Disch	narge T	ime-Peak	
Event (1	mm/hr)	Volume	Vol	ume	(mins)	
		(m ³)	(m	3)		
15 min Summer 6	53.115	0.0	5	506.5	26	
30 min Summer 4	41.638	0.0	6	575.5	40	
60 min Summer 2	26.403	0.0	9	900.0	68	
120 min Summer 1	16.328	0.0	11	16.6	126	
180 min Summer 240 min Summer	12.224 9.925	0.0	12 13	455.5 860.1	⊥84 242	
360 min Summer	7.394	0.0	15	520.7	336	
480 min Summer	5.994	0.0	16	543.8	392	
600 min Summer	5.090	0.0	17	744.8	456	
720 min Summer	4.453	0.0	18	330.9	520	
960 min Summer 1440 min Summer	3.004 2.673	0.0	21	, / 3 . 4 .85 . 1	050 932	
2160 min Summer	1.981	0.0	24	177.6	1344	
2880 min Summer	1.601	0.0	26	567.9	1736	
4320 min Summer	1.185	0.0	29	952.4	2512	
5760 min Summer 7200 min Summer	0.957	0.0	32	402.8 890 5	3248 3976	
8640 min Summer	0.708	0.0	35	549.7	4752	
10080 min Summer	0.632	0.0	36	583.4	5448	
15 min Winter 6	53.115	0.0	5	570.3	26	
30 min Winter 4 60 min Winter 3	±1.638 26.403	U.U 0 0	7 10	159.0 109.9	40 68	
Job mill whiter 2						
	2017	VD SOL	utic	ng		

CH2M						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Cu
Date 25/06/2018 13:55	Deg	ianeć	by MA	04795	50	- MICLO
$E_{1}^{1} = DACIN2 DD1 \cdot 10 CDCY$	Cha	alrod	bu	101792		Drainag
FILE BASINZ_RPI,IU.SRCA	Cile	ckeu	yu	0.01	1 0	_
XP Solutions	Sou	rce (ontrol	. 2017	7.1.2	
	с 1	0	D. I	5		0.)
Summary of Results	ior 1	.0 ye	ar Reti	urn P	eriod (+10	8)
Storm	Mav	Mav	Mav	Mav	Statud	
Event	Level	Depth	Control	Volume	9	
	(m)	(m)	(l/s)	(m³)		
100 min Mintor	E 204	0 004		1167		
120 min Winter 180 min Winter	5.304	0.804	25.5 26.5	1264	5 OK	
240 min Winter	5.397	0.897	27.0	1321.5	бок	
360 min Winter	5.431	0.931	27.6	1379.4	1 ОК	
480 min Winter	5.441	0.941	27.8	1397.5	5 ОК	
600 min Winter	5.447	0.947	27.8	1407.1	LОК	
720 min Winter	5.449	0.949	27.9	1410.4	4 ОК	
960 min Winter	5.441	0.941	27.8	1397.0	5 ОК	
1440 min Winter	5.404	0.904	27.2	1333.8	3 ОК	
2160 min Winter	5.330	0.830	26.0	1210.4	4 ОК	
2880 min Winter	5.256	0.756	24.7	1089.2	2 ОК	
4320 min Winter	5.127	0.627	22.3	884.5	ОК	
5760 min Winter	5.026	0.526	20.2	610	B OK	
8640 min Winter	4.947	0.447	16.4	523 5		
10080 min Winter	4.838	0.338	15.6	454.5	5 ОК	
Storm	Pain	Floor	led Disa	harge '	Time-Desk	
Event	Rain (mm/hr)	Volu	me Vol	ume	(ming)	
Event	(1111)	(m ³) (m	1 ³)	(mills)	
120 min Winter	16.328	. (0.0 12	252.5	124	
180 min Winter	12.224	. (408.0	182	
240 min Winter	9.925		1.0 1	5∠5.⊥ 704 0	238 210	
480 min Winter	5 994	: ().0 1s	,04.9 842 7	340 446	
600 min Winter	5.090) (10^{-10}	955.6	478	
720 min Winter	4.453	; ().0 20	052.0	556	
960 min Winter	3.604	. (0.0 22	211.2	710	
1440 min Winter	2.673	. (0.0 24	446.4	1012	
2160 min Winter	1.981	. (0.0 27	776.1	1440	
2880 min Winter	1.601	. (0.0 29	989.4	1852	
4320 min Winter	1.185	. (0.0 33	309.7	2640	
5760 min Winter	0.957	· (J.U 35	588.1	3400	
/200 min Winter 8640 min Winter	0.811 0.700) O 30	198.6 977 0	4112 1010	
10080 min Winter	0.632	. (1.0 32	129.9	5552	
TOODO WITH WINCEL	5.052	. (1.	,	5552	

CH2M	Page 3
Ash House	
Falcon Road	
Exeter EX2 7LB	Mirro
Date 25/06/2018 13:55	Designed by MA047950
File BASIN2_RP1;10.SRCX	Checked by
XP Solutions	Source Control 2017.1.2
Ra	infall Details
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 10 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10
Tin	e Area Diagram
110	
Tot	al Area (ha) 4.660
Time (mins) Area T	ime (mins) Area Time (mins) Area
From: To: (ha) Fr	om: To: (ha) From: To: (ha)
0 4 1.553	4 8 1.553 8 12 1.553

СН2М		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 13:55	Designed by MA047950	Desinado
File BASIN2_RP1;10.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						Misson
Date 25/06/2018 14:00	Desi	qned b	y MA	04795	0	MILIU
File Basin1 50%permeability	Chec	ked bv	-			Urainage
XP Solutions	Sour	ce Con	trol	2017	.1.2	
	0041			2027		
Summary of Results f	Eor 30) year	Retu	ırn Pe	eriod (+10%)
		1				<u>, </u>
Storm	Max	Max 1	Max	Max	Status	
Event I	Level I	Depth Con	ntrol	Volume		
	(m)	(m) (.	L/S)	(m³)		
15 min Summer 4	4.740 C	.240	17.9	487.2	O K	
30 min Summer 4	4.812 C).312	21.5	640.2	ОК	
120 min Summer 4	1.004 (1.950 ().450	⊿ч.э 27.0	941.0	O K	
180 min Summer 4	4.979 C	.479	28.0	1006.1	ОК	
240 min Summer 4	4.993 0).493	28.5	1036.6	ОК	
360 min Summer 5 480 min Summer 5	5.007 C).507).514	28.9	1084 1	ОК	
600 min Summer 5	5.018 0	.518	29.3	1091.6	O K	
720 min Summer 5	5.018 0	.518	29.3	1092.6	O K	
960 min Summer 5	5.013 C).513	29.1	1081.9	ОК	
2160 min Summer 4	4.955 C).455	20.4	951.6	O K	
2880 min Summer 4	4.918 0	.418	25.8	869.7	ОК	
4320 min Summer 4	4.856 C	.356	23.4	735.0	ОК	
5760 min Summer 4 7200 min Summer 4	4.809 C 4 774 C).309	21.4 19 7	634.6 559.6	ОК	
8640 min Summer 4	4.747 C).247	18.3	502.7	ОК	
10080 min Summer 4	4.726 0	.226	17.2	458.1	O K	
15 min Winter 4	4.768 C).268	19.4	545.9	ОК	
60 min Winter 4	4.930 C).430	25.0	895.5	ОК	
Storm	Rain	Flooded	Disch	harge T	ime-Peak	
Event (1	mm/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	3)		
15 min Summer 7	79.950	0.0	4	126.6	30	
30 min Summer 5	53.199	0.0	5	584.7	43	
60 min Summer 3	33.892 20 040	0.0	8	309.2 107 3	72 128	
180 min Summer 1	15.610	0.0	11	29.8	184	
240 min Summer 1	12.614	0.0	12	219.3	240	
360 min Summer	9.343	0.0	13	357.2	300	
600 min Summer	7.540 6.381	0.0	14	±0⊥.0 546.5	30∠ 428	
720 min Summer	5.565	0.0	16	518.5	498	
960 min Summer	4.481	0.0	17	736.3	634	
1440 min Summer 2160 min Summer	3.298	0.0	19 21	08.8 64.0	908 1304	
2880 min Summer	1.946	0.0	23	313.6	1684	
4320 min Summer	1.427	0.0	25	527.1	2432	
5760 min Summer	1.144	0.0	27 29	43.2 86 6	3176 3896	
8640 min Summer	0.839	0.0	30	05.3	4584	
10080 min Summer	0.745	0.0	30	99.3	5256	
15 min Winter	79.950	0.0	4	184.1	29	
60 min Winter	33.892	0.0	6	910.3	43 70	
	0017	VD Col	-	nc		
	- /// /					

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							Magan
Date 25/06/2018 14:00)	Des	ianed	by MA	04795	50	MICIO
File Pagin1 50%perme	- bili+v	Cho	akod	by	10 1 / 2 2		Drainago
File Basini_30%permea	aDIIICy		CKEU	yu Yu	0.01	1 0	3
XP Solutions		Sou	rce C	ontrol	. 2017	.1.2	
					-		
Summary of	Results	IOT :	su yea	ar Reti	urn P	eriod (+10%)	-
	Storm	Max	Max	Max	Max	Status	
	Event	Level	Depth	Control	Volume	9	
		(m)	(m)	(1/s)	(m ³)		
1.00	and a sector to the sector tot	F 004	0 504		1000	r	
120	min Winter	5.004	0.504	28.8	1137 °	OK OK	
240) min Winter	5.054	0.554	29.9 30.5	1175	2 O K	
360	min Winter	5.067	0.567	30.9	1204.8	3 ОК	
480	min Winter	5.072	0.572	31.0	1216.4	4 ОК	
600	min Winter	5.073	0.573	31.1	1218.0) ОК	
720) min Winter	5.070	0.570	31.0	1210.9	о к	
960	min Winter	5.057	0.557	30.6	1181.6	5 ОК	
1440	min Winter	5.020	0.520	29.4	1098.1	ОК	
2160	min Winter	4.961	0.461	27.4	965.8	B OK	
4320) min Winter	4.908	0.408	25.4 22.1	669 9	5 OK	
5760) min Winter	4.769	0.269	19.4	548.0) ОК	
7200	min Winter	4.729	0.229	17.4	465.4	4 OK	
8640	min Winter	4.704	0.204	15.8	413.3	в ок	
10080) min Winter	4.689	0.189	14.2	382.0	ОК	
	Storm	Rain	Flood	ed Discl	harge :	Time-Peak	
:	Event	(mm/hr)	Volu	ne Vol	.ume	(mins)	
			(m³) (m	13)		
120	min Winter	20.940) 0	.0 13	132.3	126	
180	min Winter	15.610) 0	.0 12	269.5	182	
240	min Winter	12.614	ŧ 0	.0 13	369.8	236	
360	min Winter	9.343	3 0	.0 1!	524.3	338	
480	min Winter	7.540) 0	.0 10	641.3	382	
600 720	min Winter	6.381		.0 1	736.5 017 0	458	
960	min Winter	4 481	, U	0 10	949 3	686	
1440	min Winter	3.298	3 0	.0 2	142.7	976	
2160	min Winter	2.424	ŧ 0	.0 24	426.5	1388	
2880	min Winter	1.946	5 0	.0 25	594.8	1788	
4320	min Winter	1.427	7 0	.0 28	836.4	2520	
5760	min Winter	1.144	£ 0	.0 30	074.4	3240	
7200	min Winter	0.964	£ 0	.0 32	235.7	3960	
864U 10000	min Winter	0.835	, U	.0 3	570.U 478 4	4592 5344	
10080	min Miller	0./45	, U	.0 34	1/0.4	5544	

CH2M				Page 3
Ash House				
Falcon Road				4
Exeter EX2 7LB				m
Date 25/06/2018 14:00	Desi	gned by MAO	47950	
File Basin1 50%permeabilit	y Chec	ked by		Urainage
XP Solutions	Sour	ce Control	2017.1.2	
	Rainfal	l Details		
Rainfall Mode	1	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer) 0.	750
Regio M5-60 (mm	n England and)	1 Wales 20.000 Shortes	Cv (Winter) 0. st Storm (mins)	840 15
Ratio	R	0.350 Longes	st Storm (mins) 10	080
Summer Storm	S	Yes Cl	imate Change %	+10
	<u>Time Are</u>	a Diagram		
	Total Area	a (ha) 3.350		
Time (mins) Area Time From: To: (ha) From:	(mins) Area To: (ha)	Time (mins) From: To:	Area Time (min (ha) From: To:	s) Area : (ha)
				16 0 020
0 4 0.837 4	8 0.83	8 12	0.838 12	16 0.838
	1000 0017	VD Solution	NG	
©	1902-201/	AP SOLUTION	12	

CH2M		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 14:00	Designed by MA047950	Desinado
File Basin1_50%permeability	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M					Page 1
Ash House					
Falcon Road					4
Exeter EX2 7LB					m
Date 25/06/2018 14:06	Desi	aned b	v MA0479	50	MICIO
File Basin2 50%permeability	Chec	ked bv			Drainage
VD Solutions	Sour	de Con	+rol 201	7 1 2	-
AF SOLUCIONS	SOUL		CIOI ZUI	/.1.2	
Summary of Pogulta	for 30	Jugar	Poturn 1	$Deriod (\pm 108)$)
Summary of Results i	101 30	J year	Recurii i	201100 (+10%	<u>)</u>
Storm	Max	Max 1	Max Max	Status	
Event 1	Level D	epth Con	ntrol Volu	ne	
	(m)	(m) (1	L/s) (m³))	
15 min Summer	4 754 0	254	13 0 337	6 ОК	
30 min Summer	4.830 0	.330	15.4 443	.8 O K	
60 min Summer	4.906 0	.406	17.4 552	.2 ОК	
120 min Summer	4.973 0	.473	19.0 651	.1 OK	
240 min Summer	5.003 0 5.016 0	0.503	20.0 714	.0 0 K .8 0 K	
360 min Summer	5.029 0	.529	20.2 734	.2 O K	
480 min Summer	5.035 0	.535	20.4 743	.9 ОК	
600 min Summer	5.037 0	0.537 1.537	20.4 747	.3 O K	
960 min Summer	5.037 0	.530	20.3 735	.9 OK	
1440 min Summer	5.006 0	.506	19.8 700	.0 ОК	
2160 min Summer	4.964 0	.464	18.8 637	4 ОК	
4320 min Summer	4.924 0 4.858 0	1.424	16.2 483	.6 OK 2 OK	
5760 min Summer	4.808 0	.308	14.7 412	.6 OK	
7200 min Summer	4.770 0	.270	13.6 359	.7 ОК	
8640 min Summer	4.741 0	.241	12.6 319	.1 OK	
15 min Winter	4.718 U 4.784 O	0.218	14.0 378	.0 0 K .5 0 K	
30 min Winter	4.869 0	.369	16.4 498	.3 ОК	
60 min Winter	4.953 0	.453	18.5 620	.9 ОК	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event (1	mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
15 min Summer	79 950	0 0	3 11 <i>1</i>	29	
30 min Summer	53.199	0.0	422.7	43	
60 min Summer	33.892	0.0	572.0	72	
120 min Summer	20.940	0.0	710.2	128	
240 min Summer	12.614	0.0	858.4	240	
360 min Summer	9.343	0.0	954.8	300	
480 min Summer	7.540	0.0	1028.0	362	
600 min Summer	6.381 5 565	0.0	1087.6	428 498	
960 min Summer	4.481	0.0	1221.1	634	
1440 min Summer	3.298	0.0	1343.7	908	
2160 min Summer	2.424	0.0	1511.7	1304	
4320 min Summer	⊥.946 1.427	0.0	1769.0	1688 2432	
5760 min Summer	1.144	0.0	1911.5	3176	
7200 min Summer	0.964	0.0	2012.2	3896	
8640 min Summer	0.839	0.0	2096.5 2164 9	4592 5344	
15 min Winter	79.950	0.0	351.9	29	
30 min Winter	53.199	0.0	476.4	43	
60 min Winter	33.892	0.0	642.5	70	
©1982-	-2017	XP Sol	lutions		

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							- Cu
Date 25/06/2018 14:06	5	Des	igned	by MA	04795	0	MICIO
Filo Pagin2 E0%pormos	hilitr	Cho	akod	by	01/20	0	Drainage
File Basiliz_50%perillea	DIIICY		CKEU	yu yu	0010	1 0	3
XP Solutions		Sou	rce C	ontrol	2017	.1.2	
		- ·			-		
Summary of	Results	ior :	30 yea	ar Reti	irn Pe	eriod (+10%)	_
	Storm	Mou	Mow	Move	More	Status	
	Event	Level	Depth	Control	Volume	Status	
		(m)	(m)	(l/s)	(m ³)		
100			0 500		524 2		
120	min Winter	5.029	0.529	20.2	734.3	OK	
240	min Winter	5.080	0.580	21.3	811.4	ОК	
360	min Winter	5.092	0.592	21.6	829.8	ОК	
480	min Winter	5.096	0.596	21.6	836.2	O K	
600	min Winter	5.095	0.595	21.6	835.5	O K	
720	min Winter	5.091	0.591	21.6	829.0	ОК	
960	min Winter	5.076	0.576	21.2	805.9	ОК	
1440	min Winter	5.035 1 071	0.535	20.4	743.8 648 0	OK	
2100	min Winter	4.971	0.471	17.6	564 6	OK	
4320	min Winter	4.826	0.326	15.3	438.3	ОК	
5760	min Winter	4.765	0.265	13.4	352.7	O K	
7200	min Winter	4.723	0.223	11.9	294.2	O K	
8640	min Winter	4.693	0.193	10.8	253.0	O K	
10080	min Winter	4.672	0.172	9.9	224.6	O K	
5	Storm	Rain	Flood	led Discl	harge T	ime-Peak	
1	Event (mm/hr)) Volu	ne Vol	ume	(mins)	
			(m ³) (m	13)		
120	min Winter	20.940	0 0	.0 '	797.4	126	
180	min Winter	15.610	0 0	.0 8	893.3	182	
240	min Winter	12.614	1 0	.0 9	963.4	236	
360	min Winter	9.343	3 0	.0 10	071.4	338	
480	min Winter	7.540	ט נ י		153.4	382	
600 720	min Winter	5 565	5 0		∠∠∪.∠ 276 &	400 536	
960	min Winter	4.481	L 0	.0 1	369.9	686	
1440	min Winter	3.298	3 0	.0 1	507.1	976	
2160	min Winter	2.424	1 0	.0 10	594.4	1388	
2880	min Winter	1.946	5 0	.0 18	812.6	1788	
4320	min Winter	1.427	70	.0 19	984.4	2548	
5760	min Winter	1.144	± 0	.0 21	141.9	3280	
/200	min Winter	0.964	± U a) ∩	1.0 22	404.9 350 0	3908 4672	
10080	min Winter	0.74	5 0	.0 2	428.5	5336	
10000		/ 10	. 0				

CH2M	Page 3
Ash House	
Falcon Road	<u> </u>
Exeter EX2 7LB	Mirro
Date 25/06/2018 14:06	Designed by MA047950
File Basin2_50%permeability	Checked by
XP Solutions	Source Control 2017.1.2
Rai	infall Details
Rainfall Model	FSR Winter Storms Yes
Return Period (years)	30 Cv (Summer) 0.750
Region Engla M5-60 (mm)	land and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15
Ratio R	0.350 Longest Storm (mins) 10080
Summer Storms	Yes Climate Change % +10
Tim	me Area Diagram
Tota	tal Area (ha) 2.330
Time (mins) Area Time (mins) From: To: (ha) From: To:	(ha) From: To: (ha) From: To: (ha)
0 4 0.582 4 8	8 0.582 8 12 0.583 12 16 0.583
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CH2M		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 14:06	Designed by MA047950	Desinado
File Basin2_50%permeability	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						m
Date 25/06/2018 14:03	Degi	aned h	α <i>r</i> MΔ	04795	0	MICLO
File Decip1 75%permeshility	Chog	lead by	'y 1117.	.0-775	0	Drainage
File Basini_/5%permeability	Chee	ked by		0.01.5	1.0	5
XP Solutions	Sour	ce Con	trol	2017	.1.2	
		-				
Summary of Results f	for 30	0 year	Retı	ırn Pe	eriod (+10%	<u>)</u>
Storm	Max	Max 1	Max	Max	Status	
Event 1	(m)	(m) ()	l/s)	(m ³)	I	
	((_, _,	()		
15 min Summer 4	4.855 C	0.355	23.3	731.8	O K	
30 min Summer 4	4.961 (5 067 ().461	27.3	964.2	OK	
120 min Summer 5	5.166 C	0.666	33.8	1431.8	ОК	
180 min Summer 5	5.212 0	0.712	35.1	1540.8	ОК	
240 min Summer 5	5.236 0	0.736	35.8	1598.0	ОК	
360 min Summer 5	5.258 C	J.758	36.3	1649.9	ОК	
600 min Summer 5	5.209 C 5.274 C).774	36.8	1689.1	0 K	
720 min Summer 5	5.276 0	.776	36.8	1694.0	0 К	
960 min Summer 5	5.273 0	0.773	36.7	1685.6	O K	
1440 min Summer 5	5.250 C	0.750	36.1	1630.5	ОК	
2160 min Summer 5 2880 min Summer 5	5.202 (5.152 ().652	34.8	1400.7	OK	
4320 min Summer 5	5.064 0	0.564	30.8	1197.7	O K	
5760 min Summer 4	4.994 0	0.494	28.5	1038.3	O K	
7200 min Summer 4	4.938 C	0.438	26.5	913.5	ОК	
10080 min Summer 4	±.892 (4.855 ().392	24.8	813.7 732.1	OK	
15 min Winter 4	4.895 C).395	24.9	820.4	ОК	
30 min Winter 5	5.013 C	0.513	29.1	1082.2	O K	
60 min Winter 5	5.132 0	0.632	32.8	1353.5	O K	
Storm	Rain	Flooded	Disch	narge I	'ime-Peak	
Event (I	mm/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	3)		
15 min Cummor 5	79 950	0 0	6	566 2	30	
30 min Summer	53.199	0.0	ç	903.0	44	
60 min Summer 3	33.892	0.0	12	230.6	72	
120 min Summer 2	20.940	0.0	15	527.8	128	
180 min Summer 1 240 min Summer 1	12.614	U.U N N	17	/⊥⊥.'/ 346.0	⊥86 244	
360 min Summer	9.343	0.0	20)52.9	330	
480 min Summer	7.540	0.0	22	209.8	390	
600 min Summer	6.381	0.0	23	337.2	452	
720 min Summer	5.565 4 4.81	0.0	24	±45.0 521 5	518 656	
1440 min Summer	3.298	0.0	28	378.6	930	
2160 min Summer	2.424	0.0	32	257.1	1332	
2880 min Summer	1.946	0.0	34	483.9	1732	
4320 min Summer 5760 min Summer	⊥.427	0.0	38	312.2	2508	
	1 1 4 4	Ο Ο	<u>⊿</u> 1	122 4	5/5/	
7200 min Summer	1.144 0.964	0.0 0.0	41 43	L22.4 339.3	3232	
7200 min Summer 8640 min Summer	1.144 0.964 0.839	0.0 0.0 0.0	41 43 45	122.4 339.3 520.7	3232 3968 4680	
7200 min Summer 8640 min Summer 10080 min Summer	1.144 0.964 0.839 0.745	0.0 0.0 0.0 0.0	4] 43 49 46	122.4 339.3 520.7 568.1	3232 3968 4680 5440	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter	1.144 0.964 0.839 0.745 79.950 53.199	0.0 0.0 0.0 0.0 0.0	41 43 49 46 7	122.4 339.3 520.7 568.1 752.5	3232 3968 4680 5440 30 43	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter 60 min Winter	1.144 0.964 0.839 0.745 79.950 53.199 33.892	0.0 0.0 0.0 0.0 0.0 0.0 0.0	41 43 45 46 7 10 13	122.4 339.3 520.7 568.1 752.5 016.9 382.3	3232 3968 4680 5440 30 43 72	
7200 min Summer 8640 min Summer 10080 min Summer 15 min Winter 30 min Winter 60 min Winter	1.144 0.964 0.839 0.745 79.950 53.199 33.892	0.0 0.0 0.0 0.0 0.0 0.0 0.0	41 43 49 46 7 10 13	122.4 339.3 520.7 568.1 752.5 016.9 382.3	3232 3968 4680 5440 30 43 72	

CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							C
Date 25/06/2018 14:07	2	Deg	ianed	by MA	04795	0	- MICLO
$Eile Parin 1 7E^{\circ} parma$	Cho	alead	by Mr.	10 1795	0	Drainac	
File Basini_/5%permea	ability	. Che	скеа	ya		1.0	
XP Solutions		Sou	rce C	ontrol	2017	.1.2	
Summary of	Results	for 3	30 yea	ar Reti	urn P	eriod (+10%	<u>)</u>
	Storm	Max	Max	Max	Max	Status	
	Event	Level	Depth	Control	Volume		
		(m)	(m)	(l/s)	(m³)		
1.00		F 040	0 740	25 0	1612 1	0.17	
120) min Winter	5.242	0.742	35.9	1740 5	. OK	
240) min Winter	5.324	0.824	38.1	1810 5	O K	
360) min Winter	5.352	0.852	38.7	1877.8	ОК	
480) min Winter	5.358	0.858	38.9	1892.9	ОК	
600) min Winter	5.362	0.862	39.0	1902.1	ОК	
720) min Winter	5.361	0.861	39.0	1900.4	ОК	
960) min Winter	5.350	0.850	38.7	1872.3	O K	
1440) min Winter	5.308	0.808	37.6	1770.2	ОК	
2160) min Winter	5.232	0.732	35.6	1588.9	O K	
2880) min Winter	5.159	0.659	33.6	1417.0	ОК	
4320) min Winter	5.037	0.537	29.9	1135.9	OK	
7200) min Winter	4.945	0.445	20.8 24.2	930.0	U O K	
8640) min Winter	4.825	0.325	22.0	667.5	ОК	
10080) min Winter	4.785	0.285	20.2	582.7	ОК	
	Storm Event	Rain (mm/hr)	Flood Volum	ed Discl	harge 1	ime-Peak	
		(,	(m ³)) (n	1 ³)	(1111)	
100				0 1	-1- 0	100	
120	min Winter	20.940) O	.0 1	/15.2 921 1	126 107	
240 180	min Winter	12 61/	, U 1 0	.u 1	∍∠⊥.⊥ 071 ƙ	⊥84 240	
240 360	min Winter	9.343	<u> </u>	.0 2	303.3	348	
480	min Winter	7.540) 0	.0 2	478.8	440	
600	min Winter	6.381	L 0	.0 2	621.4	476	
720	min Winter	5.565	5 0	.0 2	742.0	554	
960	min Winter	4.481	L 0	.0 2	939.4	706	
1440	min Winter	3.298	3 0	.0 3	225.7	1006	
2160	min Winter	2.424	£ 0	.0 3	650.6	1432	
2880	min Winter	1.946	b 0	.0 3	905.l 276 2	1844	
4320 5760	min Winter	1 142	, U 1 A	0 4	∠/0.3 619 1	2008 3350	
7200	min Winter	0.964	. U	.0 4	862.7	4104	
8640	min Winter	0.839) O	.0 5	067.6	4832	
10080	min Winter	0.745	5 0	.0 5	237.0	5544	

CH2M	Page 3
Ash House	
Falcon Road	
Exeter EX2 7LB	Micro
Date 25/06/2018 14:03	Designed by MA047950
File Basin1_75%permeability	Checked by
XP Solutions	Source Control 2017.1.2
Dec	
<u></u>	ainfail Details
Rainfall Model	FSR Winter Storms Yes
Return Period (years)	30 Cv (Summer) 0.750
M5-60 (mm)	20.000 Shortest Storm (mins) 15
Ratio R	0.350 Longest Storm (mins) 10080
Summer Storms	Yes Climate Change % +10
<u>Tim</u>	me Area Diagram
Tot	tal Area (ha) 5.025
Time (mins) Area Time (mins) From: To: (ha) From: To:	s) Area Time (mins) Area Time (mins) Area (ha) From: To: (ha) From: To: (ha)
0 4 1.256 4 8	8 1.256 8 12 1.256 12 16 1.257
'	
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CH2M		Page 4
Ash House		
Falcon Road		L
Exeter EX2 7LB		Micco
Date 25/06/2018 14:03	Designed by MA047950	Desinado
File Basin1_75%permeability	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1968.0 1.500 2850.0

Orifice Outflow Control

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 4.500

CH2M						Page 1
Ash House						
Falcon Road						4
Exeter EX2 7LB						Mission
Date 25/06/2018 14:08	Desi	qned b	y MA04	47950)	MILIU
File Basin2 75%permeability	Chec	ked bv	1			Urainage
XP Solutions	Sourc	ce Con	trol 2	2017	1 2	
	Dour			1017.		
Summary of Results f	For 30) vear	Retur	n Pe	riod (+10%)	
		70012	110042			-
Storm	Max	Max N	ſax	Max	Status	
Event L	Level D	epth Cor	ntrol Ve	olume		
	(m)	(m) (]	l/s)	(m³)		
15 min Summer 4	1.875 0	.375	16.6	508.0	ОК	
30 min Summer 4	1.986 0	.486	19.3	669.5	O K	
60 min Summer 5	5.096 0	.596	21.6	836.1	ОК	
120 min Summer 5	5.242 0	.696	23.0	992.8	OK	
240 min Summer 5	5.266 0	.766	24.8 1	106.0	ОК	
360 min Summer 5	5.287 0	.787	25.2 1	140.0	ОК	
480 min Summer 5	5.297 0	.797	25.4 1	156.0	ОК	
600 min Summer 5	5.301 0 5.202 0	.801	25.5 1	163.4	OK	
960 min Summer 5	5.302 0 5.297 0	.802	25.5 1	156.3	OK	
1440 min Summer 5	5.271 0	.771	24.9 1	113.8	O K	
2160 min Summer 5	5.220 0	.720	24.0 1	031.0	O K	
2880 min Summer 5	5.168 0	.668	23.1	948.9	ОК	
4320 min Summer 5	5.077 0	.577	21.3	806.8	OK	
7200 min Summer 4	1.944 0	. 444	18.3	608.4	0 K	
8640 min Summer 4	4.897 0	.397	17.2	538.7	O K	
10080 min Summer 4	1.857 0	.357	16.1	481.9	O K	
15 min Winter 4	4.918 0	.418	17.7	569.6	ОК	
30 min Winter 5	5.040 0 5.162 0	.540	20.5	751.6 939.7	OK	
			22.7		0 11	
Storm I	Rain mm/hr)	Flooded	Dischai	rge T:	(ming)	
	uu(/111)	(m ³)	(m ³)	le	(mins)	
		()	(
15 min Summer 7	79.950	0.0	479	9.9	30	
30 min Summer 5	53.199 33 800	0.0	646 861	b.3 5 9	44 72	
120 min Summer 2	20.940	0.0	1073	3.4	128	
180 min Summer 1	15.610	0.0	1201	1.8	186	
240 min Summer 1	12.614	0.0	1295	5.6	244	
360 min Summer	9.343	0.0	144(U.3	332	
600 min Summer	7.540 6.381	0.0	1639	9.4	452	
720 min Summer	5.565	0.0	1715	5.1	518	
960 min Summer	4.481	0.0	1839	9.4	656	
1440 min Summer	3.298	0.0	202	1.8 2.6	930	
2160 min Summer 2880 min Summer	2.424 1.946	0.0	2272	∠.0 1.5	⊥330 1736	
4320 min Summer	1.427	0.0	2664	4.2	2508	
5760 min Summer	1.144	0.0	2870	0.9	3232	
7200 min Summer	0.964	0.0	3022	2.7	3968	
8640 min Summer	0.839	0.0	315	⊥.U 7 1	4680 5440	
15 min Winter 7	79.950	0.0	540	0.5	30	
30 min Winter 5	53.199	0.0	726	б.4	43	
60 min Winter 3	33.892	0.0	971	1.7	72	
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CH2M							Page 2
Ash House							
Falcon Road							4
Exeter EX2 7LB							- Cu
Date $25/06/2018$ 14:08	1	Deg	ianed	hy MA	04795	50	MICLO
Filo Pagin2 75%pormos	hilitr	Cho	akod	by h	10 1 / 2 .		Drainag
File Basiliz_/5%perillea	DIIIty		ckeu	yu r	0.01	7 1 0	_
XP Solutions		Sou	rce C	ontrol	2017	/.1.2	
	- 1.				-		
Summary of	Results	ior :	so yea	ar Reti	urn P	eriod (+10%)	<u> </u>
	Storm	Max	Mav	May	Mav	Status	
	Event	Level	Depth	Control	Volume	8	
		(m)	(m)	(1/s)	(m ³)		
100				05.0	1110		
120	min Winter	5.274	0.774	25.0	1119.2	2 OK	
240	min Winter	5.328 5.357	0.028	25.9 26 4	1254	4 OK	
360	min Winter	5.384	0.884	26.8	1299.0	5 ОК	
480	min Winter	5.389	0.889	26.9	1308.0	бОК	
600	min Winter	5.392	0.892	27.0	1313.	1 ок	
720	min Winter	5.390	0.890	26.9	1310.	5 ОК	
960	min Winter	5.377	0.877	26.7	1288.	5 ОК	
1440	min Winter	5.332	0.832	26.0	1213.	в ок	
2160	min Winter	5.253	0.753	24.6	1084.3	2 ОК	
2880	min Winter	5.177	0.677	23.2	962.'	7 ОК	
4320	min Winter	5.049	0.549	20.7	621	4 OK 5 OK	
7200	min Winter	4.881	0.381	16.8	516	5 OK 5 OK	
8640	min Winter	4.826	0.326	15.3	438.3	3 ОК	
10080	min Winter	4.784	0.284	14.0	379.0	о к	
1	Storm	Rain	Flood	led Disc	harge '	Time-Peak	
1	Ivent	(mm/hr)	Volu	me Vol	Lume	(mins)	
			(m ³) (п	n³)		
120	min Winter	20.940) (.0 1	204.1	126	
180	min Winter	15.610	0 0	1.0	347.8	184	
240	min Winter	12.614		0.0 1	452.9	240	
360	min Winter	9.343		1.0 1	614.9	348	
480	min Winter	6 221	, (,		131.8 837 8	442 478	
720	min Winter	5.565	. ().0 ¹	922.5	554	
960	min Winter	4.481	. 0	0.0 2	061.4	708	
1440	min Winter	3.298		.0 2	264.4	1008	
2160	min Winter	2.424	. 0	0.0 2	546.5	1432	
2880	min Winter	1.946	6 C	.0 2	724.6	1848	
4320	min Winter	1.427		0.0 2	987.1	2632	
5760	min Winter	1.144	. (1.U 3.	∠⊥6.4 206 7	3360	
/200	min Winter	0.964		103 102	300./ 531 0	4112 4840	
10080	min Winter	0.745).0 3	652.3	5544	
10000		5.715				JJ 1 1	

CH2M	Page 3	
Ash House		
Falcon Road	4	
Exeter EX2 7LB	m	
Date 25/06/2018 14:08	Designed by MA047950	
File Basin2 75%permeability	Checked by	
XP Solutions	Source Control 2017.1.2	
Ra	ainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	30 Cv (Summer) 0.750	
Region Engi M5-60 (mm)	land and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15	
Ratio R	0.350 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +10	
<u></u>	me Area Diagram	
То	tal Area (ha) 3.495	
Time (mins) Area Time (mins) From: To: (ha) From: To:) Area Time (mins) Area Time (mins) Area (ha) From: To: (ha) From: To: (ha)	
	8 0.874 8 12 0.874 12 16 0.873	
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CH2M		Page 4
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Ash House		
Falcon Road		L
Exeter EX2 7LB		Micro
Date 25/06/2018 14:08	Designed by MA047950	Desinado
File Basin2_75%permeability	Checked by	Diamaye
XP Solutions	Source Control 2017.1.2	

Model Details

Storage is Online Cover Level (m) 6.000

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 1271.0 1.500 2000.0

Orifice Outflow Control

Diameter (m) 0.119 Discharge Coefficient 0.600 Invert Level (m) 4.500

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CH2M										Page 1	
Ash House											
Falcon Roa	d									4	
Exeter E	X2 7LB									Mirro	m
Date 02/07	/2018 17:	15		Desi	gned	by MA	40479	50			
File FILTE	RDRAINPER	MANEI	JT.SRC	X Chec	ked b	У				Ulding	ige
XP Solution	ns			Sour	ce Co	- ntrol	L 201	7.1.	2		
	Summary	of Re	sults	for 3	0 yea	r Ret	urn F	Peri	od (+4	40%)	
	Half Drain Time : 85 minutes.										
	Storm	Max	Max	Max		Max	Max	x	Max	Status	
	Event	Level	Depth (m)	Infiltra	tion Co	ontrol	Σ Out:	flow a)	Volume		
		(ш)	(11)	(1/5	,	1/5)	(1/)	5)	(ш-)		
15	min Summer	5.533	0.533		0.0	1.7		1.7	10.7	ОК	
30	min Summer	5.654	U.654		0.0	1.9		1.9 2 1	13.6 15 6	O K	
120	min Summer	5.740	0.740		0.0	2.1 2.1		∠.⊥ 2.1	16.3	Flood Risk	
180	min Summer	5.756	0.756		0.0	2.1		2.1	16.0	Flood Risk	
240	min Summer	5.732	0.732		0.0	2.0		2.0	15.4	Flood Risk	
360	min Summer	5.682	0.682		0.0	2.0		2.0	14.2	ОК	
480	min Summer	5.634	0.634		0.0	1.9		1.9	13.1	ОК	
600	min Summer	5.590	0.590		0.0	1.8		1.8	12.0	O K	
720	min Summer	5.549	0.549		0.0	1.8		1.8	11.1	ОК	
960	min Summer	5.483	0.483		0.0	1.6		1.6	9.4	ОК	
2160	min Summer	5.389	0.389		0.0	1.5		1.5	6./ 4 1	OK	
2100	min Summer	5 241	0.299		0.0	1 1		1 1	4.⊥ 2.6	0 K	
4320	min Summer	5.165	0.165		0.0	0.9		0.9	1.1	0 K	
5760	min Summer	5.118	0.118		0.0	0.8		0.8	0.6	ОК	
7200	min Summer	5.090	0.090		0.0	0.7		0.7	0.3	O K	
8640	min Summer	5.072	0.072		0.0	0.6		0.6	0.2	O K	
10080	min Summer	5.061	0.061		0.0	0.5		0.5	0.2	ОК	
15	min Winter	5.591	0.591		0.0	1.8		1.8	12.1	O K	
30	min Winter	5.732	0.732		0.0	2.0		2.0	15.4	Flood Risk	
		Stor	m	Rain	Floode	d Disc	harge	Time-	-Peak		
		Even	t	(mm/hr)	Volume	vol	lume	(mi	ns)		
					(m³)	(1	n³)				
	1	L5 min	Summer	101.754	0.	0	12.4		23		
	-	30 min	Summer	67.708	0.	0	16.5		36		
	6	50 min	Summer	43.136	0.	0	21.0		60		
	12	20 min	Summer	26.651	0.	0	26.0		94		
	18	30 min	Summer	19.868	0.	0	29.1		128		
	24	10 min	Summer	16.054	0.	U	31.3		162		
	36	ou min	Summer	0 E06 TT.891	υ.	0	34.8 37 1		232 200		
	40)0 min	Summer	8.121	0.	0	39.6		364		
	72	20 min	Summer	7.083	0.	0	41.4		428		
	96	50 min	Summer	5.703	0.	0	44.5		556		
	144	10 min	Summer	4.198	0.	0	49.1		800		
	216	50 min	Summer	3.085	0.	0	54.1		1156		
	288	30 min	Summer	2.477	0.	0	58.0		1504		
	432	20 min	Summer	1.816	0.	0	63.7 69 1		2208 2026		
	5/6 701	0 min	Summer	1 227	0.	0	00.⊥ 71 ₽		2930 3672		
	864	10 min	Summer	1.067	0.	0	74.9		4320		
	1008	30 min	Summer	0.948	0.	0	77.7		5120		
	1	L5 min	Winter	101.754	0.	0	13.9		24		

30 min Winter 67.708

0.0

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18.5

36

011211						Page 2
Ash House						
Falcon Road						4
Exeter EX2 7LB						- Cm
Date 02/07/2018 17:15	Desi	aned b	v MA047	950		MICLO
File FILTERDRAINDERMANENT SPCY	Chec	ked by	, 1110 1,	200		Drainage
VD Colutions	Cilec	Red by	+mal 00	1 7 1	2	3
XP Solutions	Sour	ce Con	trol 20) _ /	Z	
		0	Determ	Dess		408.)
Summary of Results i	or 30	J year	Return	Peri	oa (+4	40%)
Storm May May	Моч	м		low	Mow	Status
Event Level Depth In	filtra	tion Con	trol Σ Ou	utflow	Volume	Status
(m) (m)	(l/s)) (1	/s) (1	L/s)	(m³)	
(0 min Wintow 5 027 0 027		0 0	2 2	2 2	17 0	
60 min Winter 5.837 0.837		0.0	2.2	2.2	17.9	Flood Risk
180 min Winter 5.848 0.848		0.0	2.2	2.2	18.2	Flood Risk
240 min Winter 5.811 0.811		0.0	2.2	2.2	17.3	Flood Risk
360 min Winter 5.733 0.733		0.0	2.0	2.0	15.4	Flood Risk
480 min Winter 5.660 0.660		0.0	1.9	1.9	13.7	ОК
720 min Winter 5.535 0.595		0.0	⊥.¤ 1.7	1.8 1.7	10.8	OK
960 min Winter 5.449 0.449		0.0	1.6	1.6	8.4	O K
1440 min Winter 5.331 0.331		0.0	1.4	1.4	5.0	O K
2160 min Winter 5.229 0.229		0.0	1.1	1.1	2.3	O K
2880 min Winter 5.166 0.166		0.0	0.9	0.9	1.2	O K
5760 min Winter 5.071 0.071		0.0	0.6	0.7	0.4	0 K
7200 min Winter 5.055 0.055		0.0	0.5	0.5	0.1	O K
8640 min Winter 5.047 0.047		0.0	0.4	0.4	0.1	O K
10080 min Winter 5.043 0.043		0.0	0.4	0.4	0.1	O K
Storm (n Event (n	Rain m/hr)	Flooded Volume (m³)	Discharg Volume (m³)	e Time (mi	-Peak ns)	
60 min Winter 4	13.136	0.0	23.	6	62	
		0 0	20	1	100	
120 min Winter 2	26.651	0.0	29.	T	100	
120 min Winter 2 180 min Winter 1	26.651 L9.868	0.0	29. 32.	5	138	
120 min Winter 2 180 min Winter 1 240 min Winter 1 360 min Winter 1	L9.868	0.0	29. 32. 35. 20	5 1 0	138 176 248	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter	26.651 19.868 16.054 11.891 9.596	0.0 0.0 0.0 0.0	29. 32. 35. 39. 41.	5 1 0 9	138 176 248 318	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter600 min Winter	26.651 19.868 16.054 11.891 9.596 8.121	0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44.	5 1 0 9 3	138 176 248 318 386	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter7720 min Winter1	26.651 19.868 16.054 11.891 9.596 8.121 7.083	0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44.	5 1 0 9 3 4	138 176 248 318 386 454	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter600 min Winter720 min Winter960 min Winter1440 min Winter	26.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4 100	0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49.	5 1 0 9 3 4 8 0	138 176 248 318 386 454 582 826	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter720 min Winter960 min Winter1440 min Winter1440 min Winter2160 min Winter	26.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60.	5 1 0 9 3 4 8 0 6	138 176 248 318 386 454 582 826 1168	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter22160 min Winter22880 min Winter1	26.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 46. 49. 55. 60. 64.	5 1 0 9 3 4 8 0 6 9	138 176 248 318 386 454 582 826 1168 1504	
120 min Winter2180 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter12160 min Winter2280 min Winter44320 min Winter1	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71.	5 1 0 9 3 4 8 0 6 9 4	138 176 248 318 386 454 582 826 1168 1504 2204	
120 min Winter1180 min Winter1240 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter12160 min Winter2280 min Winter4320 min Winter15760 min Winter55760 min Winter5	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76.	5 5 1 0 9 3 4 8 0 6 9 9 4 3 4	138 176 248 318 386 454 582 826 1168 1504 2204 2912	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter22160 min Winter22880 min Winter4320 min Winter55760 min Winter77200 min Winter88640 min Winter8	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 80.	5 5 1 0 9 3 4 8 0 6 9 9 4 3 3 4 9	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408	
120 min Winter1180 min Winter1240 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter960 min Winter1440 min Winter1440 min Winter2160 min Winter2280 min Winter4320 min Winter57200 min Winter77200 min Winter18640 min Winter10080 min Winter	20.051 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.427 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1600 min Winter960 min Winter1440 min Winter1440 min Winter1440 min Winter2880 min Winter2800 min Winter2800 min Winter5760 min Winter5760 min Winter8640 min Winter10080 min Winter	20.051 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1720 min Winter960 min Winter1440 min Winter1440 min Winter2160 min Winter2880 min Winter4320 min Winter5760 min Winter5760 min Winter10080 min Winter	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter22160 min Winter2280 min Winter4320 min Winter5760 min Winter78640 min Winter810080 min Winter	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1600 min Winter1720 min Winter1960 min Winter11440 min Winter22160 min Winter22880 min Winter4320 min Winter5760 min Winter77200 min Winter10080 min Winter10080 min Winter10080 min Winter	20.051 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.427 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter 2 180 min Winter 1 240 min Winter 1 360 min Winter 1 480 min Winter 1 480 min Winter 1 480 min Winter 1 720 min Winter 1 1440 min Winter 2 2160 min Winter 2 280 min Winter 4 4320 min Winter 5760 min Winter 5760 min Winter 7200 min Winter 10080 min Wint	20.051 19.868 16.054 11.891 9.596 8.121 7.083 5.703 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1360 min Winter1480 min Winter1600 min Winter960 min Winter1440 min Winter1440 min Winter1440 min Winter2160 min Winter280 min Winter280 min Winter5760 min Winter5760 min Winter10080 min Winter10080 min Winter	20.651 19.868 16.054 11.891 9.596 8.121 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter1180 min Winter1240 min Winter1360 min Winter1480 min Winter1600 min Winter720 min Winter960 min Winter1440 min Winter1440 min Winter2160 min Winter2800 min Winter2800 min Winter5760 min Winter5760 min Winter8640 min Winter10080 min Winter	20.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 46. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	
120 min Winter 2 180 min Winter 1 240 min Winter 1 360 min Winter 1 480 min Winter 1 480 min Winter 600 min Winter 720 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 7200 min Winter 8640 min Winter 10080 min Winter	26.651 19.868 16.054 11.891 9.596 8.121 7.083 5.703 4.198 3.085 2.477 1.816 1.456 1.227 1.067 0.948	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	29. 32. 35. 39. 41. 44. 49. 55. 60. 64. 71. 76. 80. 83. 87.	5 1 0 9 3 4 8 0 6 9 4 3 4 9 0	138 176 248 318 386 454 582 826 1168 1504 2204 2912 3584 4408 4976	

CH2M		Page 3
Ash House		
Falcon Road		L.
Exeter EX2 7LB		Micco
Date 02/07/2018 17:15	Designed by MA047950	Drainago
File FILTERDRAINPERMANENT.SRCX	Checked by	Diamage
XP Solutions	Source Control 2017.1.2	
Ra	infall Details	
Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +40	
Tim	ne Area Diagram	
Tot	al Area (ha) 0.065	
Time (mins) Area T: From: To: (ha) Fr	ime (mins) Area Time (mins) Area rom: To: (ha) From: To: (ha)	
0 4 0.021	4 8 0.022 8 12 0.022	
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Model Details

Storage is Online Cover Level (m) 6.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)0.00000Pipe Diameter (m)0.150Infiltration Coefficient Side (m/hr)0.00000Pipe Depth above Invert (m)0.150Safety Factor2.0Slope (1:X)400.0Porosity0.30Cap Volume Depth (m)0.000Invert Level (m)5.000Cap Infiltration Depth (m)0.000Trench Width (m)0.7Number of Pipes1Trench Length (m)113.0113.0113.0113.0

Orifice Outflow Control

Diameter (m) 0.034 Discharge Coefficient 0.600 Invert Level (m) 5.000

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Summary of	f Resul	ts for 3	0 year	Return	Period	(+10%	26)
	Ha	lf Drain T	ime : 38	minutes.			
Storm	Max I	Max M	ax	Max	Max	Max	Status
Event	Level De	epth Infili	tration	Control E	Outflow Vo	olume	blacub
	(m)	(m) (l	/s)	(l/s)	(l/s) (m³)	
15 min Summer	5.460 0	.460	0.0	1.6	1.6	4.7	ОК
30 min Summer	5.525 0	.525	0.0	1.7	1.7	5.9	ОК
60 min Summer	5.554 0	.554	0.0	1.8	1.8	6.3	ОК
120 min Summer	5.540 0	.540	0.0	1.7	1.7	6.1	ОК
180 min Summer	5.511 0	.511 400	0.0	1.7	1.7	5.6 5 1	OK
240 min Summer	5.482 U	.402 431	0.0	1.0 1.6	1.6 1.6	5.⊥ 4 ?	OK
480 min Summer	5.387 O	387	0.0	1 5	15	±.∠ 3.5	O K
600 min Summer	5.351 0	. 351	0.0	1.4	1.4	2.8	O K
720 min Summer	5.320 0	.320	0.0	1.3	1.3	2.3	O K
960 min Summer	5.271 0	.271	0.0	1.2	1.2	1.6	O K
1440 min Summer	5.199 0	.199	0.0	1.0	1.0	0.7	O K
2160 min Summer	5.132 0	.132	0.0	0.8	0.8	0.3	O K
2880 min Summer	5.093 0	.093	0.0	0.7	0.7	0.2	O K
4320 min Summer	5.058 0	.058	0.0	0.5	0.5	0.1	O K
5760 min Summer	5.046 0	.046	0.0	0.4	0.4	0.0	OK
7200 min Summer	5.041 0	.041	0.0	0.3	0.3	0.0	OK
10080 min Summer	5.037 0	035	0.0	0.3	0.3	0.0	OK
15 min Winter	5.499 0	499	0.0	1.7	1.7	5.4	0 K
30 min Winter	5.581 0	.581	0.0	1.8	1.8	6.8	O K
	Storm	Rain	Flooded	l Discharge	Time-Peal	k	
	Event	(mm/hr)	Volume	Volume	(mins)		
			(m ³)	(m³)			
15	min Summ	er 79.950	0.0	6.3	2	2	
30	min Summ	er 53.199	0.0	8.4	3	2	
60	min Summ	er 33.892	0.0	10.7	5	0	
120	min Summ	er 20.940	0.0	13.2	8	4	
180	min Summ	er 15.610	0.0	14.8	11	8	
240	min Summ	er 12.614 er 0.242	0.0	ע 15.9 יידי	15	2 6	
360	min Summ	er 7540	0.0	, ±/./) 19.0	∠⊥ 27	8	
600	min Summ	er 6.381	0.0) 20.1	34	0	
720	min Summ	er 5.565	0.0) 21.0	39	8	
960	min Summ	er 4.481	0.0	22.6	51	6	
1440	min Summ	er 3.298	0.0	24.9	74	8	
2160	min Summ	er 2.424	0.0	27.5	110	4	
2880	min Summ	er 1.946	0.0	29.4	146	8	
4320	min Summ	er 1.427	0.0	32.4	218	8 C	
5760	min Summ	er 1.144 er 0.064	0.0) 34.6	289	0 2	
8640	min Summ	er 0.204	0.0	, 30.4) 38.0	440	~ 8	
10080	min Summ	er 0.745	0.0) 39.4	512	- 8	
15	min Wint	er 79.950	0.0) 7.1	2	2	
30	min Wint	er 53.199	0.0	9.4	3	3	
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Summary o	of Results	for 3	0 year	Return	Period	(+10)%)
Storm	Max Max	м	ax	Max	Max	Max	Status
Event	Level Depth	Infilt	ration	Control E	Outflow N	/olume	
	(m) (m)	(1	/s)	(l/s)	(l/s)	(m³)	
60 min Winte	r 5 620 0 620		0 0	1 0	1 0	7 2	OK
120 min Winte	r 5.590 0.590		0.0	1.8	1.8	6.9	O K
180 min Winte	r 5.539 0.539		0.0	1.7	1.7	6.1	O K
240 min Winte	r 5.493 0.493		0.0	1.7	1.7	5.3	O K
360 min Winte	r 5.417 0.417		0.0	1.5	1.5	4.0	O K
480 min Winte	r 5.356 0.356		0.0	1.4	1.4	2.9	O K
600 min Winte	r 5.309 0.309		0.0	1.3	1.3	2.1	O K
720 min Winte	r 5.270 0.270		0.0	1.2	1.2	1.5	O K
960 min Winte	r 5.207 0.207		0.0	1.1	1.1	0.8	O K
1440 min Winte	r 5.130 0.130		0.0	0.8	0.8	0.3	O K
2160 min Winte	r 5.079 0.079		0.0	0.6	0.6	0.1	O K
2880 min Winte	r 5.057 0.057		0.0	0.5	0.5	0.1	OK
4320 min Winte	r 5.043 0.043		0.0	0.4	0.4	0.0	OK
7200 min Winte	r = 5.037 0.037 r = 0.033 0.033		0.0	0.3	0.3	0.0	OK
8640 min Winte	r = 5.033 + 0.033 r = 5.031 + 0.031		0.0	0.2	0.2	0.0	0 K
10080 min Winte	r 5.029 0.029		0.0	0.2	0.2	0.0	ОК
	Storm	Pain	Flooder	1 Disabaras	Time-De	əb	
	Event	(mm/hr)	Volume	Volume	(mine)	un l	
		,	(m ³)	(m ³)	(,		
6	0 min Winter	33.892	0.0) 12.0		54	
12	0 min Winter	20.940	0.0	14.8		90	
18	0 min Winter	15.610	0.0	16.5	1	28	
24	0 min Winter	12.614	0.0	17.8	1	62	
36	0 min Winter	9.343	0.0) 19.8	2	28	
48	0 min Winter	7.540	0.0) 21.3	2	90	
60	0 min Winter	6.381	0.0	22.5	3	50	
72	U min Winter	5.565	0.0	23.6	4	06	
96	o min Winter	4.481	0.0	J 25.3	5	10 10	
144	0 min Winter	3.298 2.298	0.0	ער א רייק	10	⊐∠ 96	
210	0 min Winter	2.424 1 946	0.0	אַט. ט.ט גע	, 10 14	50 68	
432	0 min Winter	1.427	0.0) 36.2	21	96	
576	0 min Winter	1.144	0.0) 38.7	2.8	56	
720	0 min Winter	0.964	0.0	40.8	36	00	
864	0 min Winter	0.839	0.0	42.6	40	96	
1008	0 min Winter	0.745	0.0	9 44.2	51	52	

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Ra:	infall Details	
Rainfall Model Return Period (years) Region Engla M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms Yes 30 Cv (Summer) 0.750 and and Wales Cv (Winter) 0.840 20.000 Shortest Storm (mins) 15 0.350 Longest Storm (mins) 10080 Yes Climate Change % +10	
Tim	e Area Diagram	
Tot	al Area (ha) 0.042	
Time (mins) Area T From: To: (ha) Fr	ime (mins) Area Time (mins) Area om: To: (ha) From: To: (ha)	
0 4 0.014	4 8 0.014 8 12 0.014	
	1	
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Model Details

Storage is Online Cover Level (m) 6.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr) 0.00000 Pipe Diameter (m) 0.150 Infiltration Coefficient Side (m/hr) 0.00000 Pipe Depth above Invert (m) 0.150 Safety Factor 2.0 Slope (1:X) 400.0 Porosity 0.30 Cap Volume Depth (m) 0.000 Invert Level (m) 5.000 Cap Infiltration Depth (m) 0.000 Trench Width (m) 0.3 Number of Pipes 1 Trench Length (m) 139.0

Orifice Outflow Control

Diameter (m) 0.034 Discharge Coefficient 0.600 Invert Level (m) 5.000

APPENDIX F

Water Quality Risk Management

Appendix F Water Quality Risk Management

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1. Water quality management approaches

T/

Table 4.3 in Chapter 4 of the SuDS Manual 2015 (C753) outlines the minimum water quality management approaches/ considerations. This has been reproduced in Figure 1 below:

BLE 1.3	Minimum water quality ma and groundwater	nagement r	equirements for discharg	ges to receiving surface waters	
	Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries ²	Requirements for discharge to groundwater	
	Residential roofs	Very low	Removal of gross solids and sediments only		
	Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach ^a Note: extra measures may be required for discharges to protected resour		
	Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach ^a Note: extra measures may be required for discharges to protected resources ⁴	Simple index approach ⁹ Note: extra measures may be required for discharges to protected resourcest In England and Wales, Risk Screening ⁴ must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.	
	Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA		
	Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit ^a . Obtain pre-permitting advice from the environmental regulator. Risi assessment is likely to be required ^a .		

Notes

The minimum water quality management requirements for discharges to receiving surface waters and groundwater are presented here. (For Northern Ireland, this guidance should be considered as interim until such time as Northern Ireland publishes its own legislation/policy/guidance.)

 These are not required in Scotland and Northern Ireland. For England and Wales, see Step 3 of the simple index approach (Section 25.7.1).

Protected surface water resources will include those designated for drinking water abstraction or for other environmental protection reasons. Protected groundwater resources are represented by SPZ1s in England and Wales.

- 2 In Scotland, the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 General Binding Rules, Rule 10 (d) (iv) effectively provides an exemption from requiring SuDS for coastal discharges. However, control of any contaminants likely to be present in surface water runoff is still required, but can be delivered using alternative methods such as proprietary treatment products. As the term 'SuDS' in this manual includes proprietary treatment products, this exemption is not valid in this context.
- 3 The application of the simple index approach should follow the approach outlined in Section 26.7.1 (or equivalent approved).
- 4 Risk screening is an assessment to identify high risk scenarios where the Environment Agency or Natural Resources Wales (NRW) would wish to be consulted regarding infiltration of water from surface runoff in order to agree the proposed design approach. The risk screening method is provided in Section 26.7.2.
- 5 The risk assessment should determine the appropriate design approach to mitigate risk to acceptable levels following the guidance outlined in Section 26.7.3. This assessment should be approved by the environmental regulator.

Figure 1: Minimum water quality management requirements; reproduced from p63 of the SuDS Manual 2015 (C753).

Due to the different land use of the proposed sites, each development has been assessed independently as shown in Table 1 below.

Development	Description	Pollution hazard level – SuDS Manual	Assessment method
Carparks Portishead Station	The Portishead carparks are considered as commercial areas. Additionally, the traffic estimation for the carparks and drop off area showed that 225 users will arrive by car seeking to park at the station and 106 users will use the drop off areas. These figures, together with the users using taxis or public transport, reveal that more than 300 traffic movements/day are expected ¹ . Therefore, they are classed as medium hazard level.	Medium	Simple Index Method
Roads and roundabout Portishead Station	The traffic forecast showed that up to 1905 turning movements are estimated for the peak hours at the realigned roundabout (Phoenix Way/ Quays Avenue/Harbour Road). Consequently, these roads do not correspond to low traffic roads and are classified as medium hazard level.	Medium	Simple Index Method
Carparks Pill station	The traffic forecast for the carpark showed that only 60 traffic movements per day are expected which less than the 300 traffic movements limit indicated in the SuDS Manual. However, the carpark is to serve the new Pill Station (which is considered as 'commercial yard and delivery areas') and is the access to the attached Railway Network Depot next to the carpark. Hence, the carpark is classed as medium hazard level.	Medium	Simple Index Method
Haul roads	The haul roads will be used by heavy vehicles, therefore high pollution hazard level is anticipated.	High	Consultation to environmental regulator
Compounds	The compounds will be used by heavy vehicles, therefore high pollution hazard level is anticipated.	High	Consultation to environmental regulator

Table 1: Pollution hazard level and risk assessment method

2. Portishead and Pill Stations

As the development within these sites will be discharged to surface water, and is classed as medium (non-residential car parking with frequent change (eg hospitals, retail), the Simple Index Approach has been used to identify the pollution hazard and mitigation measures appropriate for the site based on land use.

The steps followed are as outlined in Box 26.2 of Chapter 26 of the SuDS Manual 2015 (C753), as reproduced in Figure 2 below:

¹ Based on 467470.BQ.04.20_MetroWest Phase 1 - Harbour Rd-Quays Ave Options Modelling_April 2015.docx and 467470.BQ.04.20_MetroWest Phase 1 - Harbour Rd-Quays Ave Modelling_June 2015 Update.docx

BOX 26.2	Steps of the simple index approach
	Step 1 – Allocate suitable pollution hazard indices for the proposed land use
	Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index
	Step 3 – Where the discharge is to protected ¹ surface waters or groundwater, consider the need for a more precautionary approach
	Note: 1 Designated as those protected for the supply of drinking water (Table 4.3).

Figure 2: Steps of the simple index approach; reproduced from p567 of the SuDS Manual 2015 (C753).

Step 1: Allocate suitable pollution hazard indices for the proposed land use

The pollution hazard indices are presented in Table 26.2 of C753. This has been reproduced in Figure 3 below:

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

Notes

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> Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).
> These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Figure 3: Pollution hazard indices; reproduced from p568 of the SuDS Manual 2015 (C753).

Based on this, the development proposed within the stations has been assessed and Table 2 shows the associated pollution hazard Level/ Indices for each land use type.

Development site	Catchment	Pollution hazard level	Total suspended solids	Metals	Hydro- carbons
	Cat A.1	Medium	0.7	0.6	0.7

Development site	Catchment	Pollution hazard level	Total suspended solids	Metals	Hydro- carbons
	Cat A.2	Medium	0.7	0.6	0.7
Portishead Station	Cat A.3	Medium	0.7	0.6	0.7
	Cat A.4	Medium	0.7	0.6	0.7
Pill Station	Carpark	Medium	0.7	0.6	0.7

Table 2. Pollution hazard level/ indices for proposed development

Step 2: Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

The total SuDS mitigation indices should be equal to or exceed the pollution hazard indices. Where multiple components are proposed to provide mitigation, it is suggested that a factor of 0.5 is applied to secondary or tertiary components to account for a reduction in performance due to already reduced inflow concentrations.

As the runoff will be discharged to surface water, Table 26.3 in Chapter 26 of the SuDS manual is recommended to determine the mitigation indices/ SuDS components that will provide sufficient water quality improvement. Table 26.3 has been reproduced in Figure 4 below:

		Mitigation indices ¹	ces ¹		
Type of SuDS compone	ent TSS	Metals	Hydrocarbons		
Filter strip	0.4	0.4	0.5		
Filter drain	0.42	0.4	0.4		
Swale	0.5	0.6	0.6		
Bioretention system	0.8	0.8	0.8		
Permeable pavement	0.7	0.6	0.7		
Detention basin	0.5	0.5	0.6		
Pond ⁴	0.73	0.7	0.5		
Wetland	0.83	0.8	0.8		
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event. for inflow concentrations relevant to the contributing drainage area.				

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://tinyurl.com/qf7yuj7
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

Figure 4: Mitigation indices; reproduced from p570 of the SuDS Manual 2015 (C753).

Table 3 provides a summary of the proposed drainage components that will be used to provide water quality mitigation.

Development site	Catchment	Proposed drainage component	Total suspended solids	Metals	Hydro- carbons
Portishood		Permeable pavement	0.7	0.6	0.7
Station	Cat A.1	Swale	0.25 = (0.5x0.5)	0.3 = (0.6x0.5)	0.3 = (0.6x0.5)
		Total	0.95	0.9	1
Portishead	Cat A.2	Bioretention system	0.8	0.8	0.8
Station		Total	0.8	0.8	0.8
Dortishood		Swale	0.5	0.6	0.6
Station	Cat A.3	Filter drain	0.2 = (0.5x0.4)	0.2 = (0.5x0.4)	0.2 = (0.5x0.4)
		Total	0.7	0.8	0.8
Portishead Station	Cat A.4	Permeable pavement	0.7	0.6	0.7
		Total	0.7	0.6	0.7
Pill Station	Carpark	Permeable pavement	0.7	0.6	0.7
		Total	0.7	0.6	0.7

As can be seen from a review of Table 2 and Table 3 mitigation measure/ proposed drainage features are sufficient to offset the pollution hazard level for each land use.

Table 3. Mitigation indices for chosen components for the proposed developments.

Step 3: Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach

As the discharge of the sites is at locations very close to the coast, no water abstraction for drinking water purpose is expected, therefore a more precautionary approach is not required (see note 1 of Table 4.3, which is reproduced in Figure 1 for information).

3. Compounds

The design of the compounds is still on progress and the only available information at the moment was abstracted from the document 'MetroWest 1 Construction Strategy' and is shown on Table 4. Details of construction compounds below.

Compound	Description - facilities	
C-15 Sheepway compound	Additional localised storage and welfare. There will be a small amount of parking, materials storage and toilets.	
C-14 The Portbury Hundred Compound	Large amount of parking for staff vehicles, materials storage, toilets, changing facilities, canteen and offices. Space for storage of sleepers, drainage, troughing, energy recovery units for vegetation removal, spoil, ballast and track formation. Dumpers, excavators, dozers, lorries will be using the compound.	
Turning area for construction vehicles east to C-14	Approximate 500m ² of turning area available for construction vehicles	

Compound	Description - facilities
C-13 Lodway Farm	A medium level of parking will be provided for staff, materials storage, toilets, changing facilities, canteen and offices. Personal vehicles, small vans, minibuses and HGV access will be using the compound.
C-9 Ham Green Compound	Low loaders to drop off RRVs will be using the compound. Mitigation measures may be necessary to ensure run off and sediment does not enter the lake.
C-4 Clanage Road	Medium sized parking area, materials storage, toilets, changing facilities; canteen and site offices.

Table 4. Details of construction compounds

As the development within these sites will be discharged to surface water, and is classed as high risk (sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels are to be delivered, handled, stored, used or manufactured, industrial sites), the pollution hazard has been identified and consultation with North Somerset Levels Internal Drainage Board has been undertaken to agree the appropriate mitigation measures. Those measure will need to be accepted by the Environmental Regulator prior to detail design. See appendix A for further details.

The water pollution hazards identified in relation to the compounds use and how they are mitigated are described in Table 5. Nevertheless, the potential hazards should be examined when the detail design of the compounds is completed.

Pollution hazard	Mitigation measure
	Filter drains are proposed as the conveyance system for most part of the compounds. The flows from the filter drains will be then directed to ditches located around the perimeter of the compounds that will also allow sedimentation. Additionally, silt trap chambers are promoted to capture the silt.
Sedimentation	Detention basins are proposed as the most downstream drainage feature before the discharge (at the greenfield runoff peak) to the watercourses to provide water storage but also a secondary water treatment (sedimentation and pollution removal).
	Storage materials areas should be under cover to prevent wash down.
Fuel and oils	For the areas of fuel and oil handling, oil separators will be provided to remove hydrocarbons from high-risk areas of runoff. In addition, penstock chambers will be proposed downstream of the oil separators and at other locations of the network to enable shut down of the surface water drainage network in case of a spill occurs. Besides, the legal requirement when the capacity of the storage tank is more than 200 litres and there is risk of an oil spillage reaching a public water source, the tank needs to be bunded.
Water from wash down areas	Wash down areas should be isolated and appropriate water treatment to be provided as required.

Table 5. Mitigation measure for compounds

4. Haul roads

The proposed haul roads between Portishead and Portbury Hundred construction compound sites will discharge to existing watercourses, and are classed as high risk (sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites). the pollution hazard has been identified and consultation with North Somerset Levels Internal Drainage Board has been undertaken to agree the appropriate mitigation measures. Those measure will need to be accepted by the Environmental Regulator prior to detail design. See appendix A for further details.

The main pollution hazard for the haul roads is the silt derived by the construction vehicles movements. Runoff will be collected by ditches with check dams to capture sediment and prevent any contaminated water being discharged to the watercourses. The accumulated silt will need to be removed periodical basis. As runoff peaks are going to be attenuated at greenfield rates, the removal of contaminants through settling, adsorption will be enhanced.

APPENDIX G

Concept Drainage Design Report Rev 01 from January 2017

REPORT

Concept Drainage Design for Portishead and Pill Stations

Prepared for Travelwest

January 2017



CH2M HILL 1 The Square Temple Quay Bristol BL1 6DG

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Appendices

A EA advice on Portbury ditch , NSC drainage advice, analysis of Portbury ditch water levels

- B Portishead Station Drainage Catchment Areas 467470.BQ.04.20-SK105 Portishead Station Drainage Strategy 467470.BQ.04.20-SK106 Portishead Station Existing Drainage 467470.BQ.04.20-SK107
- C Pill Station Drainage Strategy 467470.BQ.04.20-200-SK10

1 Introduction

This report covers the concept drainage design for the proposed Portishead and Pill station car parks and associated new highways for the Metrowest scheme.

2 Design Constraints and Parameters

The drainage design life for the car parks and new road drainage systems shall be 60 years.

The drainage system for all the new roads and parking areas shall be designed to North Somerset Council (NSC)requirements for a 1 in 30 year rainfall event with an allowance for climate change (refer to Appendix A). Exceedance routes up to the 1 in 100 year rainfall event, with an allowance for climate change will be required to demonstrate that no flooding to property occurs. Tide locking will need to be taken into account in the drainage design.

The NPPF Planning Practice Guidance states that "Generally the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

- 1. into the ground (infiltration);
- 2. to a surface water body;
- 3. to a surface water sewer, or other drainage system;
- 4. to a combined sewer.

Following this hierarchy, NSC would like to see the drainage from both the car parks and the new sections of road discharging either via infiltration or to the existing / new ditch network, rather than going into the highway drainage system.

If this is not possible, the capacity of the existing highway system will need to be checked and potentially upgraded to ensure no flooding for up to the 1 in 30 year event with an allowance for climate change.

Car park drainage systems should include pollution control and NSC would like to see this achieved through the use of bio-retention where practicable.

The normal requirement would be to restrict flows to greenfield rates on previously undeveloped land, or as close to greenfield as practicable, but not exceeding existing rates on previously develop land.

As the Portishead site is so close to the coast, NSC do not require restriction to the discharge rate, however a capacity check will be required to demonstrate that the drainage system maintains a 1 in 30 year with climate change capacity under tide locked conditions.

For Pill Station car park, the standard principles will apply, which is assumed to be greenfield rates or a minimum 5 l/s.

3 Portishead Station

The proposed drainage for the carparks and highways work have been analysed on a catchment basis. Four catchment areas have been identified as shown on drawing SK105 Drainage Catchment Areas (refer to Appendix B)

3.1 Cat A.1

This is catchment the area to the west of the proposed rail station and includes the proposed main car park and footpaths. This area is an existing field.

Without GI results it is assumed that the soil is heavy clay, WRAP class 4 potentially 3 and with a shallow groundwater level (ie 1 to 2m below ground level). As such it is assumed that infiltration is not an option and therefore impermeable surfacing shall be proposed for the car park and footways. Total impermeable area is 5,825m².

The drainage proposal for this catchment area is for the car park to discharge via gullies to a swale (refer to Appendix B drawing SK106 – Drainage Strategy). The footpaths shall have filter drains along the edge which shall also discharge to the swale.

The swale shall be located along the southern edge of the site and have a French drain with check dams. Rye grass shall line the swale to provide pollution control.

The proposed outfall for the swale shall be the Portbury ditch, which is an open watercourse, under the EA jurisdiction. The EA has verbally advised that the discharge rate into the ditch shall be set by NSC flood authority (refer to Appendix A).

The analysis of water levels, in vicinity of the proposed Portbury Ditch outfall, for 25 year and 50 year climate change (assumed to be 20%) scenarios are 4.85m and 7.05m respectively (refer to Appendix A). For a 1 in 30 year event this has been interpolated as 5.29m. It is therefore recommended that a microdrainage design is undertaken to confirm the required size of swale for this tide lock level of 5.29m.

The outfall structure to the Portbury Ditch will require a flood defence permit from the EA. This shall be subject to more detailed design but a precast concrete headwall is considered by the EA to be an appropriate solution.

3.2 Cat A.2

This catchment area lies to the north of the proposed rail station and includes new roads and footways The new roads shall tie into Harbour Road to the east and Phoenix Road to the west. This shall be an impermeable area of 3966m².

There is an existing surface water drainage network in this catchment area, which is identified on Wessex Water services plan as a highway drain, suggesting it is owned by NSC. The existing highway runoff discharges to "The Cut" via a 225mm pipe and the existing impermeable area that is drained by this system is approximately 5000m² (refer to Appendix B drawing SK107 – Existing Drainage).

Given the proposed impermeable area is less than the existing, it is proposed that this catchment area discharges into the existing highway system. A swale is also proposed along the west side of the new roundabout and entry /exit arm, which shall discharge in to the existing highway drainage (refer to Appendix B drawing SK106 –Drainage Strategy).

Bio-retention areas are proposed in vicinity of the new road including the centre island of the new roundabout.

3.3 Cat A.3

This catchment area is to the south of the proposed rail station and includes a new road and footways that tie-into Quays Avenue. The impermeable area for this catchment is 2982m².

There are no available records of an existing surface water network or outfall on Quays Avenue, other than gullies so it is assumed that a highway pipe network is present. The existing impermeable area is 2235m². (Refer to Appendix B drawing SK107 – Existing Drainage)

For the new section of Quays road, drainage shall be provided with positive drainage network with a filter drain along the toe of the embankment (refer to Appendix B drawing SK106 – Drainage Strategy). This system shall outfall into the existing drainage network on Quays road.

A bio-retention area is proposed in vicinity of the green space to the east of the re-aligned Quays Road.

The proposed footway that shall run along the existing Quays Avenue, shall drain into the proposed green space.

3.4 Cat A.4

This catchment area is the car parking and hardstanding by the Portishead station which covers an area of 3690m². It is proposed that permeable pavement is used, with a gravel tank system and membrane under the car park. This shall discharge to an existing manhole and outfall to The Cut (refer to Appendix B drawing SK106 –Drainage Strategy)

4 Pill Station

4.1 Cat B.1

The catchment area for Pill Station is the car park area B.1 (Refer to Appendix C drawing SK10 Pill Station Drainage Strategy). This area is currently an informal private car park with a mix of grass, asphalt and gravel surfacing.

Existing drainage records of the area have not been received but a streetview visual suggests no existing gullies on Monmouth Road. This is supported by anecdotal evidence of localized flooding on the Monmouth Road. Gullies are found further down Avon Road, where Monmouth road changes name.

The proposed drainage strategy for this catchment area of 1488 m² is for a permeable pavement with a gravel tank system and membrane under the car park. This shall discharge into a proposed new highway drainage system to be provided on Monmouth Road and shall connect into an existing system on Avon Road.

5 Recommendations

5.1 Portishead

- 1 Review drainage options once GI information is available
- 2 Carry out further design work to size the swales to meet NSC requirements
- 3 Assess the capacity of the existing highway network of catchment area A.2.
- 4 Assess capacity of the outfall system to "The Cut"
- 5 Carry out a survey of existing highway drainage in catchment area A.3 and assess the capacity of the network

5.2 Pill Station

1 Carrry out a survey of existing highway drainage on Monmouth and Avon Road and assess the capacity of the network.

Appendix A

Lillie, Penny/UKS

From:	Bellamy, Dave/EXT
Sent:	06 December 2016 14:56
То:	Lillie, Penny/UKS
Subject:	RE: Proposed Portishead MetroWest Station

Hi Penny,

I spoke with Dave Pring earlier regarding the Portishead Metrowest station drainage discharge to the main river. Discharge rate will be set by the Lead Local Flood Authority, in this case North Somerset Council. As I said to you on phone last week, this will almost certainly be restricted to the greenfield run-off rate. The only consultation required with the Environment Agency is in obtaining a flood defence permit for the outfall structure. I asked when would be a good time to talk with them about this and he advised that once we have a design for the structure we can run it past them. I mentioned that it would likely be a precast concrete headwall, and his opinion was that there would be no issue with obtaining a permit on this basis. The number to phone once we have a design is 03708 506506 Hope this helps. Kind regards Dave

From: Lillie, Penny/UKS Sent: 02 December 2016 12:23 To: Bellamy, Dave/EXT <Dave.Bellamy@ch2m.com> Subject: RE: Proposed Portishead MetroWest Station

ok many thanks kind regards

Penny Lillie Project Engineer

Direct +44 (0)1793 816671 Mobile +44 (0)7547 190959

CH2M Burderop Park, Swindon, UK SN4 0QD www.ch2m.com

From: Bellamy, Dave/EXT Sent: 02 December 2016 12:21 To: Lillie, Penny/UKS <<u>Penny.Lillie@ch2m.com</u>> Subject: RE: Proposed Portishead MetroWest Station

Hi Penny, No nothing yet but I will chase them up again. Cheers Dave

From: Lillie, Penny/UKS Sent: 02 December 2016 12:19 To: Bellamy, Dave/EXT <<u>Dave.Bellamy@ch2m.com</u>> Subject: RE: Proposed Portishead MetroWest Station

Hi Dave any news ? if not I am happy to follow up .

Lillie, Penny/UKS

From:	Jennifer Devereux <jennifer.devereux@n-somerset.gov.uk></jennifer.devereux@n-somerset.gov.uk>
Sent:	16 December 2016 08:49
То:	Lillie, Penny/UKS
Cc:	Linfoot, Andrew/BRS
Subject:	FW: highway drainage designs [EXTERNAL]
Attachments:	Pill Station Existing Highway Gullies.pdf; Portishead Station Existing Highway Gullies.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Hi Penny

Please find below the drainage detail.

Kind Regards Jenny

From: Lucy Nicholson
Sent: Thursday, December 15, 2016 5:08 PM
To: Jennifer Devereux <Jennifer.Devereux@n-somerset.gov.uk>; Richard Matthews <Richard.Matthews@nsomerset.gov.uk>
Subject: RE: highway drainage designs

Hi Jenny / Richard,

Sorry it's taken me so long to get back to you on this – I 've been completely overwhelmed by Town centre and other planning issues!

Unfortunately we do not hold very much information on the highway drainage networks, all we have is a GIS layer showing the location of gullies (attached for each of the locations in your email) but there is no information on pipe connections or dimensions etc.

The drainage system for all the new roads and parking areas should be designed to manage a 1 in 30 year rainfall event with an allowance for climate change. Exceedance routes up to the 1 in 100 year rainfall event, with an allowance for climate change will be required to demonstrate that no flooding to property occurs. Tide locking will need to be taken into account in the drainage design.

The NPPF Planning Practice Guidance states that "Generally the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable: 1. into the ground (infiltration);

- 2. to a surface water body;
- 3. to a surface water sewer, or other drainage system;
- 4. to a combined sewer.

Following this hierarchy we would like to see the drainage from both the car parks and the new sections of road discharging either via infiltration or to the existing / new ditch network, rather than going into the highway drainage system.

If this is not possible, the capacity of the existing highway system will need to be checked and potentially upgraded to ensure no flooding for up to the 1 in 30 year event with and allowance for climate change.

Car park drainage systems should include pollution control and we would like to see this achieved through the use of bio-retention where practicable.

The normal requirement would be to restrict flows to greenfield rates on previously undeveloped land, or as close to greenfield as practicable, but net exceeding existing rates on previously develop land.

As the Portishead site is so close to the coast, we do not need to restrict the discharge rate, however a capacity check will be required to demonstrate that the drainage system maintains a 1 in 30 year with climate change capacity under tide locked conditions.

For the other locations the standard principles will apply.

Hope this makes sense, let me know if you have any queries.

Kind regards

Lucy Nicholson Senior Flood Risk Officer Development & Environment North Somerset Council

Tel: 01275 888204

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0RqL0/http%3A%2F%2Fwww.n-somerset.gov.uk

From: Jennifer Devereux
Sent: Thursday, December 08, 2016 12:16 PM
To: Lucy Nicholson <<u>Lucy.Nicholson@n-somerset.gov.uk</u>>
Subject: FW: highway drainage designs

Hi Lucy

They would like any details you have on the existing highway drainage at Pill and Ashton as well. They haven't asked, but I'll send you the draft drawings showing where we have permanent compounds too.

Thanks Jenny

From: Penny.Lillie@ch2m.com [mailto:Penny.Lillie@ch2m.com]
Sent: Thursday, December 08, 2016 11:59 AM
To: Jennifer Devereux <<u>Jennifer.Devereux@n-somerset.gov.uk</u>>
Cc: Andrew.Linfoot@ch2m.com
Subject: highway drainage designs

Hi Jenny

Yes we will need existing highway drainage for Pill and Ashton as well please. kind regards

Penny Lillie Project Engineer

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From: Jennifer Devereux [mailto:Jennifer.Devereux@n-somerset.gov.uk]
Sent: 08 December 2016 11:15
To: Lillie, Penny/UKS <<u>Penny.Lillie@ch2m.com</u>>
Cc: Linfoot, Andrew/BRS <<u>Andrew.Linfoot@ch2m.com</u>>; Cooper, Robert/UKS <<u>Robert.Cooper@ch2m.com</u>>
Subject: RE: Portishead : highway drainage designs [EXTERNAL]

Thanks Penny

I'll have a word with our drainage team. With regard to your second point do you need details of the system in just the Portishead area, or where there are maintenance access points, at Pill and at Ashton as well.

Kind Regards Jenny

From: Penny.Lillie@ch2m.com [mailto:Penny.Lillie@ch2m.com]
Sent: Thursday, December 08, 2016 10:56 AM
To: Jennifer Devereux <Jennifer.Devereux@n-somerset.gov.uk>
Cc: Andrew.Linfoot@ch2m.com; Robert.Cooper@ch2m.com
Subject: Portishead : highway drainage designs

Hi Jenny

I'm assisting Andrew and yes thank you that would be very helpful.

We are looking to outfall the carpark catchment area to the Portbury Ditch as shown on the attached. The EA advised, on Tuesday, that the discharge rate will be set by the Lead Local Flood Authority. The only consultation required with the EA will be in obtaining a flood defence permit for the outfall structure.

Also for the remaining new highway catchment areas we propose to tie-in to the existing surface highway drainage system. We have details of the system north of the proposed rail line but not on south side. Wessex water do not own this system so we are assuming it belongs to NSC?

Grateful if you can advise or put me in touch with someone that can.

kind regards

Penny Lillie Project Engineer

Direct +44 (0)1793 816671 Mobile +44 (0)7547 190959

CH2M Burderop Park, Swindon, UK SN4 0QD www.ch2m.com

From: Jennifer Devereux [mailto:Jennifer.Devereux@n-somerset.gov.uk]
Sent: 08 December 2016 10:38
To: Linfoot, Andrew/BRS <<u>Andrew.Linfoot@ch2m.com</u>>
Cc: Fabisiak, Magda/BRS <<u>Magda.Fabisiak@ch2m.com</u>>; Lillie, Penny/UKS
<<u>Penny.Lillie@ch2m.com</u>>
Subject: RE: Car park drainage designs [EXTERNAL]

Thanks

If you need me ask our drainage team about the discharge rates or anything else let me know.

Kind Regards Jenny

> From: Andrew.Linfoot@ch2m.com [mailto:Andrew.Linfoot@ch2m.com] Sent: Thursday, December 08, 2016 10:32 AM To: Jennifer Devereux <Jennifer.Devereux@n-somerset.gov.uk> Cc: Magda.Fabisiak@ch2m.com; Penny.Lillie@ch2m.com Subject: RE: Car park drainage designs

Jenny

We are struggling a bit with this at the moment going round and round; the concept designs are in place, but trying to get someone to decide on discharge rates is proving to be a challenge. The EA now say it is NSC... We are working on it. Regards

Andrew Linfoot BA PGDipUD MPhil CMLI Landscape and urban design lead UK D 0117 910 2580 M 07921 495322

CH2M

1 The Square Temple Quay, Bristol, BS1 6DG United Kingdom www.ch2m.com | LinkedIn | Twitter | Facebook From: Jennifer Devereux [mailto:Jennifer.Devereux@n-somerset.gov.uk]
Sent: 08 December 2016 10:21
To: Linfoot, Andrew/BRS <<u>Andrew.Linfoot@ch2m.com</u>>
Subject: Car park drainage designs [EXTERNAL]

Hi Andrew

I was just wondering when the drainage designs for the Highway elements of MetroWest would be available. We are looking to meet the drainage officers and IDB probably in Feb, so there is no immediate rush, but I know they would like to comment on the outline designs.

Kind Regards Jenny

Jennifer Devereux Transport Policy Officer (MetroWest Phase 1) Development & Environment North Somerset Council

Tel: 01275884052

E-Mail: <u>Jennifer.Devereux@n-somerset.gov.uk</u>

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jxQyLniaxpBGha_EKSo754Gr5jD2bu_zKZG4Q49uEuSvukvkXkPyUNcV3DHXmSmfz29wxiMOliWbwvujq 8TfmigCGxgkC_jlztHwoMYfQ7DvtTec/http%3A%2F%2Fwww.n-somerset.gov.uk for information about our services

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zP7fD7d_t82UJR3VdirfXUr8usiEezaKoh4TVtkCne0oSER2nnCLRvNqhMw3YWVBUsgBfXqJK6ajgloUGIK K3-gdzMNi81S3As3UBbyXw07IHSShztcHEkq-uTsHcAUorK4JS0_7fEt_B9Xbg-

nIOPfsqOt2pqZZ2NBPFN_ZQjYeUdaW_ebt6d4B6VOjgz6TxpiLIxsTyEwVG3gKwNliYcLVxDZErOuKzSP mjuASYzOs-

AqDdmfBeJLToKYH8NsLjYHKt9IbsWdCV5wv4KRja06dVSgrjwIU47AsXkcuce9scUZ3kbmbOItnsOk9pXF w-ZMKArOXW-uJSKyLBEzMIT3HixchQbjAUjGSaZRuuuka89nV_Dcjf8BBTABYSY-UNXfnuJ38V4iel0rl-UUGEilTIyvpGIgG9ox-mXQByZPcJ1buO2tHosuFKUSnXgCR9I2lcFpjZ6E/http%3A%2F%2Fwww.n-
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 $\underline{YV41Zv1yqEY94SHtnd0_ADp7x1crJvePyvokjuhY8z28S0yuPU10PGc1frUF9abTG5dABZYjdd64iuFpM4jAxc0JqsBb}\\\underline{MwMBxJrdrYr9dLNFkank07mzychMtit7bTRnUsx-}$

7bNFHewMDsxOFCz28z3w9J5xjulMOGQ1W9MoCLZMBJmLMlbmYSIGD-

XtgVFgEW4S7nfgp7ZmSG3aSI0ChwWN37524THXV1OAW3Fa5VFRhK50Vt1pkI6XJgESOSwBuWWxflS84X-

<u>krKjv Hehlw7erF xuGDbfeSrR7UWeqHZfXJF3hRHp26J-I6zDnCswVtG21UMVk F-A/http%3A%2F%2Fwww.n-somerset.gov.uk</u> for information about our services

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<u>NR4rXqZF2RFnb6DEBWLpEr9l0U4AtwKvzjN6hcqEH6uG12YskkiVXmHgo7W6rxDjbhb_Giy_bk1zQjgbmJ26PNpU</u> <u>1035UNxAsaq-</u>

<u>mmPYhG3Oi6bFijPDeGHRq5o904IPFk7tpLgIPnEoiloIWiHyZv7wudO</u> AxVUH iLmMvd1VwocWeyzGg8ZBNIPI3H h84J0HuQl8qj_ptVP2FveQm6_zh-

iaozyaF5LjaZ3X96kCe2yuXy1hiDU4jdMViNg_dl96dpDpQSHrxHImnGSluc_6ttc1c9NbGirQ9DqAPa_Vyl0L6-jxeLH6fInl_GJJ2BHJKmVpUn-

bjrKtchq2cgZgR6yfzY_Uyb6dzPDFTdZEqZBBCzb4yahpLBV11iWsuybZTI/http%3A%2F%2Fwww.n-somerset.gov.uk%2Fconnect

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aBul7gz5dbPLWnN9LCMIIfHeB1Tk5r0fG01JrgA6u3my3zxcIJz3Ah3YV6T5xegF4JEUB8ZuQgYUXVfuInc8AIpmFpgmvev2ccbikuuRAPIHVQ9584YiJWDivWPmKTuLIy2BuDJQjTEVmc2DhfAtocfRXpdF96I1xhog01T1KxeA-

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KtLXhWtGDTZIUHsMyuWO181nnJBgc0kN1D2Hst2erQCBeCYBwIzInFWR6i8Xbu42nj1JZRoJcIJo55qECIorrWp3k 45mNZYP11DIZPEm2z6I2c4zakFazBzQI4VwztyE6qNHcMCp0y4UQ8mxs6GQWz1veTPmiLRuACqWKngZBM9X9n LiQ/http%3A%2F%2Fwww.n-somerset.gov.uk%2Fcareconnect

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<u>AjepZTRRMQCcpdGIVyENBUcyi8WN2NqIdqh16FJ4SVF8KPXPF2ttADliQieLMngZZsG1GqzEfVxYdHZogdAEjzcjolKHjPg</u> ER8g8 BME 607DVG600BYX3vGDuoEAEoLThxdObNcEMJMqltV0q-K 10UKoSa0R2Mwuw8I-

D_b2vWSopjgRf2qQDAAK40WqeZzJ1aEsnu0CnfXPtxuiNjKH0UORY3wvY6ofgc6T_0LJ2wrZ0DKbJfqb6K14QzuXXb5K9ig mSh1yq_2H9krkx9qCBO9ptJPZ8Yy5x7I0A20igHJjX-0RqL0/http%3A%2F%2Fwww.n-somerset.gov.uk for information about our services

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Lillie, Penny/UKS

From:Vasilyev, Kostya/UKSSent:18 January 2017 13:36To:Lillie, Penny/UKSCc:Cooper, Robert/UKS; Bird, Robert/UKSSubject:RE: Portishead -tide locked levelAttachments:Scanned from a Xerox Multifunction Printer.pdf

Penny

Thank you for your enquiry.

Following the location of points on the scan sent to me and Robert Bird on 16/01/2017 13:13 by Robert Cooper, I can say that the water levels for the 25 year and 50 year events (climate change scenario) are as follows:

The **left point** as per the scan referenced above (please also find it attached) (near the drain , the location is to the south of Harbour Road):

50 year event: 7.05m 25 year event: 4.85m

The levels are the same for both pre-development and post development situation for each of the return periods listed above.

It looks like the water stays within the ditch or is not overtopping the planned ground levels (in post development situation).

There is no water level information in the model for the **right point** (to the north of Phoenix Road).

In order to provide some estimate for this point we looked at the downstream end of this drain (at its confluence with the Portbury? Drain, the location is to the east of Newfoundland Way, see the red star on the map below). These levels will provide a very conservative approximation of levels at the right point on the scan provided. Taking this information from the downstream end of this drain allows us to estimate levels further upstream of this drain as this drain is not represented in a model.

The downstream side of the brook that flows by the right point:

50 year event:

7.06m (post development situation) 7.05m (pre-development situation)

25 year event:

5.24m (both pre and post development situation)

It looks like the water stays within the ditch or is not overtopping the planned ground levels (in post development situation).

Hope it helps.

Please let us know if there are more questions.

Many thanks.

Kind regards

Appendix B





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Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire		
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Tel +44 (0)117 910 2580 Fax +44 (0)117 910 2581 www.ch2m.com		
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Appendix C



	NOTES:
	1. All dimensions are in metres unless noted otherwise.
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	Drawing Scale: 1:250 @ A1

APPENDIX H

Project Summary Plans





awing file path & name : \lbrsfpp01\projects\674946 NSC - 2016 Bristol Framework\674946 BQ.42 MW PM support Nov 16 to Mar 17\90 AutoCAD\Project Summary Plans\ 674946 BQ.42.01.450 to 461 R







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	Micro compound
	Proposed works to rock face
	——— Retaining wall
	——— Public rights of way
	Existing railway
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85.6m	Rev By Chkd Apprvd Date Description
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	TRAVEIWEST
87.5m	Councils working together to improve your local transport
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	Project PORTISHEAD BRANCH LINE
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