PROPOSED DEVELOPMENT ACROSS LAND OFF KELVEDON ROAD, TIPTREE, ESSEX

FLOOD RISK ASSESSMENT AND SURFACE WATER DRAINAGE/SUDS STRATEGY

JULY 2021

REF: 2229/RE/01-19/01 REVISION B

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CONTRACT

Evans Rivers and Coastal Ltd has been commissioned by Marden Homes to carry out a Flood Risk Assessment and Surface Water Drainage/SUDS Strategy for a proposed development across land off Kelvedon Road, Tiptree, Essex.

QUALITY ASSURANCE, ENVIRONMENT AND HEALTH AND SAFETY

Evans Rivers and Coastal Ltd operates a Quality Assurance, Environmental, and Health and Safety Policy.

This project comprises various stages including data collection; hydrological and hydrogeological assessments; surface water drainage designs; and reporting. Quality will be maintained throughout the project by producing specific methodologies for each work stage. Quality will also be maintained by initiating internal quality procedures including the validation of third party deliverables; creation of an audit trail to record any changes made; and document control using a database and correspondence log file system.

To adhere to the Environmental Policy, data will be obtained and issued in electronic format and alternatively by post. Paper use will also be minimised by communicating via email or telephone where possible. Documents and drawings will be transferred in electronic format where possible and all waste paper will be recycled. Meetings away from the office of Evans Rivers and Coastal Ltd will be minimised to prevent unnecessary travel, however for those meetings deemed essential, public transport will be used in preference to car journeys.

The project will follow the commitment and objectives outlined in the Health and Safety Policy operated by Evans Rivers and Coastal Ltd. All employees will be equipped with suitable personal protective equipment prior to any site visits and a risk assessment will be completed and checked before any site visit. Other factors which have been taken into consideration are the wider safety of the public whilst operating on site, and the importance of safety when working close to a water source and highway. Any designs resulting from this project and directly created by Evans Rivers and Coastal Ltd will also take into account safety measures within a "designers risk assessment".

Report carried out by:

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1432.301.01
2229/RE/01

1. INTRODUCTION

1.1 Project Scope

1.1.1 Evans Rivers and Coastal Ltd has been commissioned by Marden Homes to carry out a Flood Risk Assessment and Surface Water Drainage/SUDS Strategy for a proposed development across land off Kelvedon Road, Tiptree, Essex.

1.1.2 It is understood that this assessment will be submitted to the Planning Authority as part of a planning application. Specifically, this assessment intends to:

1) Carry out an assessment of the practical use of sustainable drainage (SUDS) measures using the relevant soil maps, software and other literature;

2) Determine the existing surface water drainage regime across the site using appropriate methods;

3) Develop a post-development management plan/drainage strategy for surface water across the site, which considers the use of SUDS and alternative methods of surface water disposal;

4) Make an assessment of the flood risk to the site during return period events up to the climate change enhanced 1 in 100 year storm event and recommend mitigation measures accordingly;

5) Carry out an appraisal of flood risk from any other sources such as groundwater as required by NPPF;

6) Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated 2019. Other documents which have been consulted include:

- Woods-Ballard., et al. 2015. *The SUDS Manual, Report C753*. London: CIRIA.
- Woods-Ballard., et al. 2007. *The SUDS Manual, Report C697*. London: CIRIA.
- BS8582:2013 entitled *Code of practice for surface water management for development sites*.
- DEFRA document entitled *Sustainable Drainage Systems – Non statutory technical standards for sustainable drainage systems* dated March 2015.
- LASOO document entitled *Non statutory technical standards for sustainable drainage systems – Best Practice Guidance* dated 2015.
- DEFRA/EA document entitled *Rainfall runoff management for developments* dated 2013.
- Communities and Local Government 2007. *Improving the Flood Performance of New Buildings*. HMSO.
- DEFRA/EA document entitled *The flood risks to people methodology (FD2321/TR1),* 2006;

- EA *Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose*, 2008;
- National Planning Practice Guidance – Flood Risk and Coastal Change.
- Essex County Council's SUDS Design Guide dated 2020.
- Essex County Council Local Flood Risk Management Strategy (LFRMS) dated 2013.
- Essex County Council Preliminary Flood Risk Assessment dated 2011 (PFRA).
- Colchester Borough Council Strategic Flood Risk Assessment (SFRA) Appendix C Colchester Supplementary Report dated 2008.
- Colchester Borough Council Strategic Flood Risk Assessment (SFRA) Level 1 Update dated 2016.
- Colchester Town Surface Water Management Plan (SWMP) dated 2013.

2. DATA COLLECTION

2.1 To assist with this report, the data collected included:

- Ordnance Survey 1:10,000 street view map obtained via Promap (Evans Rivers and Coastal Ltd OS licence number 100049458).
- British Geological Survey, *Online Geology of Britain Viewer*.
- British Geological Survey, *Groundwater flooding susceptibility map.*
- British Geological Society, *BGS SuDS detailed data*.
- 1:250,000 *Soil Map of Eastern England* (Sheet 4) published by Cranfield University and Soil Survey of England and Wales 1983.
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- Topographical survey carried out by J Taylor Ltd (shown at the end of this report).
- Anglian Water asset plans (Appendix C).
- Topographical survey carried out by BB Surveys Ltd (shown on Drawing Numbers 2219-1968-SU00, 2219-1968-SU01, 2219-1968-SU02, 2219-1968-SU03, 2219-1968-SU04, 2219-1968-SU05).
- Filtered LIDAR data at 1m resolution.
- Infiltration testing carried out by Geosphere Environmental (Appendix B).

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

3.1.1 The site is located across land off Kelvedon Road, Tiptree, Essex. The approximate Ordnance Survey (OS) grid reference for the site is 588663 216996 and the location of the site is shown on Figure 1.

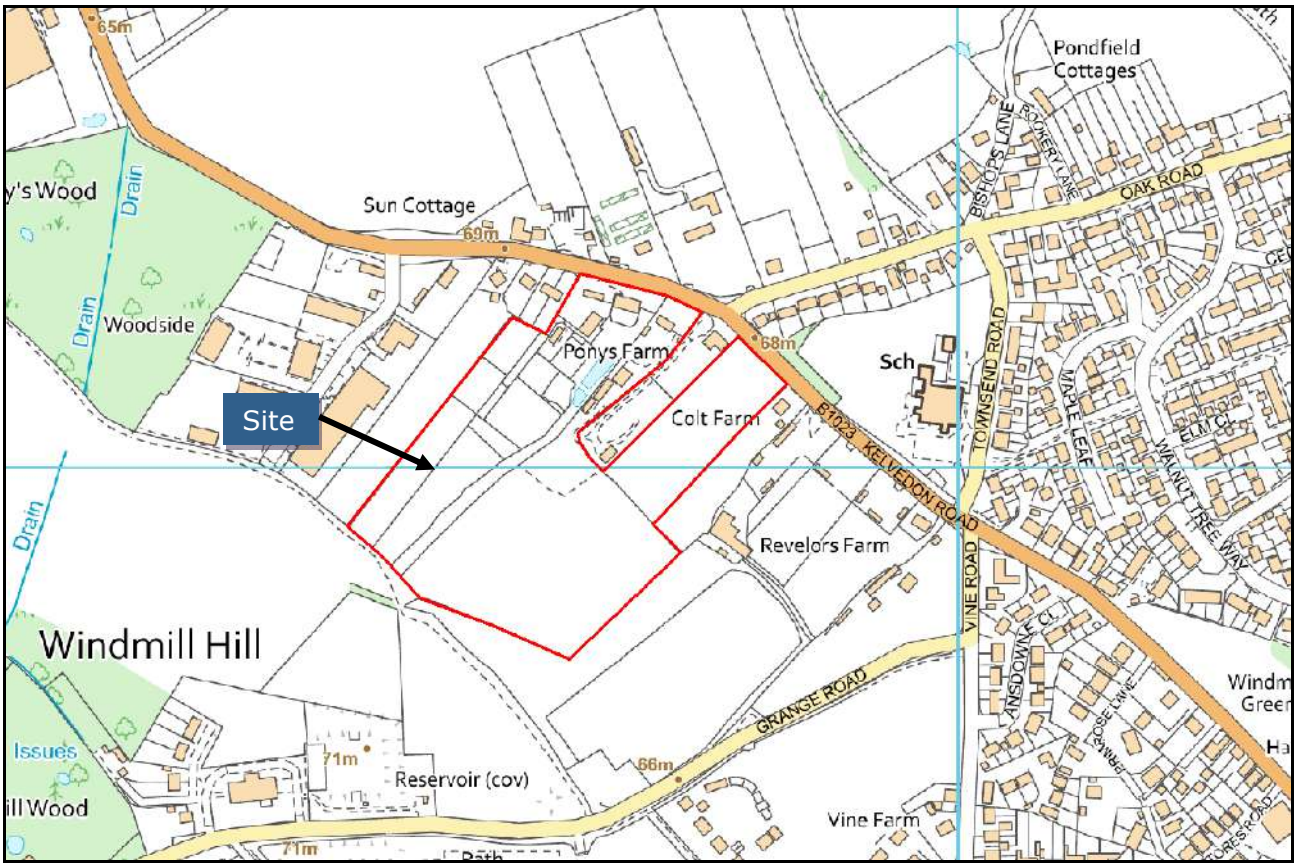

Figure 1: Site location plan (Source: Ordnance Survey)

3.1.2 The site is irregular in shape and covers a total area of approximately 5.11 ha. The site currently comprises Pony's Farm and grassed paddocks. The site is accessed via Kelvedon Road adjacent to the north eastern frontage of the site.

3.1.3 A topographical survey has been carried out by J Taylor Ltd (shown at the end of this report) and BB Surveys Ltd (shown on Drawing Numbers 2219-1968-SU00, 2219-1968-SU01, 2219-1968-SU02, 2219-1968-SU03, 2219-1968-SU04, 2219-1968-SU05). Ground levels are in metres above Ordnance Datum (m AOD). It can be seen that ground levels fall in a south easterly direction.

3.1.4 Filtered LIDAR data at 1m resolution has been obtained in order to determine and illustrate the topography across the site and surrounding area (Figure 2).

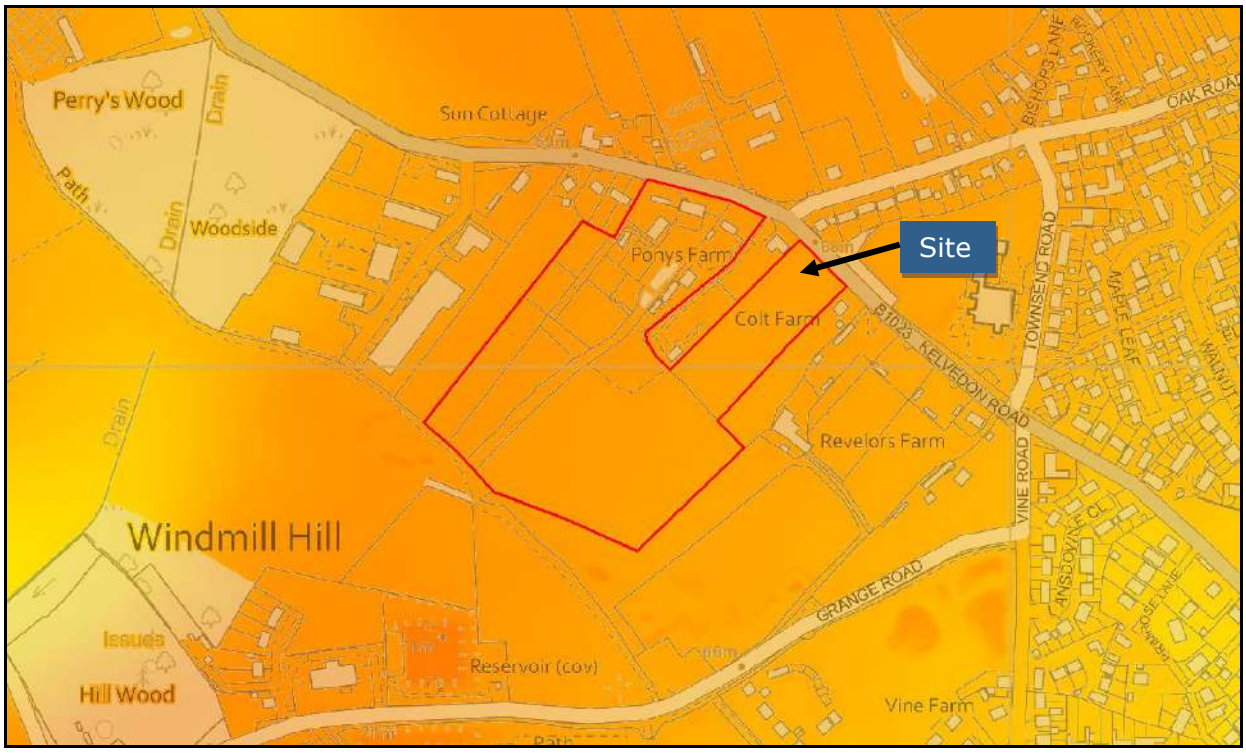

Figure 2: Filtered LIDAR survey data at 1m resolution where higher ground is denoted by red and orange colours and lower ground is denoted by yellow and green colours

3.2 Site Proposals

3.2.1 It is the Client's intention to develop the site with residential dwellings, together with driveways, garages, access roads, open space and gardens.

3.2.2 Access will be provided from Kelvedon Road. The site proposals can be seen on Drawing Number 1432.301.01.

4. SOURCES OF FLOODING

4.1 Fluvial

4.1.1 The Environment Agency Flood Map (Figure 3) and Figure 2H/1 of the 2016 SFRA shows that the site is located within the NPPF Flood Zone 1, 'Low Probability' which comprises land as having less than a 1 in 1000 year annual probability of fluvial or tidal flooding (i.e. an event more severe than the extreme 1 in 1000 year event). NPPF states that all uses of land are appropriate in this zone.

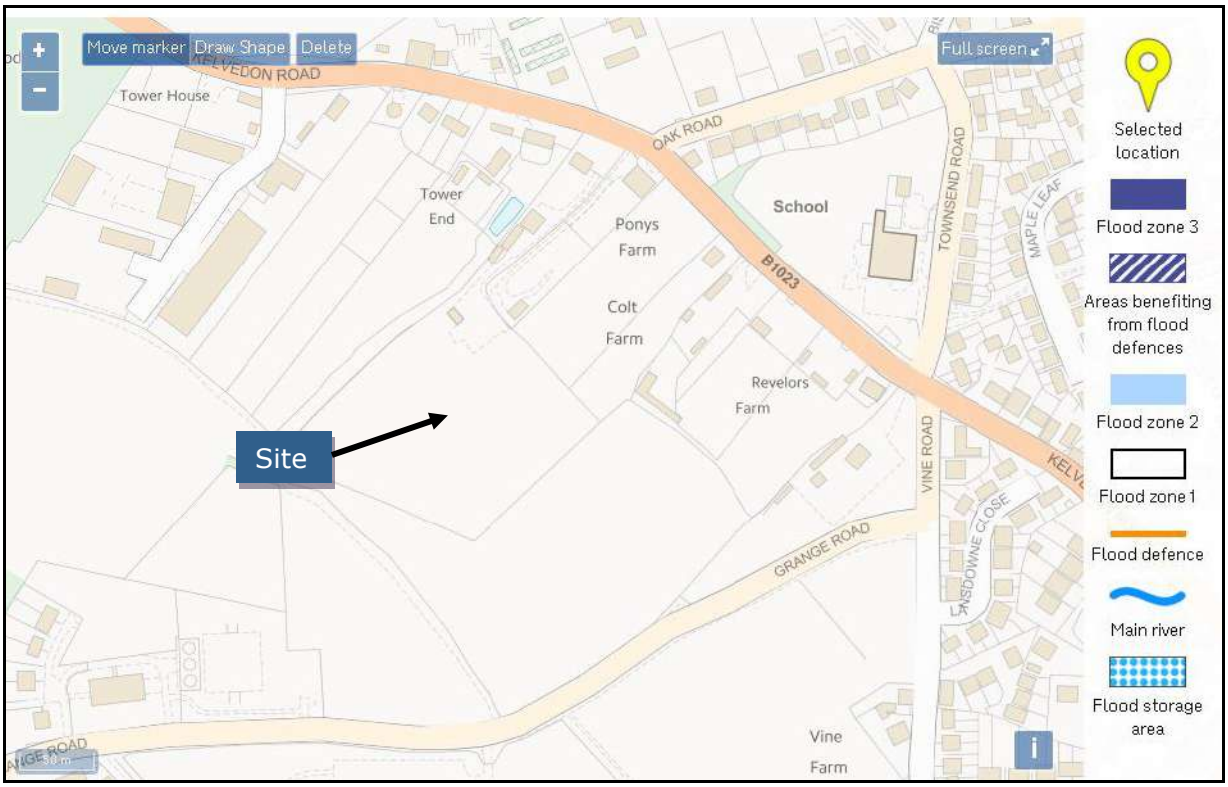

Figure 3: Environment Agency Flood Map (Source: Environment Agency)

4.2 Groundwater Flooding

4.2.1 In order to assess the potential for groundwater flooding during higher return period rainfall events, the Jacobs/DEFRA report entitled *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study*, published in May 2004, was consulted, together with the guidance offered within the document entitled *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*, commissioned by DEFRA and carried out by Jacobs in 2006.

Soil and Geology at the Site

4.2.2 The infiltration testing report indicates that the soils beneath the site comprise topsoil overlying London Clay. No groundwater strikes were recorded during the intrusive investigation.

Groundwater Flooding Potential at the Site

4.2.3 There have been no recorded groundwater flood events across the area between 2000 and 2003, as indicated by the Jacobs study. The BGS Groundwater Flooding

Susceptibility Map indicates that there is "Limited Potential for Groundwater Flooding to Occur".

4.2.4 It is considered that the evidence suggests a low risk of groundwater flooding to the site.

4.3 Surface Water Flooding and Sewer Flooding

4.3.1 Surface water and sewer flooding across urban areas is often a result of high intensity storm events which exceed the capacity of the sewer thus causing it to surcharge and flood. Poorly maintained sewer networks and blockages can also exacerbate the potential for sewer flooding. Surface water flooding can also occur as a result of overland flow across poorly drained rural areas.

4.3.2 Figure 2H/1 of the 2016 SFRA shows that there have been no recorded Essex County Council flood incidents within the vicinity of the site.

4.3.3 The Environment Agency's Surface Water Flooding Map (Figure 4) indicates that across the site and access there is a very low surface water flooding risk (i.e. chance of flooding less than 1 in 1000 years). Therefore, safe refuge and access/egress is available at all times.

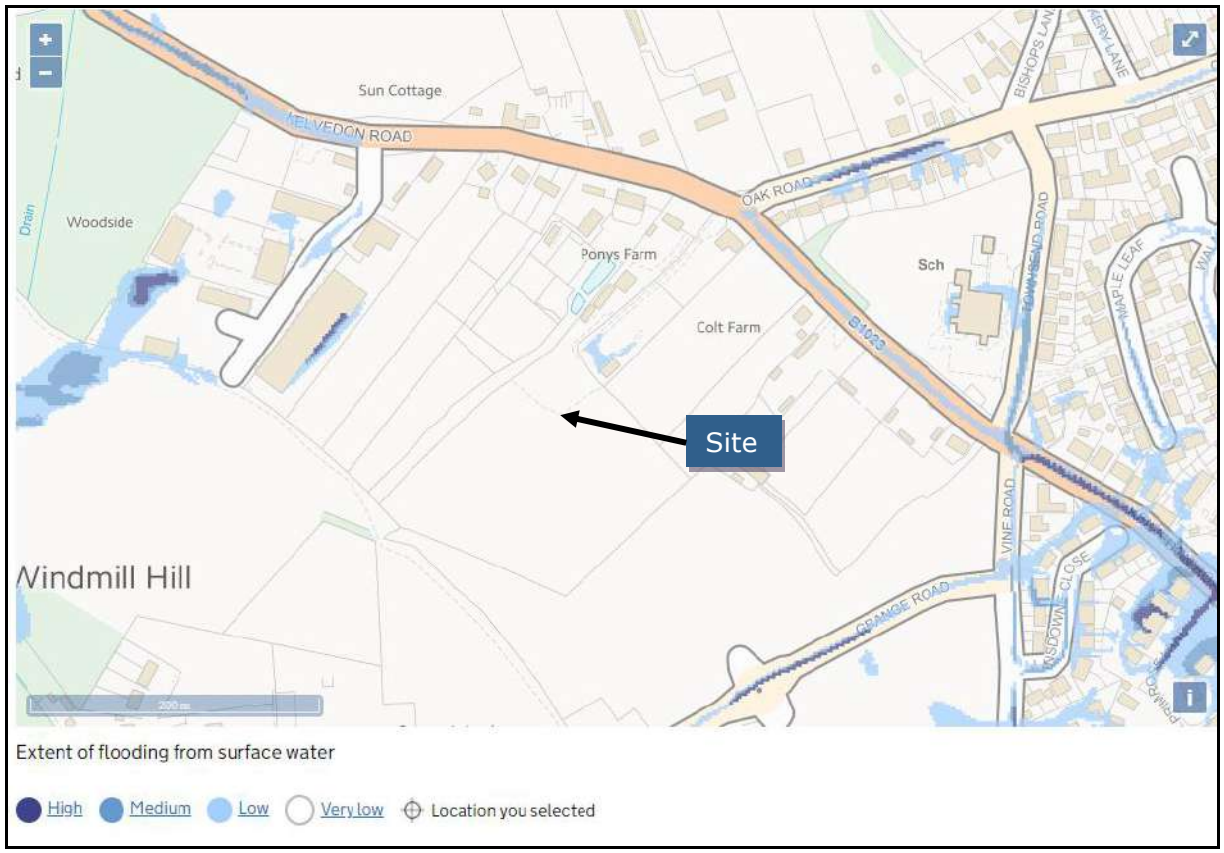

Figure 4: Environment Agency Surface Water Flooding Map (Source: Environment Agency)

4.4 Reservoirs, Canals And Other Artificial Sources

4.4.1 The failure of man-made infrastructure such as flood defences and other structures can result in unexpected flooding. Flooding from artificial sources such as reservoirs, canals and lakes can also occur suddenly and without warning, leading to high depths and velocities of flood water which pose a safety risk to people and property.

4.4.2 The Environment Agency's "Risk of flooding from reservoirs" map indicates that the site is not at risk from such features.

5. SURFACE WATER DRAINAGE AND SUDS

5.1 Introduction

5.1.1 Planning policy recommends the maximum practical use of Sustainable Drainage Systems (SUDS) within proposals for new sites. There is a requirement that sustainable drainage systems (SUDS) be installed where appropriate, in order to limit the amount of surface water runoff entering drainage systems and to return surface water into the ground to follow its natural drainage path.

5.1.2 The National Planning Policy Framework (NPPF) and the Environment Agency require that the effects of climate change to be considered in any assessment of flood risk for developments. When considering the impacts of climate change on rainfall intensity, Table 2 of the UK Government's climate change allowances guidance dated February 2016, advises that when designing surface water drainage systems, an increase in peak rainfall intensity of up to 40% should be considered.

5.1.3 In addition to the consideration of the design event for the SUDS techniques adopted in this report, the possibility of exceedance has been considered further in Section 5.8, and as outlined in CIRIA 635 entitled *Designing for exceedance in urban drainage – good practice,* and the CIRIA/HR Wallingford document entitled *Drainage of development sites – a guide* dated 2004. Although the guidance does not specify a return period event, the exceedance event is usually considered as the event which would exceed the design requirements of the drainage system in question. For example, SUDS attenuation/infiltration devices are usually designed to consider the climate change 1 in 100 year event and therefore the exceedance event in this instance could be considered as the 1 in 1000 year storm event.

5.2 Existing Surface Water Drainage

5.2.1 A detailed drainage survey is not available (and therefore the hydraulic characteristics and condition of the system cannot be determined), therefore in accordance with 2b of Section 24.5 of CIRIA 753, runoff from the site can be estimated using the urbanisation methods in the ReFH2 software.

5.2.2 In order to quantify the existing runoff rate from the site, the methodology outlined within the document entitled *The Revitalised Flood Hydrograph Model ReFH2 Technical Guidance* has been adopted. The document states that Table 24.1 of CIRIA 753 prefers FEH Methods over the IoH 124 Method, as they are more accurate when calculating peak flows within small catchments and plot scale Greenfield runoff calculations.

5.2.3 The method also uses the more up-to-date FEH13 Point rainfall data (which replaces the FEH99 data) which have been imported into the ReFH2.3 software from the FEH Web Service as well as the catchment descriptors (ReFH 2.3+ xml).

5.2.4 The total site area is 5.11 ha and as the site has existing roofs/hardstanding, the impact of these areas (3155 sq m) on existing runoff rates have been taken into account by using the Urbanisation tab within the ReFH2.3 software, as recommended in Section 9.3 of the technical guidance (for example the existing hardstanding area of 0.3155 ha was entered as well as an Imperviousness factor of 1 and Impervious Runoff Factor of 1).

5.2.5 When choosing either a winter or summer storm profile, the advice in Section 8.1 of the technical guide and Hydrosolutions support team suggests that winter profiles are used in all but the most heavily urbanised catchments (i.e. URBEXT greater than 0.3) in which a summer storm should be specified. The URBEXT value for the existing site has been

calculated using the QMED Urbanisation tab in the WINFAP Version 4 software and equates to 0.03940 (based on an URBAN value of 0.06174). Therefore, the URBEXT value for the site is less than the URBEXT threshold of 0.3 and hence a winter storm should be used.

5.2.6 As the site area is less than 50 ha, Section 9.1.1 of the technical guidance has been followed in order for the results to be rescaled in accordance with the SUDS guidance (i.e. Tp updated to 3.251 and B_L updated to 38.885).

5.2.7 The results for the existing (urbanised) site have been extracted from the ReFH2.3 software and can be seen in Table 1 and Appendix A. The (direct) runoff volume can also be calculated by specifying a storm duration of 6 hours and timestep of 8 minutes.

Table 1: Runoff rates and volumes for the existing site using ReFH2.3

Return Period	Runoff rate (l/s)	Runoff volume for 6 hour event (cu m)
1	14.4	277
2	16.4	319
30	33.8	685
100	43.2	887
100+40%CC	62.4	1300

5.3 Soil Types and SUDS Suitability

5.3.1 Part H of the Building Regulations and Section 3.2.3 of CIRIA 753 prioritises discharges to the ground and then a watercourse, with discharge to a sewer only to be considered when both infiltration and discharge to a watercourse is not reasonably practicable.

5.3.2 The infiltration testing report indicates that the soils beneath the site comprise topsoil overlying London Clay. No groundwater strikes were recorded during the intrusive investigation. The test results in Appendix B yielded no appreciable infiltration across the site.

5.3.3 Therefore, due to the soil types/infiltration capacity across the site, there is a stronger case to implement an attenuation SUDS solution at the site instead of an infiltration SUDS solution.

5.3.4 The topographical survey shows a drainage ditch running in a south westerly direction through the middle of the site. However, the ditch abruptly ends along part of the south western frontage of the site. To the south of the site at this location another ditch exists and runs in a south easterly direction away from the site and towards Grange Road. However, there is no obvious connection between the two ditches and the land between the site and the other ditch is under the control of a third party making it unviable to discharge to this ditch system.

5.3.5 The Anglian Water asset plans (Appendix C) shows that the closest public surface water sewer is located 452m east and within Maple Leaf. Therefore, an attenuated discharge will be directed into this sewer.

5.3.6 Lined permeable paving (in the form of permeable block paving, porous asphalt or grass reinforcement/plastic grids with gravel - See Section 20.1.3 of CIRIA 753) used for attenuation and water quality could be used to construct the proposed hardstanding

areas such as driveways and private access roads. Surface water from building roofs could then be drained onto, or into, the permeable paving directly thus providing additional water quality treatment. This approach is described further in CIRIA 582 entitled *Source control using constructed pervious surfaces.*

5.3.7 Surface water from the permeable paving and proposed public access roads (which would be constructed using conventional building materials) could be directed to a detention basin located across the large open space area.

5.3.8 An attenuated discharge will be directed into the Anglian Water sewer within Maple Leaf. Anglian Water will need to be approached in due course in order to determine preferred connection points.

5.4 Pervious Surfaces

5.4.1 The proposed hardstanding areas comprising driveways and private access roads could be constructed using lined pervious paving such as permeable block paving or grass reinforcement/plastic grids with gravel as discussed further in Section 20.1.3 of CIRIA 753, which will be used for attenuation rather than infiltration (Type C). Surface water from the proposed building roofs could then be drained onto, or into, these surfaces directly. This approach is described further in CIRIA 582 entitled *Source control using constructed pervious surfaces.*

5.4.2 The Building Regulations state that "infiltration devices should not be built within 5m of a building or road or in areas of unstable land". However, the CIRIA Susdrain factsheet entitled "Using SUDS Close to Buildings", suggests that the 5m rule was originally devised for soakaways, as these devices concentrate runoff into a quite small area of ground (i.e. point infiltration), whereas permeable paving acts as a blanket and promotes diffuse infiltration.

5.4.3 The aforementioned CIRIA Susdrain document continues to state that permeable paving that collects and drains rainwater falling directly on it can be used against any building providing there is no point source of water from any other impermeable surfaces connected to it. Despite this, the document also states that allowing water to soak into the ground close to foundations should always be done in consultation with a geotechnical advisor or registered ground engineering professional (also acknowledged in Section 25.2.3 of CIRIA 753). This issue does not apply when using permeable paving for attenuation/cleansing purposes only such as in this case.

5.4.4 The Interpave document entitled *Understanding permeable paving: Guidance for designers, planners and local authorities* dated 2010, suggests that permeable paving can permit a flow rate of up to 4000mm/hr. The system shown on Figure 5 allows for the complete capture of water using an impermeable, flexible membrane placed on top of the subgrade level and up the sides of the permeable sub-base.

5.4.5 A hydraulically bound coarse aggregate base will be required to withstand heavy vehicles. Figure 6 shows the typical dimensions of the permeable paving for this load category.

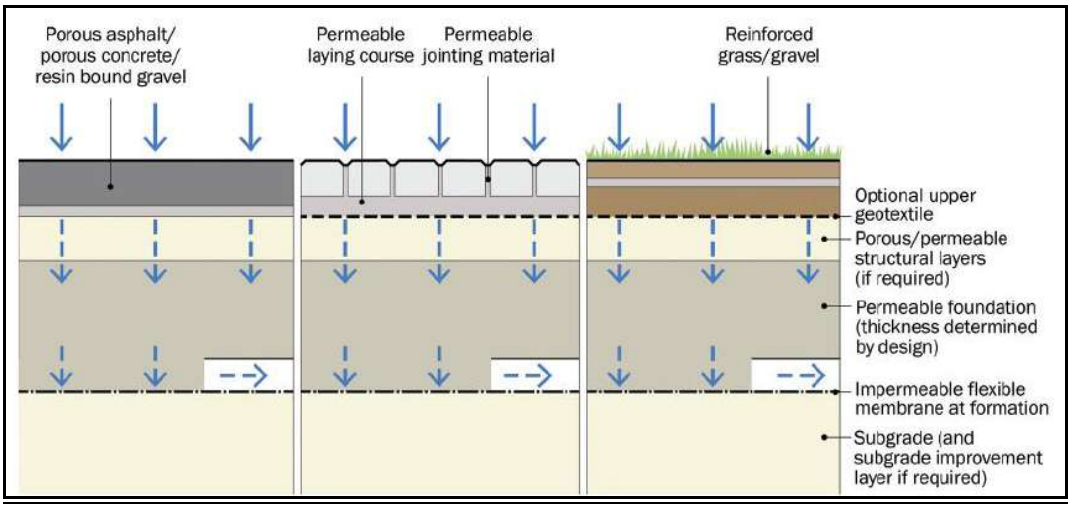

Figure 5: Section through a pervious surface (Source: Figure 20.14 of CIRIA 753)

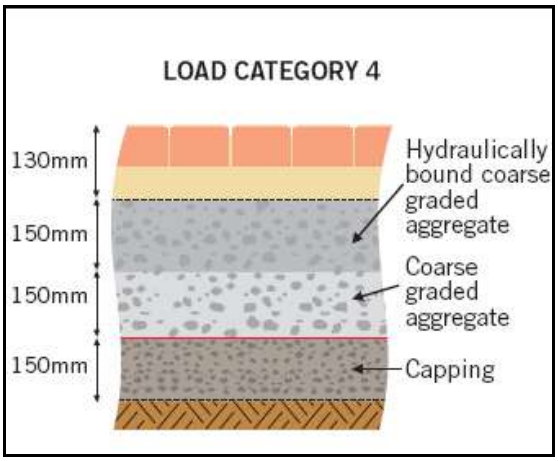

Figure 6: Section through a permeable surface for expected load category (Source: Interpave *Permeable pavements – guide to the design construction and maintenance of concrete block permeable pavements* dated 2010)

5.5 Detention Basin

5.5.1 Surface water from the permeable paving and proposed public access roads (which would be constructed using conventional building materials) could be directed to a detention basin located across the large open space area.

5.5.2 Dry detention basins are discussed further in Chapter 22 of CIRIA 753 and Table 1 of BS8582:2013 and are effective when providing temporary storage and controlled release of detained runoff. Such features are normally vegetated and are mainly dry except during and immediately after storm events. Detention basins can be used for more than one purpose according to Section 22.6 of CIRIA 753 (e.g. play areas). Section 22.4 of CIRIA 753 states that detention basins can be sized to provide flood attenuation for all events up to the 1 in 100 year event and with discharges being constrained to the equivalent Greenfield rate.

5.5.3 Anglian Water will need to be approached in due course in order to determine preferred connection points. It is understood from the ECC SUDS Design Guide that when discharging into an Anglian Water sewer then the discharge rate should be as close to the greenfield 1 in 1 year runoff rate as possible with a minimum final outlet size limit of 75mm.

5.5.4 The DEFRA/EA document entitled *Rainfall runoff management for developments* dated 2013, and BS8582:2013 advise that the post-development site should aim to try and replicate the undeveloped state and that for Greenfield sites, the peak runoff rate from the developed site for the 1 in 1 year event and 1 in 100 year event should be constrained to the equivalent peak Greenfield runoff rate to minimise the impact on the receiving watercourse.

5.5.5 The guidance states that when considering volume control, the volume discharged from the site for the 1 in 100 year, 6 hour event is constrained to the equivalent volume associated with the Greenfield condition.

5.5.6 The ECC SUDS Design Guide states that in all cases, including brownfield sites, wherever practicable the runoff rate should be restricted to the Greenfield 1 in 1 year rate.

5.5.7 The aforementioned guidance and Section 24.10 of CIRIA 753 states that where the additional volume from the development cannot be used or disposed of on-site (e.g. through infiltration or rainwater harvesting) such as in this case, to avoid an increased runoff volume from developed areas into the sewer system, this volume should be discharged at a very low rate.

5.5.8 Therefore, the guidance recommends that:

a) The additional volume resulting from the development (i.e. long term storage volume) should be discharged at a rate of 2 l/s/ha (or less); or

b) *ALL* the runoff for the 1 in 100 year event from the site should be discharged at a rate of 2 l/s/ha or QBAR (whichever is greater).

5.5.9 In order to provide effective attenuation from the site it is proposed that the runoff from the proposed site will be discharged in accordance with criterion b) above.

5.5.10 The contributing total hardstanding area has been calculated as 21444 sq m. Runoff from the contributing hardstanding areas is assumed to be 100% (i.e. 100% PIMP and no infiltration into the ground) and permeable parts of the developed site such as garden areas will be profiled so that they do not enter the drainage system (see Section 5.9). Therefore, in accordance with Section 24.2 of CIRIA 753 permeable areas will not contribute to the drainage system and have therefore not been included in the calculations.

5.5.11 The equivalent Greenfield runoff rate for the contributing area has been calculated using the same methodology outlined in Section 5.2 (using 'As rural' results and not the Urbanisation Tab). The results can be seen in Table 2 and Appendix D.

Table 2: Greenfield runoff rate equivalent for contributing area using ReFH2.3

Return Period	Runoff rate (l/s)	Runoff volume for 6 hour event (cu m)
1	5.55	105
2	6.32	121
30	13	262
100	16.7	340
100+40%CC	24.2	504

5.5.12 Table 2 shows that the equivalent 1 in 2 year runoff rate (i.e. similar to QBAR) is 6.32 l/s and when considering 2 l/s/ha the rate is 4.29 l/s. The 1 in 1 year runoff rate is 5.55 l/s.

5.5.13 Therefore, a discharge from the proposed site will be set to 5.55 l/s to comply with the ECC guidance.

5.5.14 The basin has been designed in accordance with CIRIA 753 and ECC SUDS Design Guide, which requires the basin to have a depth of up to 1.2m and maximum side slopes of 1 in 3. Section 22.2 of CIRIA 753 recommends that the maximum depth of water within the basin should not exceed 2m and side slopes should not exceed 1 in 3.

5.5.15 In this case, the maximum depth of the basin below the existing ground level has been limited to 1m and side slopes of 1 in 4 have been modelled for safety reasons.

5.5.16 It should be noted that the MicroDrainage support team has confirmed that the software does not allow the 1 in 1 year event to be modelled when using FEH13 data and hence the 1 in 2 year event has been chosen instead.

5.5.17 Additionally, a 10% increase in impermeable area has been included in order to consider urban creep as specified by BS8582:2013 and Section 24.7.2 of CIRIA 753 (i.e. total contributing area increases to 23588 sq m).

5.5.18 In order to determine the size of the basin during the 1 in 100 year plus climate change event, the *Source Control – Tank/Pond* function within the Microdrainage software, Version 2020.1, has been used together with the Point rainfall data extracted from the FEH Web Service. The results can be seen in Appendix E and Table 3.

Table 3: Attenuation calculations

Return Period	Post-development discharge rate (l/s)	Storage volume/Discharge volume (cu m)	Storage depth (m)	Total Depth (m)	Area covered (sq m)
1 in 2 year event.	5.55	481.8/553.8	0.262	1	2660
1 in 30 year event.	5.55	938.1/875.3	0.483	1	2660
1 in 100 year event.	5.55	1226.2/866.7	0.613	1	2660
1 in 100 year event plus (40%) climate change event.	5.55	1808.5/784.1	0.856	1	2660

5.5.19 Table 20.1 of CIRIA 753 indicates that it may be possible for the pervious paving to incorporate partial infiltration (Type B) in order to help with interception (i.e. the capture and retention of the first 5mm of rainfall), although this cannot be factored into the storage design. Section 13.4.2 of CIRIA 753 states that infiltration can play an important role in providing interception even on sites with low infiltration rates.

5.5.20 Rainwater reuse has been considered further. It is proposed that water butts are provided on downpipes to capture and provide some attenuation of runoff from the roof area. Once the water butt becomes full, surface water will overflow into the drainage system.

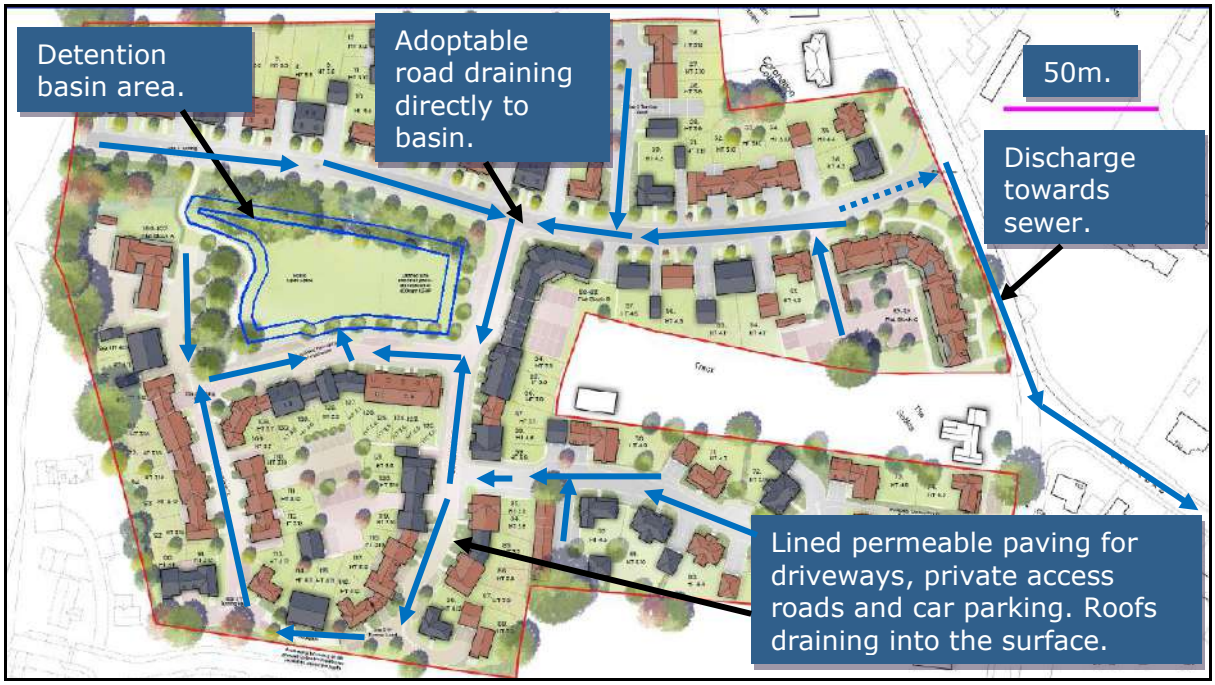

Figure 7: Indicative SUDS scheme (See also Drawing Number 2229/RE/01A)

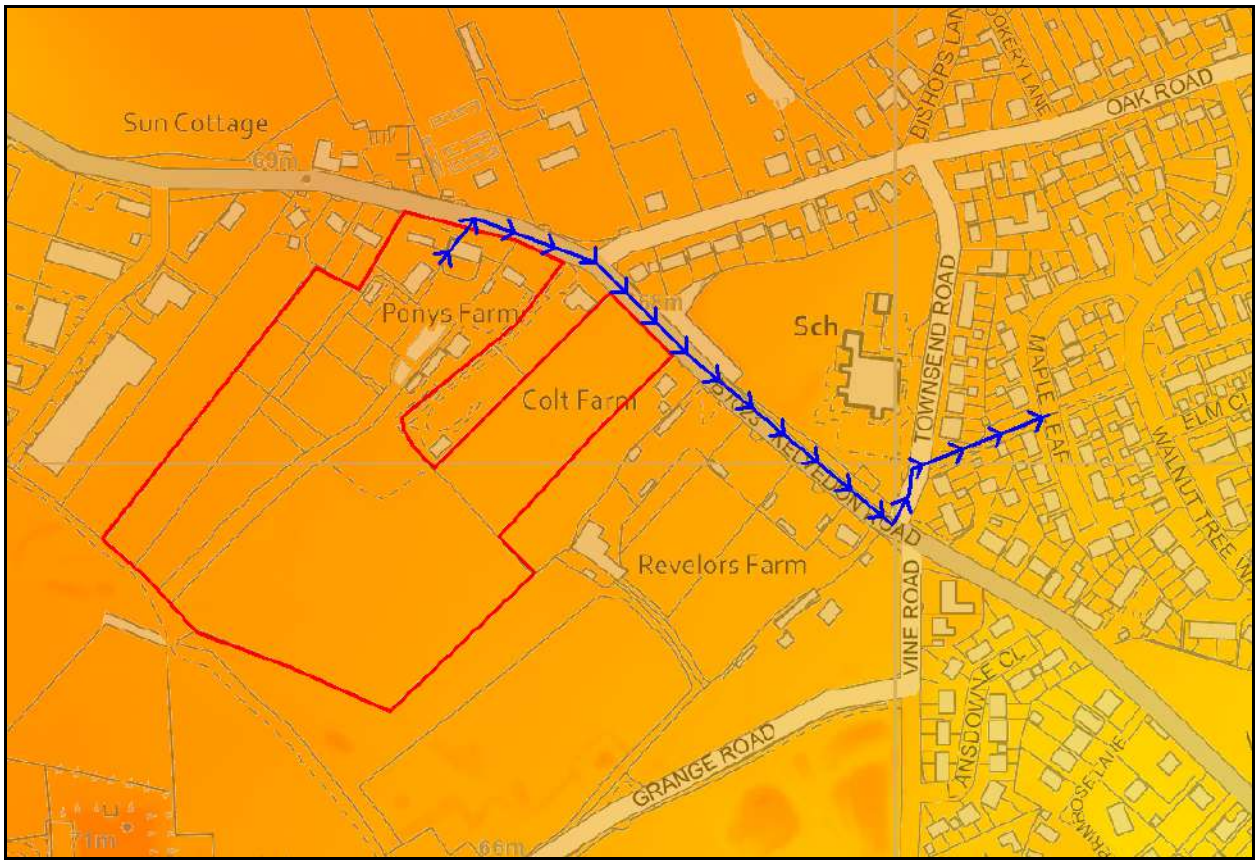

Figure 8: Route from site to public surface water sewer

5.6 Pollution Prevention

5.6.1 Table 26.2 of CIRIA 753 shows that residential roof water has a very low pollution hazard level. Table 26.2 of CIRIA 753 shows that residential driveways and low traffic roads have a low pollution hazard level. When considering the adoptable highway draining to the basin and it having a medium pollution hazard due to a high number of traffic movements.

5.6.2 Permeable paving will sufficiently cleanse surface water from roofs and hardstanding areas such as driveways and private roads. Chapter 20 of CIRIA 753 confirms that permeable paving can improve water quality by sedimentation, filtration, adsorption and biodegradation. Where applicable, roof water draining to the permeable paving is also considered to be of a suitable quality and will not be required to be subjected to additional pollution prevention measures.

5.6.3 The detention basin will sufficiently cleanse surface water further from hardstanding areas. Section 22.5 of CIRIA 753 states that vegetated detention basins can help retain runoff and reduce the contaminant load. They can also treat runoff by gravitational settling of particulate pollutants. Table 26.7 of CIRIA 753 shows that detention basins provide interception, primary treatment and secondary treatment in the SUDS management train. Chapter 16 of CIRIA 697 states that detention basins have a medium potential to remove suspended solids and heavy metals and a low potential to remove nutrients. Table 1.7 of CIRIA 697 confirms that detention basins can improve water quality by sedimentation, filtration, adsorption and biodegradation.

5.6.4 To consider the medium pollution hazard from the adoptable highway, additional pollution measures could consist of those discussed in Chapter 16 of CIRIA 697 and Chapter 14 of CIRIA 753 which suggests that pre-treatment measures could comprise, for example, proprietary filtration systems which trap particulates and soluble pollutants from the runoff prior to discharge into the basin. For example, a Polypipe RIDGISTORM-X4 product would be suitable as shown at https://www.polypipe.com/civils-and-infrastructure/ridgistorm-x4-surface-water-treatment-devices. Section 21.9.9 of CIRIA 753 indicates that a sediment sump could be included or sediment traps. Furthermore, an oil interceptor could be included prior to discharge into the basin.

5.6.5 It is therefore considered that (collectively) the SUDS measures included within this report will sufficiently improve water quality across the proposed site and comply with Box 4.3 of CIRIA 753.

5.6.6 When considering water quality treatment, the Simple Index Approach set out in 26.7.1 of CIRIA 753 needs to be considered. Using Tables 26.2 and 26.3 in CIRIA 753, it can be seen on Table 4 overleaf, that the use of permeable paving and a detention basin (in combination) to cleanse roof water and access roads/driveways will meet the pollution mitigation requirements (i.e. values in Table 4 for SUDS components should be equal to, or greater than the values for Land Use).

Table 4: Simple Index Approach

Land Use	Total Suspended Solids index	Metals index	Hydrocarbons index
Residential Roofs	0.2	0.2	0.05
Residential Driveways/Low traffic roads	0.5	0.4	0.4
Adoptable roads	0.7	0.6	0.7
SUDS Component for treatment	Total Suspended Solids index	Metals index	Hydrocarbons index
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Proprietary treatment systems	Designed and specified to cleanse surface water from roads and to meet indices above.		

5.7 Adoption and Maintenance

5.7.1 The SUDS measures can be privately adopted and maintained (perhaps by a management company and/or homeowners).

5.7.2 The permeable paving, basin and proprietary treatment systems should be maintained in accordance with Table 20.15, Table 22.1 and Table 14.2 respectively of CIRIA 753, shown as Tables 5, 6 and 7 hereafter.

Table 5: Maintenance regime for permeable paving (Source: taken from Table 20.15 of CIRIA 753)

TABLE 20.15 Operation and maintenance requirements for pervious pavements		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 6: Maintenance regime for detention basin (Source: taken from Table 22.1 of CIRIA 753)

TABLE 22.1 Operation and maintenance requirements for detention basins		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 7: Maintenance regime for proprietary treatment system (Source: taken from Table 14.2 of CIRIA 753)

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system		
Maintenance schedule	**Required action**	**Typical frequency**
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

5.8 Designing For Exceedance

5.8.1 Section 3.2.6 of CIRIA 753 states that the designated drainage system may include areas that are only designed to flood on an infrequent basis such as car parks, roads and recreational areas. For larger events, the site layout should be designed so that exceedance flows are managed in safe conveyance and storage zones so that the risk of flooding is acceptable for all people and property. Section 13.4.5 of CIRIA 753 states that an exceedance flow route or temporary storage area will be required for rainfall events that exceed the design capacity of the system.

5.8.2 The calculations in this FRA consider the climate change (40%) 1 in 100 year event and therefore are designed to accommodate flows during the design event. The exceedance return period event has been assumed to be the 1 in 1000 year event as this yields a storage depth and volume higher than the design event.

5.8.3 The results in Appendix F indicate that the basin cannot accommodate all of the surface water during the exceedance return period event without surface flooding. The flooded volume of 317.1 cu m will be retained temporarily across the paving/road area of 11226 sq m at a depth of 0.03m and controlled with standard kerbing and shallow gradients.

5.8.4 Excess water can enter the basin by overtopping or via a large gully adjacent to the basin (Figure 9). Erosion control measures may be needed to prevent damage to the basin during this event.

5.8.5 Permeable paving areas should be graded so that runoff onto neighbouring areas is prevented. Kelvedon Road adjacent to the site entrance is set higher than the site which will ensure no off-site flooding via this direction.

5.8.6 It is recommended that all proposed buildings should have a finished floor level of 150mm higher than ground levels to ensure no internal flooding caused by wave action from vehicles.

5.8.7 It is considered that flood routing can be investigated further at the detailed design stage and that the measures outlined in this FRA provide sufficient reassurance that there is scope when designing for exceedance at this site. This element could be conditioned as part of any planning approval.

Figure 9: Example of runoff from highway into a basin (Source: taken from Suffolk County Council Local SUDS Design Guide)

5.9 Runoff from Permeable Areas

5.9.1 Permeable areas will not be permitted to drain into the drainage system and therefore long term storage including climate change allowances from these areas has been considered separately. The Essex County Council's SUDS Design Guide dated 2014 discusses the requirement to consider permeable areas and long term storage, as these will be subject to climate change which may result in measurable runoff.

5.9.2 In section 4.2.2 and 4.5.5 of CIRIA 697 *The SUDS Manual,* guidance is provided on how to determine runoff volume. The *REFH2 Greenfield Runoff Volume* calculator provided in the MicroDrainage software also allows a Greenfield runoff volume to be calculated based on the FEH13 data and user defined permeable area.

5.9.3 Figure 10 shows that the runoff volume for a typical garden area of 84 sq m is 1.648 cu m during the 1 in 100 year event. Applying 40% climate change to this figure increases it to 2.31 cu m.

5.9.4 When applying the volume of runoff of 2.31 cu m across its area would result in a depth of 0.03m.

5.9.5 It is recommended that in order to contain the water across these areas, each garden area should be profiled/lowered by a maximum of 0.1m. This will prevent runoff onto other areas. It is considered that this water would evaporate and infiltrate over time (which would mimic a more natural scenario).

5.9.6 It is not considered viable to include permeable areas within the SUDS calculations due to the risk of high sediment loads and the risk of overdesign.

Evans Rivers & Costal Ltd		Page 1
19 St Andrews Avenue Thorpe St Andrew Norwich NR7 0RG	Runoff volume	
Date 15/01/2019 13:01 File 1000yr road.srcx	Designed by rupertercl Checked by	
Micro Drainage	Source Control 2018.1	

ReFH2 Greenfield Runoff Volume

Input

Return Period (Years)	100
Storm Duration (min)	360
FEH Rainfall Version	2013
Site Location	GB 588788 217031
Data Type	Point
Season	Winter
Country	England/Wales/Northern Ireland
Area (ha)	0.008
SAAR (mm)	569
BFIHOST	0.382
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Percentage Runoff (%)	51.10
Greenfield Runoff Volume (m³)	1.648

Figure 10: Greenfield runoff volume from rear garden areas during 1 in 100 year event

5.10 Additional Information

5.10.1 For the purposes of this report a hydrobrake has been used in the model which will limit the flow rate from the pervious paving and basin. However, other control devices such as orifice plates could be used. Section 28.5.3 of CIRIA 753 states that in order to minimise the risk of blockage for very low flow controls perforated risers can be used (Figure 11).

5.10.2 Surface water within the paving structure, (which will also be accepting surface water flows from other parts of the site such as roofs), will drain out of the paving sub-structure and into the basin via a drainage pipe located at the end of the paving extent. Figure 12 and 13 shows a cross section of the paving structure with outfall pipe.

5.10.3 Section 20.10.2 of CIRIA 753 states that where water leaves the sub-base to flow to the next part of the drainage system, an outlet is required from the sub-base. This is usually achieved using either a series of perforated pipes or with a length of fin drain (Figure 14). Section 20.10 of CIRIA 753 states that perforated pipes should extend at least 1m into the sub-base and should be slotted in order to convey water.

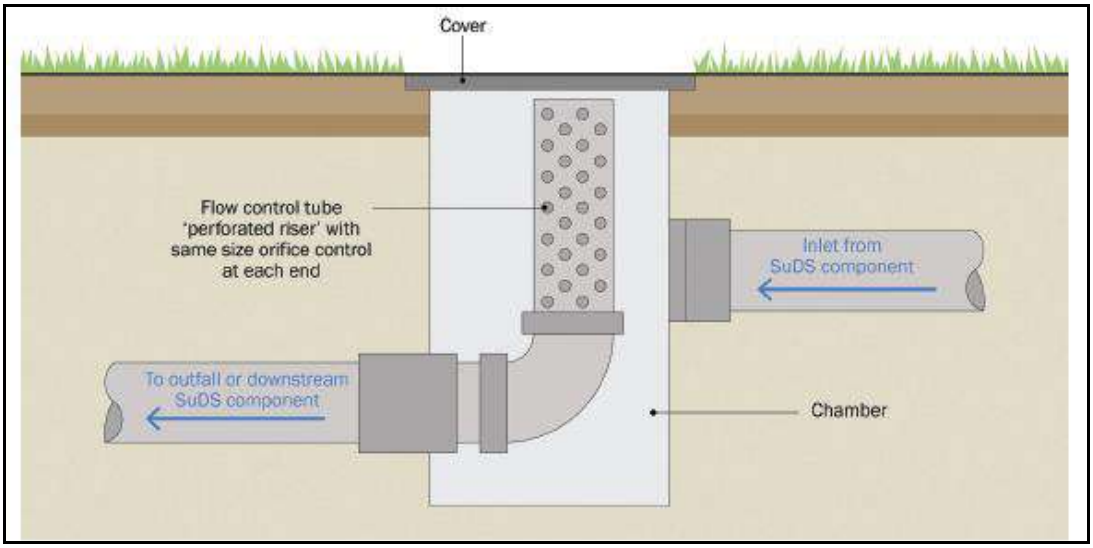

Figure 11: Example of a perforated riser to reduce the risk of blockage (Source: Figure 28.19 of CIRIA 753)

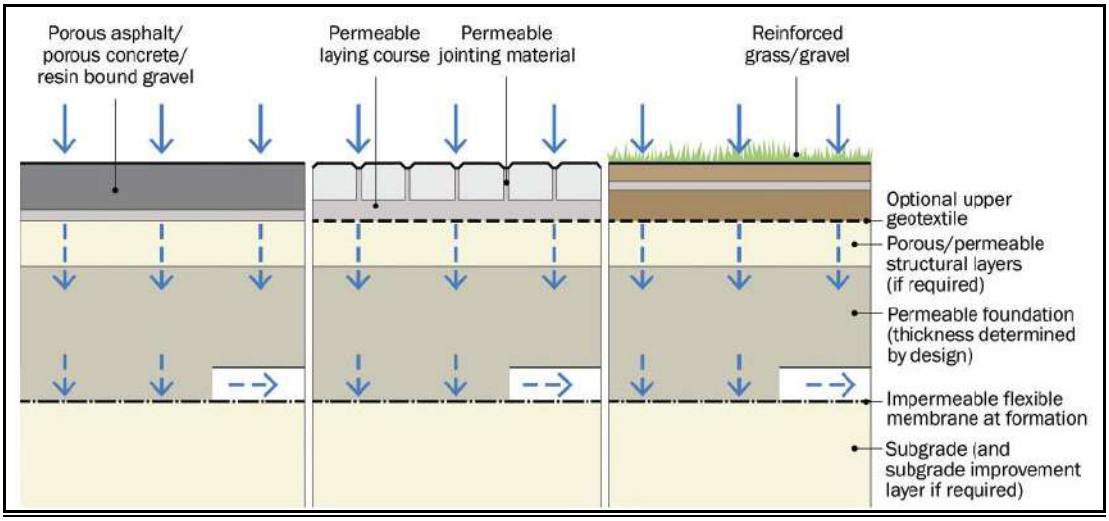

Figure 12: Section through a pervious surface (Source: Figure 20.14 of CIRIA 753)

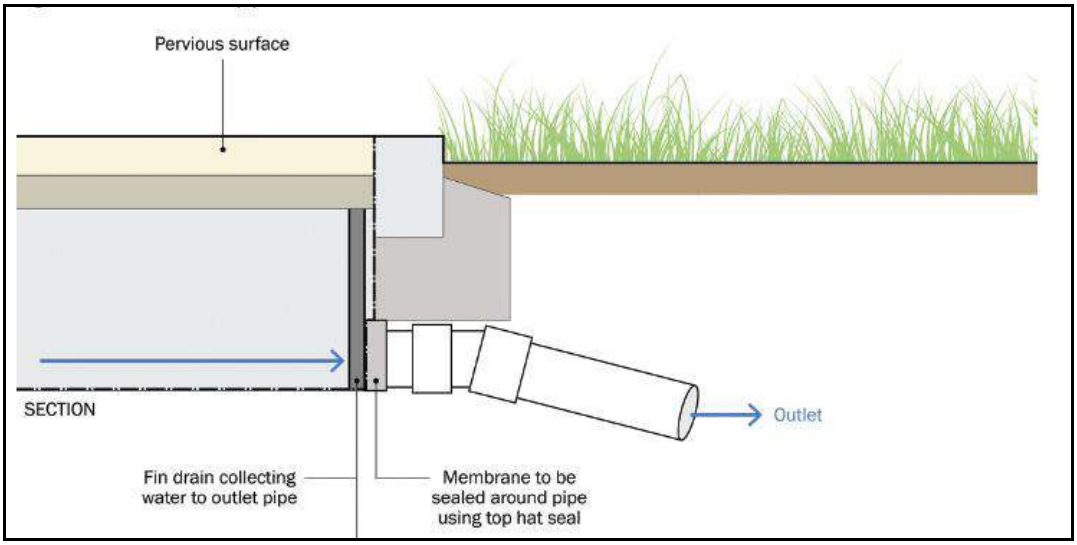

Figure 13: Fin drain outlet (Source: taken from Figure 20.26 of CIRIA 753

6. CONCLUSIONS

- A review of the relevant guidance documents and various types of data collected at the site has enabled a full assessment of the flood risks to be quantified.

- The site is located within the Flood Zone 1 therefore all uses of land are appropriate in this zone.

- This assessment has investigated the possibility of groundwater flooding and flooding from other sources at the site. It is considered that there will be a low risk of groundwater flooding across the site and very low risk of flooding from other sources such as surface water.

- An assessment of the practical use of sustainable drainage techniques has been carried out. As soil types will not support the effective use of infiltration devices, it is proposed that surface water is attenuated through the use of permeable paving and a detention basin prior to discharge into the local AW surface water sewer system.

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APPENDIX A –EXISTING GREENFIELD RUNOFF CALCULATIONS

ReFH 2 - exis rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

1 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 3.01
Total rainfall (mm): 13.26

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.239
Total flow vol. (ML): 0.679
Peak flow (m³/s): 0.0132

Results (urbanised)

Direct runoff vol. (ML) 0.266
Total flow vol. (ML): 0.679
Peak flow (m³/s): 0.0144

Graph series

☑ Input rainfall
☑ Net rainfall
☑ Direct runoff
☑ Baseflow
☑ Total flow

Project checksum

1ACA-BF0A

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

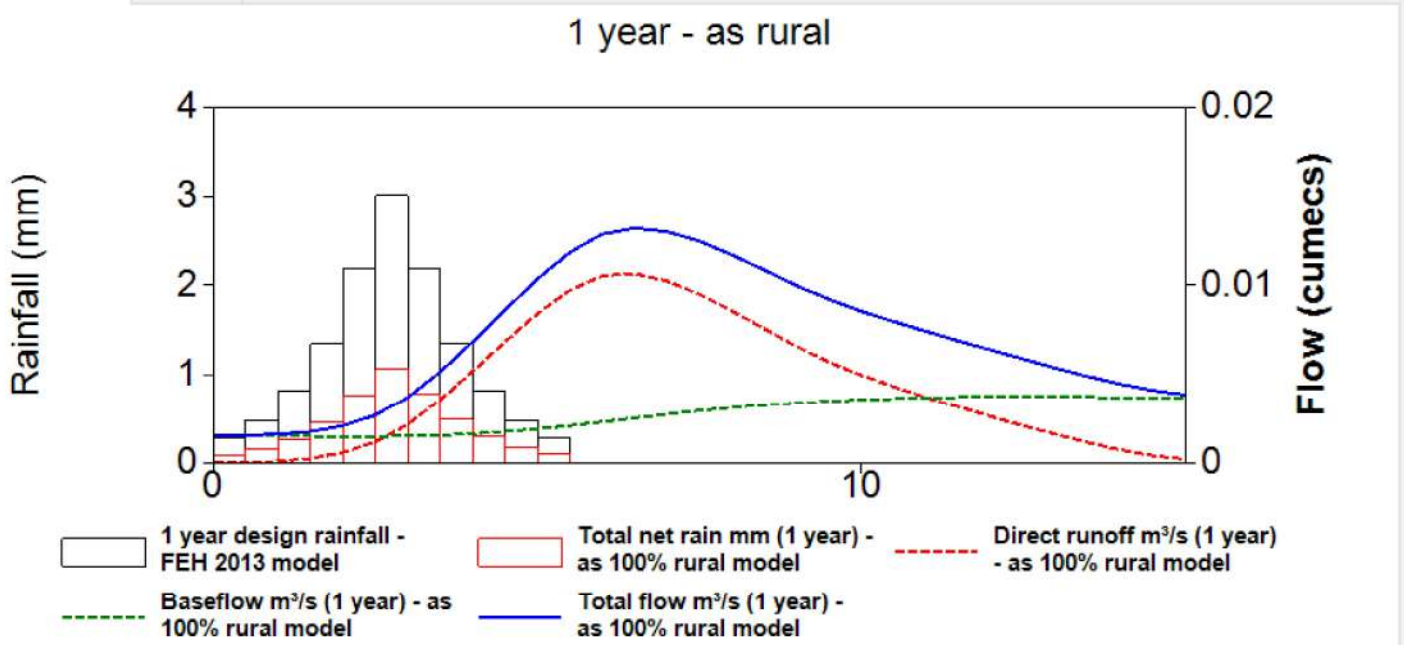
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.0511

Area (ha): 5.11

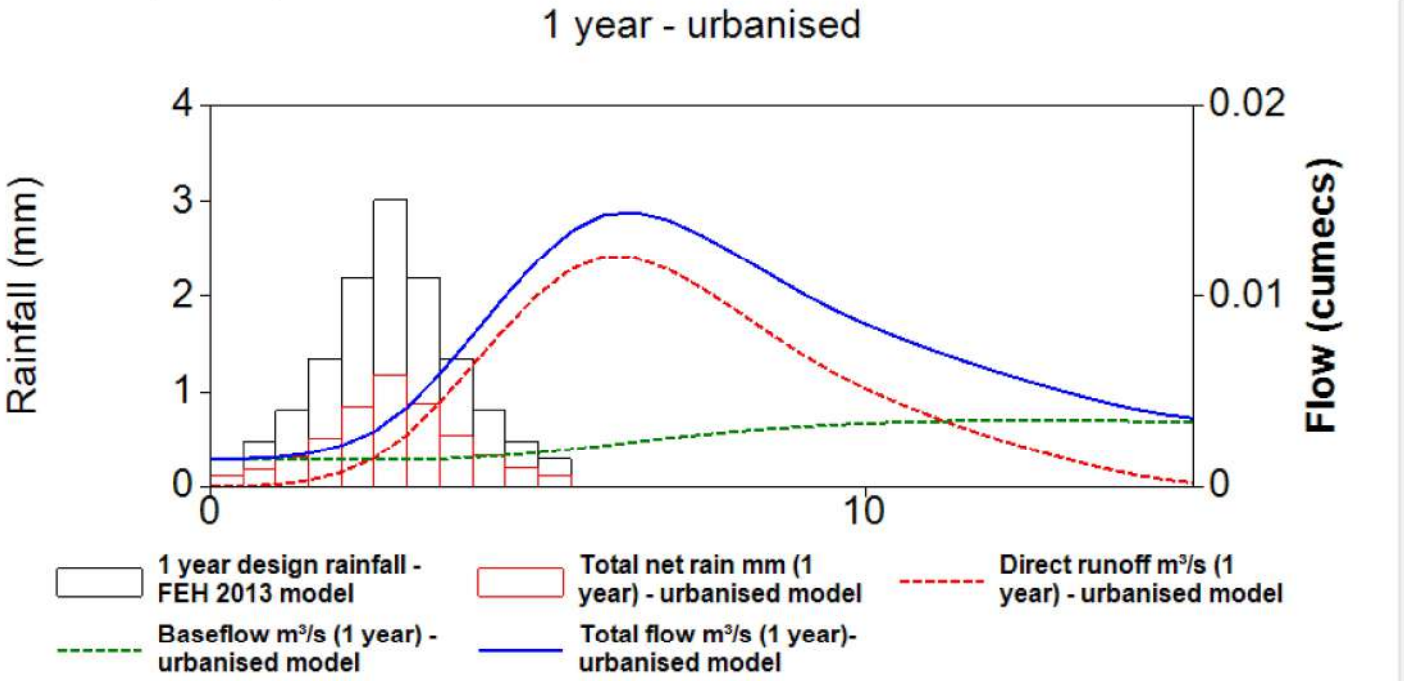
Reset all Apply

1 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:18:23 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 1ACA-BF0A

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.05

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH 2013 model (mm):	20.75	Total runoff (ML):	0.27
Total Rainfall (mm):	13.26	Total flow (ML):	0.68
Peak Rainfall (mm):	3.01	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.71]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [34.57]	Yes
BR	1.84	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0]	Yes
Urbext 2000	0.04 [0]	Yes
Impervious runoff factor	1 [0.7]	Yes
Imperviousness factor	1 [0.4]	Yes
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.2912	0.0000	0.1094	0.0000	0.00147	0.00147
00:30:00	0.4879	0.0000	0.1838	0.0000	0.00145	0.00148
01:00:00	0.8131	0.0000	0.3076	0.0001	0.00143	0.00156
01:30:00	1.3445	0.0000	0.5125	0.0003	0.00142	0.00177
02:00:00	2.1880	0.0000	0.8442	0.0008	0.00141	0.00218
02:30:00	3.0141	0.0000	1.1835	0.0015	0.00141	0.00294
03:00:00	2.1880	0.0000	0.8740	0.0028	0.00143	0.00419
03:30:00	1.3445	0.0000	0.5433	0.0045	0.00148	0.00594
04:00:00	0.8131	0.0000	0.3309	0.0064	0.00156	0.00795
04:30:00	0.4879	0.0000	0.1994	0.0083	0.00167	0.01
05:00:00	0.2912	0.0000	0.1193	0.0101	0.00182	0.0119
05:30:00	0.0000	0.0000	0.0000	0.0114	0.00199	0.0134
06:00:00	0.0000	0.0000	0.0000	0.0121	0.00219	0.0143
06:30:00	0.0000	0.0000	0.0000	0.0120	0.0024	0.0144
07:00:00	0.0000	0.0000	0.0000	0.0114	0.0026	0.014
07:30:00	0.0000	0.0000	0.0000	0.0104	0.00278	0.0132
08:00:00	0.0000	0.0000	0.0000	0.0093	0.00294	0.0123
08:30:00	0.0000	0.0000	0.0000	0.0081	0.00308	0.0112
09:00:00	0.0000	0.0000	0.0000	0.0070	0.0032	0.0102
09:30:00	0.0000	0.0000	0.0000	0.0060	0.00329	0.00932
10:00:00	0.0000	0.0000	0.0000	0.0052	0.00337	0.00854
10:30:00	0.0000	0.0000	0.0000	0.0044	0.00343	0.00785
11:00:00	0.0000	0.0000	0.0000	0.0037	0.00347	0.00721
11:30:00	0.0000	0.0000	0.0000	0.0031	0.0035	0.00661
12:00:00	0.0000	0.0000	0.0000	0.0025	0.00352	0.00606
12:30:00	0.0000	0.0000	0.0000	0.0020	0.00353	0.00554
13:00:00	0.0000	0.0000	0.0000	0.0015	0.00352	0.00505
13:30:00	0.0000	0.0000	0.0000	0.0011	0.00351	0.00459
14:00:00	0.0000	0.0000	0.0000	0.0007	0.00349	0.00419
14:30:00	0.0000	0.0000	0.0000	0.0004	0.00345	0.00386
15:00:00	0.0000	0.0000	0.0000	0.0002	0.00342	0.00363
15:30:00	0.0000	0.0000	0.0000	0.0001	0.00338	0.00348
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00334	0.00338
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00329	0.00331
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00325	0.00325

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00321	0.00321
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00317	0.00317
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00313	0.00313
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00309	0.00309
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00305	0.00305
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00301	0.00301
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00297	0.00297
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00293	0.00293
21:30:00	0.0000	0.0000	0.0000	0.0000	0.0029	0.0029
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00286	0.00286
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00282	0.00282
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00279	0.00279
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00275	0.00275
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00272	0.00272
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00268	0.00268
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00265	0.00265
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00261	0.00261
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00258	0.00258
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00255	0.00255
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00251	0.00251
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00248	0.00248
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00245	0.00245
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00242	0.00242
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00239	0.00239
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00236	0.00236
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00233	0.00233
30:30:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00227	0.00227
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00224	0.00224
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00221	0.00221
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00218	0.00218
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00216	0.00216
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
34:00:00	0.0000	0.0000	0.0000	0.0000	0.0021	0.0021
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00207	0.00207
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00205	0.00205

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00202
36:00:00	0.0000	0.0000	0.0000	0.0000	0.002	0.002
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00194	0.00194
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
38:00:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00187	0.00187
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00182
40:00:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00169	0.00169
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162
44:30:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
47:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

ReFH 2 - exis rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

2 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 3.45
Total rainfall (mm): 15.20

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.276
Total flow vol. (ML): 0.776
Peak flow (m³/s): 0.015

Results (urbanised)

Direct runoff vol. (ML) 0.307
Total flow vol. (ML): 0.776
Peak flow (m³/s): 0.0164

Graph series

☑ Input rainfall
☑ Net rainfall
☑ Direct runoff
☑ Baseflow
☑ Total flow

Project checksum

1ACA-BF0A

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

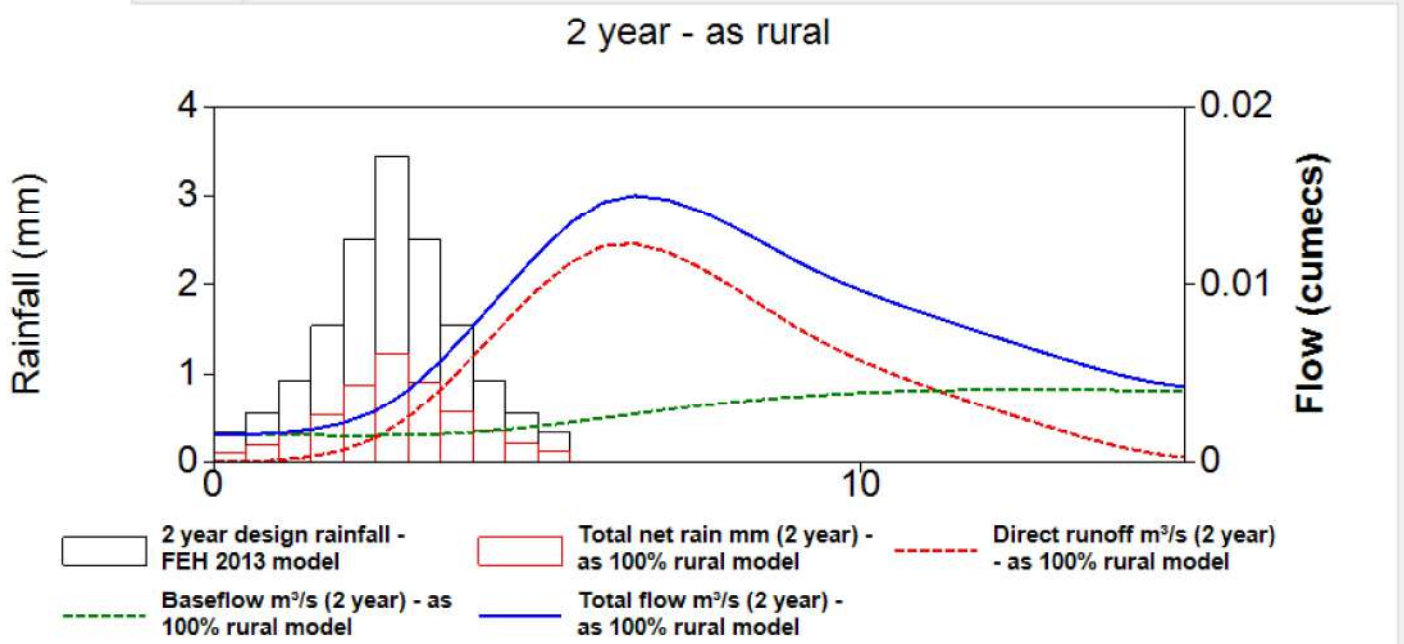
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.0511

Area (ha): 5.11

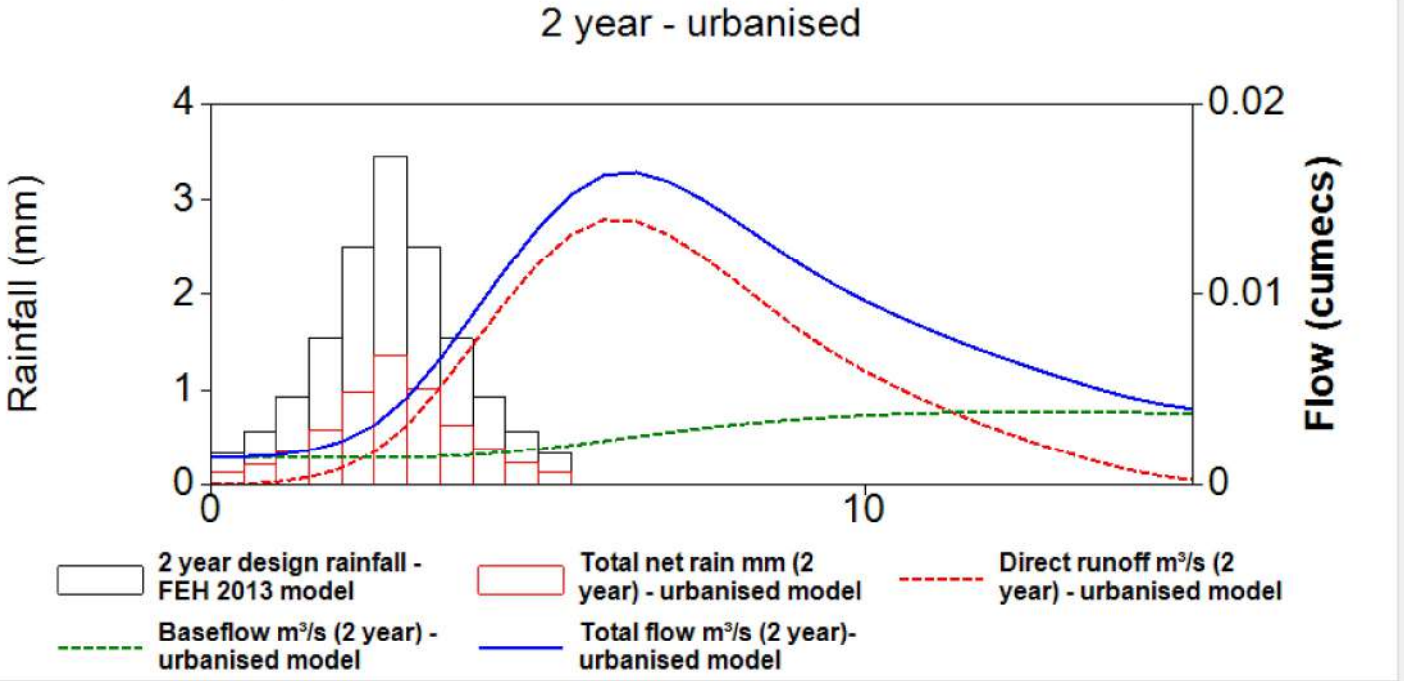
Reset all Apply

2 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) — Export



Graph (urbanised) | Grid (urbanised) — Export



UK Design Flood Estimation

Generated on 05 May 2021 08:22:44 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 1ACA-BF0A

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.05

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 model (mm):	23.78	Total runoff (ML):	0.31
Total Rainfall (mm):	15.20	Total flow (ML):	0.78
Peak Rainfall (mm):	3.45	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.71]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [34.57]	Yes
BR	1.81	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0]	Yes
Urbext 2000	0.04 [0]	Yes
Impervious runoff factor	1 [0.7]	Yes
Imperviousness factor	1 [0.4]	Yes
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.3337	0.0000	0.1254	0.0000	0.00147	0.00147
00:30:00	0.5591	0.0000	0.2107	0.0000	0.00145	0.00148
01:00:00	0.9318	0.0000	0.3530	0.0001	0.00144	0.00158
01:30:00	1.5408	0.0000	0.5887	0.0004	0.00142	0.00182
02:00:00	2.5075	0.0000	0.9713	0.0009	0.00141	0.00229
02:30:00	3.4542	0.0000	1.3650	0.0017	0.00142	0.00317
03:00:00	2.5075	0.0000	1.0105	0.0032	0.00144	0.00461
03:30:00	1.5408	0.0000	0.6291	0.0051	0.0015	0.00663
04:00:00	0.9318	0.0000	0.3835	0.0074	0.00159	0.00895
04:30:00	0.5591	0.0000	0.2312	0.0096	0.00172	0.0113
05:00:00	0.3337	0.0000	0.1384	0.0116	0.00189	0.0135
05:30:00	0.0000	0.0000	0.0000	0.0132	0.00209	0.0153
06:00:00	0.0000	0.0000	0.0000	0.0140	0.00232	0.0163
06:30:00	0.0000	0.0000	0.0000	0.0139	0.00256	0.0164
07:00:00	0.0000	0.0000	0.0000	0.0132	0.00279	0.0159
07:30:00	0.0000	0.0000	0.0000	0.0120	0.003	0.015
08:00:00	0.0000	0.0000	0.0000	0.0108	0.00319	0.0139
08:30:00	0.0000	0.0000	0.0000	0.0094	0.00335	0.0128
09:00:00	0.0000	0.0000	0.0000	0.0081	0.00348	0.0116
09:30:00	0.0000	0.0000	0.0000	0.0070	0.00359	0.0106
10:00:00	0.0000	0.0000	0.0000	0.0060	0.00368	0.00966
10:30:00	0.0000	0.0000	0.0000	0.0051	0.00375	0.00886
11:00:00	0.0000	0.0000	0.0000	0.0043	0.0038	0.00812
11:30:00	0.0000	0.0000	0.0000	0.0036	0.00384	0.00744
12:00:00	0.0000	0.0000	0.0000	0.0029	0.00387	0.0068
12:30:00	0.0000	0.0000	0.0000	0.0023	0.00388	0.00621
13:00:00	0.0000	0.0000	0.0000	0.0018	0.00387	0.00564
13:30:00	0.0000	0.0000	0.0000	0.0013	0.00386	0.00511
14:00:00	0.0000	0.0000	0.0000	0.0008	0.00383	0.00464
14:30:00	0.0000	0.0000	0.0000	0.0005	0.0038	0.00427
15:00:00	0.0000	0.0000	0.0000	0.0002	0.00376	0.00401
15:30:00	0.0000	0.0000	0.0000	0.0001	0.00372	0.00383
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00367	0.00372
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00362	0.00364
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00358	0.00358

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00353	0.00353
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00349	0.00349
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00344	0.00344
19:00:00	0.0000	0.0000	0.0000	0.0000	0.0034	0.0034
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00335	0.00335
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00331	0.00331
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00327	0.00327
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00323	0.00323
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00319	0.00319
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00315	0.00315
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00311	0.00311
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00307	0.00307
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00303	0.00303
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00299	0.00299
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00295	0.00295
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00291	0.00291
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00288	0.00288
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00284	0.00284
26:30:00	0.0000	0.0000	0.0000	0.0000	0.0028	0.0028
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00277	0.00277
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00273	0.00273
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0027	0.0027
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00266	0.00266
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00263	0.00263
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00259	0.00259
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00256	0.00256
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00253	0.00253
31:00:00	0.0000	0.0000	0.0000	0.0000	0.0025	0.0025
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00246	0.00246
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00243	0.00243
32:30:00	0.0000	0.0000	0.0000	0.0000	0.0024	0.0024
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00237	0.00237
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00234	0.00234
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00231	0.00231
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00228	0.00228
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00225	0.00225

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00222	0.00222
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00219	0.00219
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00217	0.00217
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00214	0.00214
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00211	0.00211
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00208	0.00208
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00203	0.00203
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00201	0.00201
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00195	0.00195
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00193
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00191	0.00191
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00188	0.00188
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00181	0.00181
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00176	0.00176
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
46:00:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

ReFH 2 - exis rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

30 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 7.08
Total rainfall (mm): 31.16

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.601
Total flow vol. (ML): 1.59
Peak flow (m³/s): 0.0309

Results (urbanised)

Direct runoff vol. (ML) 0.662
Total flow vol. (ML): 1.59
Peak flow (m³/s): 0.0338

Graph series

☑ Input rainfall
☑ Net rainfall
☑ Direct runoff
☑ Baseflow
☑ Total flow

Project checksum

1ACA-BF0A

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

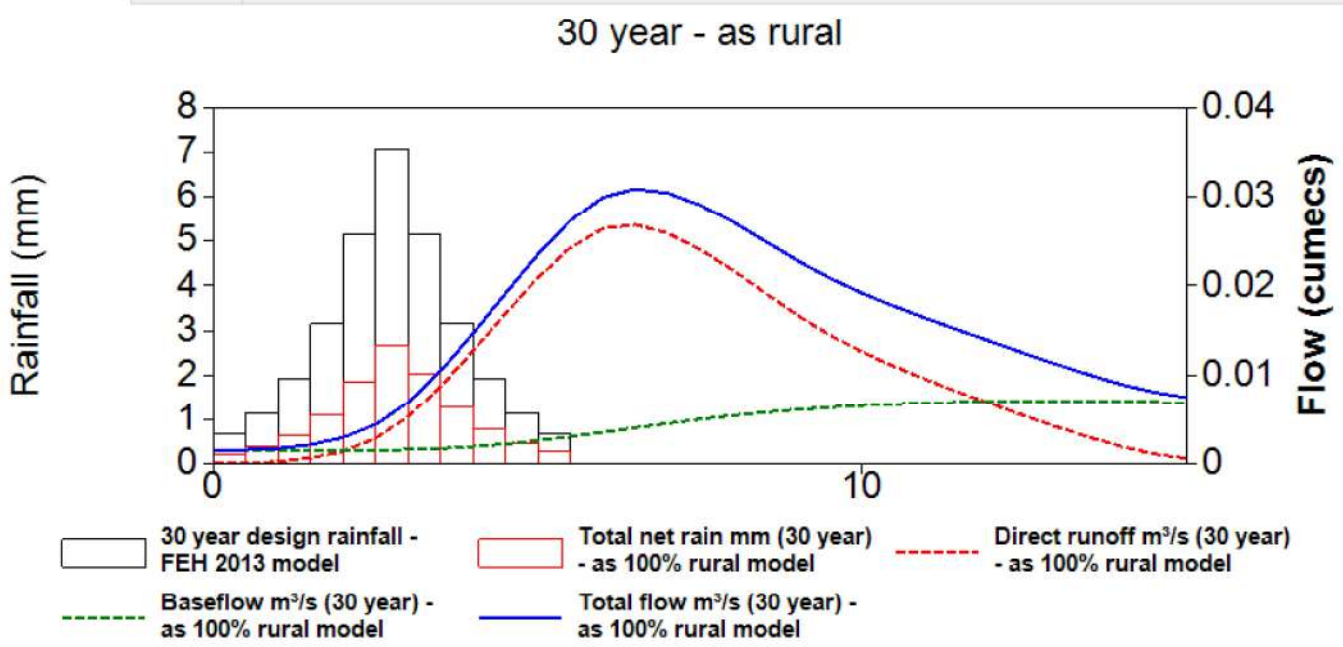
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.0511

Area (ha): 5.11

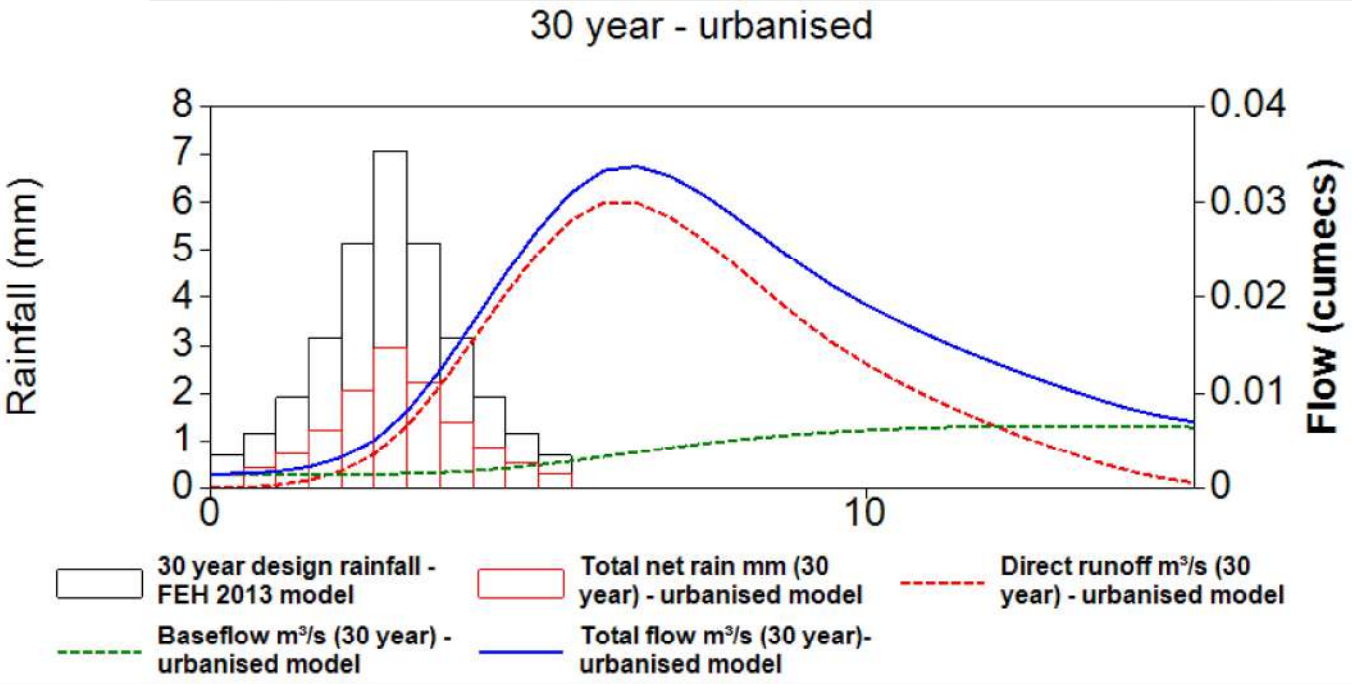
Reset all Apply

30 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) — Export



Graph (urbanised) | Grid (urbanised) — Export



UK Design Flood Estimation

Generated on 05 May 2021 08:26:18 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 1ACA-BF0A

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.05

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 2013 model (mm):	48.74	Total runoff (ML):	0.66
Total Rainfall (mm):	31.16	Total flow (ML):	1.59
Peak Rainfall (mm):	7.08	Peak flow (m³/s):	0.03

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.71]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [34.57]	Yes
BR	1.65	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0]	Yes
Urbext 2000	0.04 [0]	Yes
Impervious runoff factor	1 [0.7]	Yes
Imperviousness factor	1 [0.4]	Yes
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.6840	0.0000	0.2573	0.0000	0.00147	0.00147
00:30:00	1.1460	0.0000	0.4338	0.0001	0.00145	0.00152
01:00:00	1.9100	0.0000	0.7307	0.0003	0.00144	0.00173
01:30:00	3.1582	0.0000	1.2292	0.0008	0.00143	0.00224
02:00:00	5.1397	0.0000	2.0563	0.0018	0.00143	0.00325
02:30:00	7.0801	0.0000	2.9462	0.0036	0.00145	0.00507
03:00:00	5.1397	0.0000	2.2211	0.0066	0.00152	0.00813
03:30:00	3.1582	0.0000	1.3992	0.0108	0.00164	0.0124
04:00:00	1.9100	0.0000	0.8589	0.0155	0.00183	0.0174
04:30:00	1.1460	0.0000	0.5200	0.0204	0.0021	0.0225
05:00:00	0.6840	0.0000	0.3120	0.0248	0.00244	0.0272
05:30:00	0.0000	0.0000	0.0000	0.0282	0.00286	0.031
06:00:00	0.0000	0.0000	0.0000	0.0300	0.00332	0.0333
06:30:00	0.0000	0.0000	0.0000	0.0300	0.00381	0.0338
07:00:00	0.0000	0.0000	0.0000	0.0285	0.00428	0.0328
07:30:00	0.0000	0.0000	0.0000	0.0262	0.00472	0.0309
08:00:00	0.0000	0.0000	0.0000	0.0234	0.00511	0.0285
08:30:00	0.0000	0.0000	0.0000	0.0205	0.00545	0.026
09:00:00	0.0000	0.0000	0.0000	0.0177	0.00574	0.0234
09:30:00	0.0000	0.0000	0.0000	0.0152	0.00597	0.0212
10:00:00	0.0000	0.0000	0.0000	0.0130	0.00616	0.0192
10:30:00	0.0000	0.0000	0.0000	0.0112	0.00632	0.0175
11:00:00	0.0000	0.0000	0.0000	0.0094	0.00644	0.0159
11:30:00	0.0000	0.0000	0.0000	0.0079	0.00653	0.0144
12:00:00	0.0000	0.0000	0.0000	0.0065	0.00659	0.0131
12:30:00	0.0000	0.0000	0.0000	0.0052	0.00663	0.0118
13:00:00	0.0000	0.0000	0.0000	0.0039	0.00663	0.0106
13:30:00	0.0000	0.0000	0.0000	0.0028	0.00662	0.00942
14:00:00	0.0000	0.0000	0.0000	0.0018	0.00658	0.00841
14:30:00	0.0000	0.0000	0.0000	0.0011	0.00653	0.00759
15:00:00	0.0000	0.0000	0.0000	0.0006	0.00646	0.00702
15:30:00	0.0000	0.0000	0.0000	0.0003	0.00639	0.00666
16:00:00	0.0000	0.0000	0.0000	0.0001	0.00631	0.00642
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00623	0.00626
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00615	0.00616

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00608	0.00608
18:00:00	0.0000	0.0000	0.0000	0.0000	0.006	0.006
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00592	0.00592
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00585	0.00585
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00577	0.00577
20:00:00	0.0000	0.0000	0.0000	0.0000	0.0057	0.0057
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00562	0.00562
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00555	0.00555
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00548	0.00548
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00541	0.00541
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00534	0.00534
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00527	0.00527
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00521	0.00521
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00514	0.00514
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00507	0.00507
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00501	0.00501
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00495	0.00495
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00488	0.00488
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00482	0.00482
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00476	0.00476
27:30:00	0.0000	0.0000	0.0000	0.0000	0.0047	0.0047
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00464	0.00464
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00458	0.00458
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00452	0.00452
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00446	0.00446
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00441	0.00441
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00435	0.00435
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00429	0.00429
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00424	0.00424
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00418	0.00418
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00413	0.00413
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00408	0.00408
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00403	0.00403
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00397	0.00397
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00392	0.00392
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00387	0.00387

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00382	0.00382
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00378	0.00378
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00373	0.00373
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00368	0.00368
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00363	0.00363
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00359	0.00359
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00354	0.00354
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00349	0.00349
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00345	0.00345
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00341	0.00341
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00336	0.00336
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00332	0.00332
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00328	0.00328
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00324	0.00324
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00319	0.00319
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00315	0.00315
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00311	0.00311
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00307	0.00307
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00303	0.00303
45:00:00	0.0000	0.0000	0.0000	0.0000	0.003	0.003
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00296	0.00296
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00292	0.00292
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00288	0.00288
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00285	0.00285
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00281	0.00281
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00277	0.00277
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00274	0.00274
49:00:00	0.0000	0.0000	0.0000	0.0000	0.0027	0.0027
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00267	0.00267
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00263	0.00263
50:30:00	0.0000	0.0000	0.0000	0.0000	0.0026	0.0026
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00257	0.00257
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00253	0.00253
52:00:00	0.0000	0.0000	0.0000	0.0000	0.0025	0.0025
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00247	0.00247
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00244	0.00244

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.00241	0.00241
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00238	0.00238
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00235	0.00235
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00232	0.00232
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00229	0.00229
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00226	0.00226
56:30:00	0.0000	0.0000	0.0000	0.0000	0.00223	0.00223
57:00:00	0.0000	0.0000	0.0000	0.0000	0.0022	0.0022
57:30:00	0.0000	0.0000	0.0000	0.0000	0.00217	0.00217
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00214	0.00214
58:30:00	0.0000	0.0000	0.0000	0.0000	0.00212	0.00212
59:00:00	0.0000	0.0000	0.0000	0.0000	0.00209	0.00209
59:30:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
60:00:00	0.0000	0.0000	0.0000	0.0000	0.00204	0.00204
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00201	0.00201
61:00:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198
61:30:00	0.0000	0.0000	0.0000	0.0000	0.00196	0.00196
62:00:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00193
62:30:00	0.0000	0.0000	0.0000	0.0000	0.00191	0.00191
63:00:00	0.0000	0.0000	0.0000	0.0000	0.00189	0.00189
63:30:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
64:00:00	0.0000	0.0000	0.0000	0.0000	0.00184	0.00184
64:30:00	0.0000	0.0000	0.0000	0.0000	0.00181	0.00181
65:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
65:30:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
66:00:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
66:30:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
67:00:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
67:30:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
68:00:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
68:30:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
69:00:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162
69:30:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
70:00:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
70:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
71:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
72:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

ReFH 2 - exis rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

100 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 8.93
Total rainfall (mm): 39.32

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.782
Total flow vol. (ML): 2.01
Peak flow (m³/s): 0.0396

Results (urbanised)

Direct runoff vol. (ML) 0.858
Total flow vol. (ML): 2.01
Peak flow (m³/s): 0.0432

Graph series

- Input rainfall
- Net rainfall
- Direct runoff
- Baseflow
- Total flow

Project checksum

1ACA-BF0A

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.0511

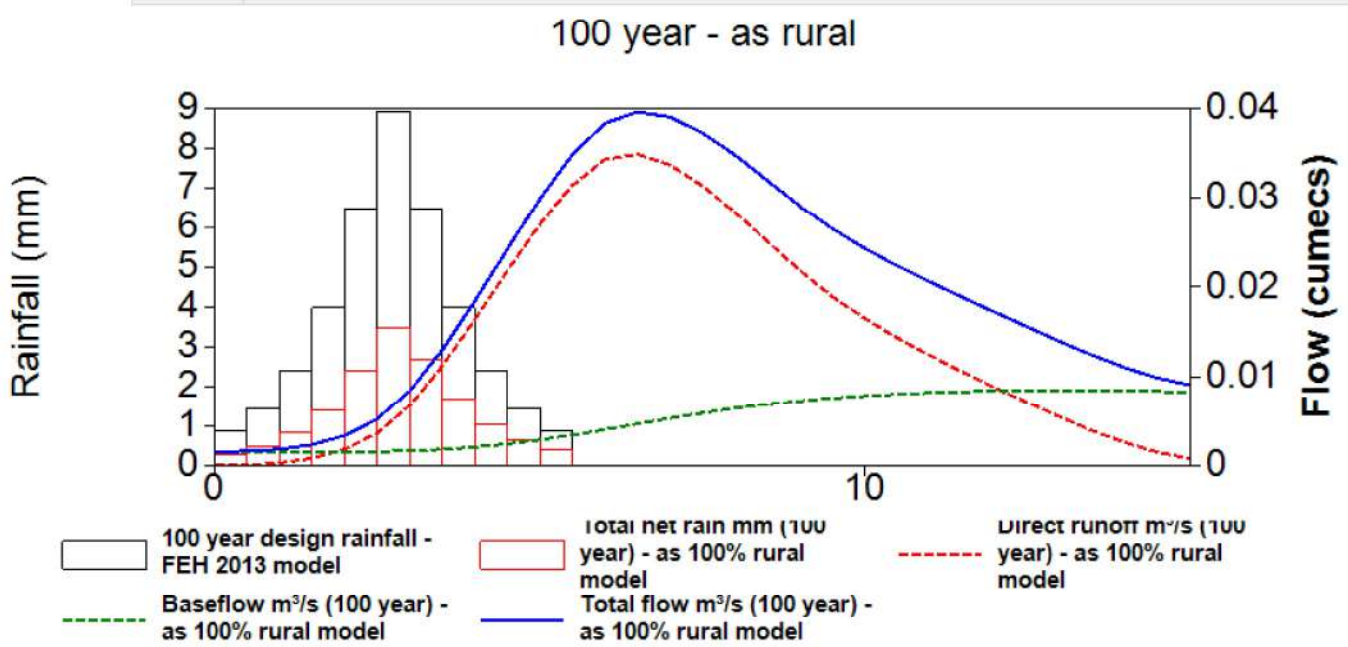
Area (ha): 5.11

Reset all Apply

100 year design rainfall - FEH 2013 model

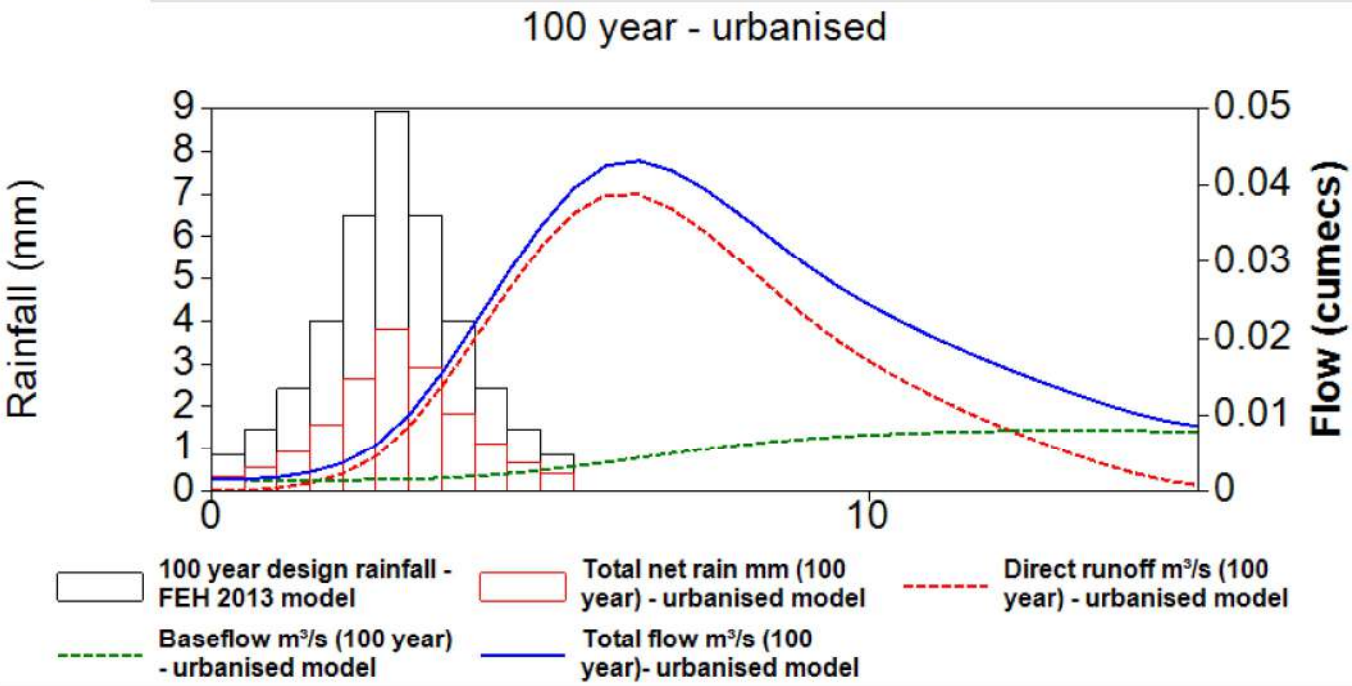
Graph (as rural) | Grid (as rural)

Export



Graph (urbanised) | Grid (urbanised)

Export



UK Design Flood Estimation

Generated on 05 May 2021 08:28:27 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 1ACA-BF0A

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.05

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	61.50	Total runoff (ML):	0.86
Total Rainfall (mm):	39.32	Total flow (ML):	2.01
Peak Rainfall (mm):	8.93	Peak flow (m³/s):	0.04

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.71]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [34.57]	Yes
BR	1.57	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0]	Yes
Urbext 2000	0.04 [0]	Yes
Impervious runoff factor	1 [0.7]	Yes
Imperviousness factor	1 [0.4]	Yes
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.8632	0.0000	0.3249	0.0000	0.00147	0.00147
00:30:00	1.4463	0.0000	0.5487	0.0001	0.00145	0.00153
01:00:00	2.4104	0.0000	0.9267	0.0004	0.00144	0.00181
01:30:00	3.9856	0.0000	1.5657	0.0010	0.00143	0.00246
02:00:00	6.4861	0.0000	2.6372	0.0023	0.00144	0.00374
02:30:00	8.9349	0.0000	3.8137	0.0046	0.00147	0.00606
03:00:00	6.4861	0.0000	2.8997	0.0084	0.00155	0.00997
03:30:00	3.9856	0.0000	1.8366	0.0138	0.0017	0.0155
04:00:00	2.4104	0.0000	1.1309	0.0199	0.00194	0.0218
04:30:00	1.4463	0.0000	0.6859	0.0262	0.00227	0.0284
05:00:00	0.8632	0.0000	0.4120	0.0319	0.0027	0.0346
05:30:00	0.0000	0.0000	0.0000	0.0363	0.00322	0.0396
06:00:00	0.0000	0.0000	0.0000	0.0388	0.0038	0.0426
06:30:00	0.0000	0.0000	0.0000	0.0388	0.0044	0.0432
07:00:00	0.0000	0.0000	0.0000	0.0369	0.00499	0.0419
07:30:00	0.0000	0.0000	0.0000	0.0340	0.00554	0.0395
08:00:00	0.0000	0.0000	0.0000	0.0304	0.00603	0.0364
08:30:00	0.0000	0.0000	0.0000	0.0267	0.00646	0.0331
09:00:00	0.0000	0.0000	0.0000	0.0230	0.00682	0.0298
09:30:00	0.0000	0.0000	0.0000	0.0198	0.00711	0.0269
10:00:00	0.0000	0.0000	0.0000	0.0170	0.00735	0.0243
10:30:00	0.0000	0.0000	0.0000	0.0145	0.00755	0.0221
11:00:00	0.0000	0.0000	0.0000	0.0123	0.0077	0.02
11:30:00	0.0000	0.0000	0.0000	0.0103	0.00782	0.0181
12:00:00	0.0000	0.0000	0.0000	0.0085	0.0079	0.0164
12:30:00	0.0000	0.0000	0.0000	0.0067	0.00795	0.0147
13:00:00	0.0000	0.0000	0.0000	0.0052	0.00797	0.0131
13:30:00	0.0000	0.0000	0.0000	0.0037	0.00795	0.0116
14:00:00	0.0000	0.0000	0.0000	0.0024	0.00791	0.0103
14:30:00	0.0000	0.0000	0.0000	0.0014	0.00785	0.00925
15:00:00	0.0000	0.0000	0.0000	0.0007	0.00777	0.00851
15:30:00	0.0000	0.0000	0.0000	0.0004	0.00768	0.00804
16:00:00	0.0000	0.0000	0.0000	0.0001	0.00759	0.00773
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00749	0.00754
17:00:00	0.0000	0.0000	0.0000	0.0000	0.0074	0.0074

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.0073	0.0073
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00721	0.00721
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00712	0.00712
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00703	0.00703
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00694	0.00694
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00685	0.00685
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00676	0.00676
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00668	0.00668
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00659	0.00659
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00651	0.00651
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00642	0.00642
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00634	0.00634
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00626	0.00626
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00618	0.00618
24:30:00	0.0000	0.0000	0.0000	0.0000	0.0061	0.0061
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00602	0.00602
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00595	0.00595
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00587	0.00587
26:30:00	0.0000	0.0000	0.0000	0.0000	0.0058	0.0058
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00572	0.00572
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00565	0.00565
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00558	0.00558
28:30:00	0.0000	0.0000	0.0000	0.0000	0.0055	0.0055
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00543	0.00543
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00537	0.00537
30:00:00	0.0000	0.0000	0.0000	0.0000	0.0053	0.0053
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00523	0.00523
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00516	0.00516
31:30:00	0.0000	0.0000	0.0000	0.0000	0.0051	0.0051
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00503	0.00503
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00497	0.00497
33:00:00	0.0000	0.0000	0.0000	0.0000	0.0049	0.0049
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00484	0.00484
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00478	0.00478
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00472	0.00472
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00466	0.00466

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.0046	0.0046
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00454	0.00454
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00448	0.00448
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00442	0.00442
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00437	0.00437
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00431	0.00431
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00426	0.00426
39:00:00	0.0000	0.0000	0.0000	0.0000	0.0042	0.0042
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00415	0.00415
40:00:00	0.0000	0.0000	0.0000	0.0000	0.0041	0.0041
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00404	0.00404
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00399	0.00399
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00394	0.00394
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00389	0.00389
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00384	0.00384
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00379	0.00379
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00374	0.00374
44:00:00	0.0000	0.0000	0.0000	0.0000	0.0037	0.0037
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00365	0.00365
45:00:00	0.0000	0.0000	0.0000	0.0000	0.0036	0.0036
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00356	0.00356
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00351	0.00351
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00347	0.00347
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00342	0.00342
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00338	0.00338
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00333	0.00333
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00329	0.00329
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00325	0.00325
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00321	0.00321
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00317	0.00317
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00313	0.00313
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00309	0.00309
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00305	0.00305
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00301	0.00301
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00297	0.00297
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00293	0.00293

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.00289	0.00289
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00286	0.00286
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00282	0.00282
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00278	0.00278
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00275	0.00275
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00271	0.00271
56:30:00	0.0000	0.0000	0.0000	0.0000	0.00268	0.00268
57:00:00	0.0000	0.0000	0.0000	0.0000	0.00265	0.00265
57:30:00	0.0000	0.0000	0.0000	0.0000	0.00261	0.00261
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00258	0.00258
58:30:00	0.0000	0.0000	0.0000	0.0000	0.00255	0.00255
59:00:00	0.0000	0.0000	0.0000	0.0000	0.00251	0.00251
59:30:00	0.0000	0.0000	0.0000	0.0000	0.00248	0.00248
60:00:00	0.0000	0.0000	0.0000	0.0000	0.00245	0.00245
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00242	0.00242
61:00:00	0.0000	0.0000	0.0000	0.0000	0.00239	0.00239
61:30:00	0.0000	0.0000	0.0000	0.0000	0.00236	0.00236
62:00:00	0.0000	0.0000	0.0000	0.0000	0.00233	0.00233
62:30:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
63:00:00	0.0000	0.0000	0.0000	0.0000	0.00227	0.00227
63:30:00	0.0000	0.0000	0.0000	0.0000	0.00224	0.00224
64:00:00	0.0000	0.0000	0.0000	0.0000	0.00221	0.00221
64:30:00	0.0000	0.0000	0.0000	0.0000	0.00218	0.00218
65:00:00	0.0000	0.0000	0.0000	0.0000	0.00215	0.00215
65:30:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
66:00:00	0.0000	0.0000	0.0000	0.0000	0.0021	0.0021
66:30:00	0.0000	0.0000	0.0000	0.0000	0.00207	0.00207
67:00:00	0.0000	0.0000	0.0000	0.0000	0.00205	0.00205
67:30:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00202
68:00:00	0.0000	0.0000	0.0000	0.0000	0.00199	0.00199
68:30:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
69:00:00	0.0000	0.0000	0.0000	0.0000	0.00194	0.00194
69:30:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
70:00:00	0.0000	0.0000	0.0000	0.0000	0.00189	0.00189
70:30:00	0.0000	0.0000	0.0000	0.0000	0.00187	0.00187
71:00:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00182
72:00:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
72:30:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
73:00:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
73:30:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173
74:00:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
74:30:00	0.0000	0.0000	0.0000	0.0000	0.00169	0.00169
75:00:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
75:30:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
76:00:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162
76:30:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
77:00:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
77:30:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
78:00:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
78:30:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
79:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
79:30:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

ReFH 2 - exis rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

100 year 1.4 CC

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 12.51
Total rainfall (mm): 55.05

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 1.16
Total flow vol. (ML): 2.81
Peak flow (m³/s): 0.0575

Results (urbanised)

Direct runoff vol. (ML) 1.26
Total flow vol. (ML): 2.81
Peak flow (m³/s): 0.0624

Graph series

☑ Input rainfall
☑ Net rainfall
☑ Direct runoff
☑ Baseflow
☑ Total flow

Project checksum

1ACA-BF0A

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

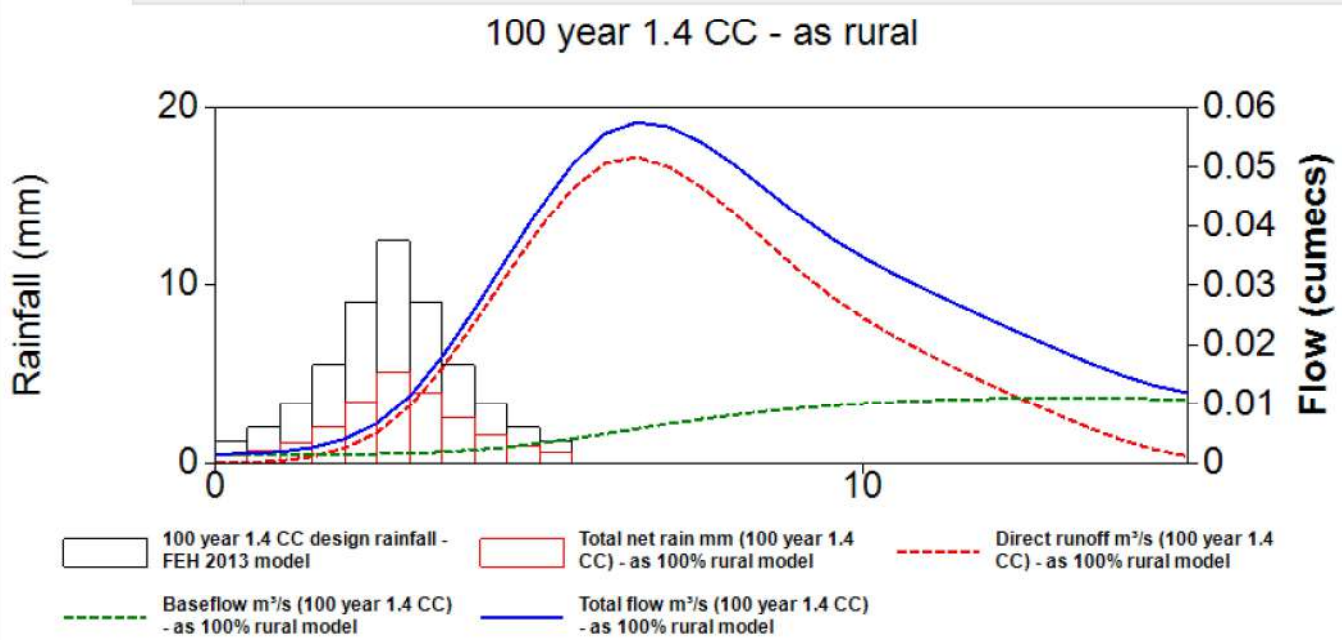
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.0511

Area (ha): 5.11

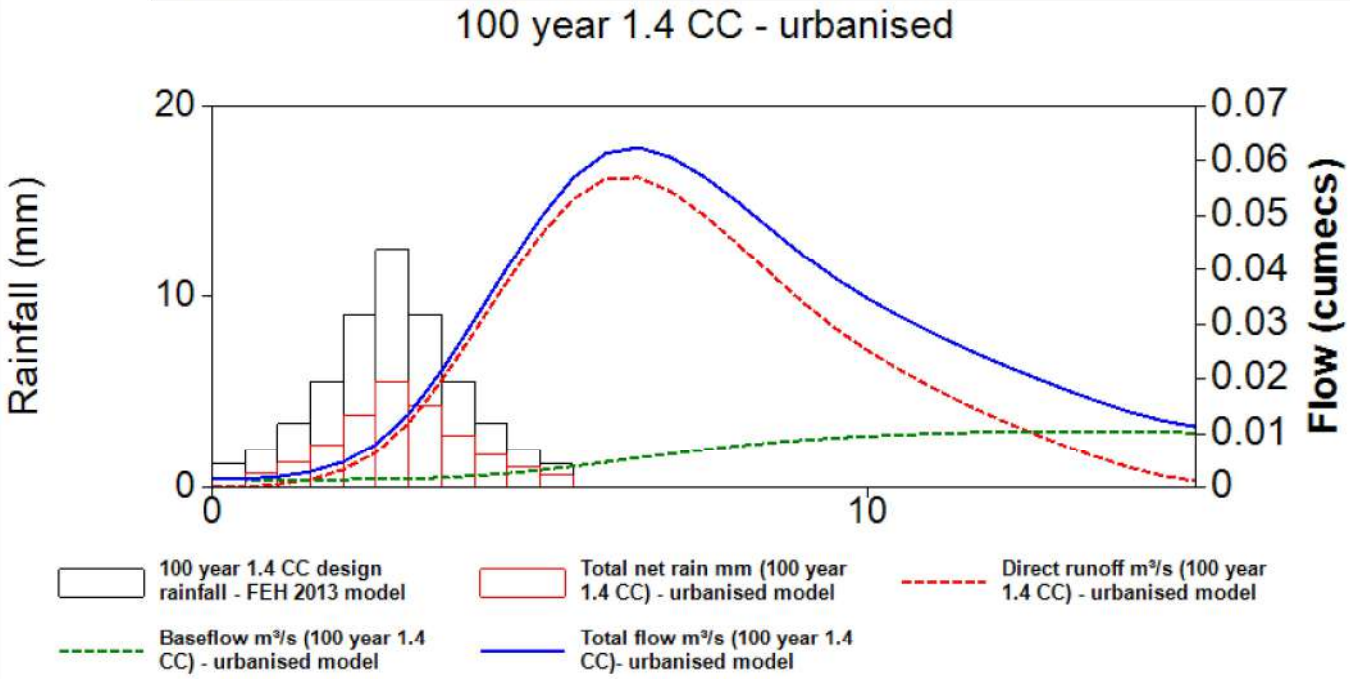
Reset all Apply

100 year 1.4 CC design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) — Export



Graph (urbanised) | Grid (urbanised) — Export



UK Design Flood Estimation

Generated on 05 May 2021 08:30:27 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 1ACA-BF0A

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.05

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 100 year 1.4 CC

Summary of results

Rainfall - FEH 2013 model (mm):	86.11	Total runoff (ML):	1.26
Total Rainfall (mm):	55.05	Total flow (ML):	2.81
Peak Rainfall (mm):	12.51	Peak flow (m³/s):	0.06

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No
Climate change factor	1.40	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.71]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [34.57]	Yes
BR	1.43	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0]	Yes
Urbext 2000	0.04 [0]	Yes
Impervious runoff factor	1 [0.7]	Yes
Imperviousness factor	1 [0.4]	Yes
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.2085	0.0000	0.4554	0.0000	0.00147	0.00147
00:30:00	2.0248	0.0000	0.7716	0.0001	0.00145	0.00156
01:00:00	3.3746	0.0000	1.3098	0.0005	0.00144	0.00196
01:30:00	5.5798	0.0000	2.2314	0.0015	0.00143	0.00288
02:00:00	9.0806	0.0000	3.8060	0.0032	0.00145	0.00469
02:30:00	12.5089	0.0000	5.5973	0.0065	0.0015	0.008
03:00:00	9.0806	0.0000	4.3205	0.0120	0.0016	0.0136
03:30:00	5.5798	0.0000	2.7622	0.0197	0.00181	0.0215
04:00:00	3.3746	0.0000	1.7102	0.0286	0.00213	0.0308
04:30:00	2.0248	0.0000	1.0404	0.0378	0.00258	0.0404
05:00:00	1.2085	0.0000	0.6262	0.0463	0.00316	0.0494
05:30:00	0.0000	0.0000	0.0000	0.0530	0.00385	0.0568
06:00:00	0.0000	0.0000	0.0000	0.0568	0.00464	0.0614
06:30:00	0.0000	0.0000	0.0000	0.0570	0.00546	0.0624
07:00:00	0.0000	0.0000	0.0000	0.0544	0.00626	0.0606
07:30:00	0.0000	0.0000	0.0000	0.0501	0.00701	0.0571
08:00:00	0.0000	0.0000	0.0000	0.0449	0.00769	0.0526
08:30:00	0.0000	0.0000	0.0000	0.0395	0.00827	0.0477
09:00:00	0.0000	0.0000	0.0000	0.0341	0.00877	0.0428
09:30:00	0.0000	0.0000	0.0000	0.0293	0.00918	0.0385
10:00:00	0.0000	0.0000	0.0000	0.0252	0.00951	0.0347
10:30:00	0.0000	0.0000	0.0000	0.0216	0.00978	0.0313
11:00:00	0.0000	0.0000	0.0000	0.0183	0.01	0.0283
11:30:00	0.0000	0.0000	0.0000	0.0153	0.0102	0.0255
12:00:00	0.0000	0.0000	0.0000	0.0126	0.0103	0.0229
12:30:00	0.0000	0.0000	0.0000	0.0101	0.0104	0.0205
13:00:00	0.0000	0.0000	0.0000	0.0077	0.0104	0.0181
13:30:00	0.0000	0.0000	0.0000	0.0056	0.0104	0.0159
14:00:00	0.0000	0.0000	0.0000	0.0036	0.0103	0.014
14:30:00	0.0000	0.0000	0.0000	0.0021	0.0102	0.0124
15:00:00	0.0000	0.0000	0.0000	0.0011	0.0101	0.0113
15:30:00	0.0000	0.0000	0.0000	0.0005	0.01	0.0106
16:00:00	0.0000	0.0000	0.0000	0.0002	0.00991	0.0101
16:30:00	0.0000	0.0000	0.0000	0.0001	0.00978	0.00985
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00966	0.00966

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00954	0.00954
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00941	0.00941
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00929	0.00929
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00918	0.00918
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00906	0.00906
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00894	0.00894
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00883	0.00883
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00872	0.00872
21:30:00	0.0000	0.0000	0.0000	0.0000	0.0086	0.0086
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00849	0.00849
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00839	0.00839
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00828	0.00828
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00817	0.00817
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00807	0.00807
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00797	0.00797
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00786	0.00786
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00776	0.00776
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00766	0.00766
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00757	0.00757
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00747	0.00747
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00737	0.00737
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00728	0.00728
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00719	0.00719
29:00:00	0.0000	0.0000	0.0000	0.0000	0.0071	0.0071
29:30:00	0.0000	0.0000	0.0000	0.0000	0.007	0.007
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00691	0.00691
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00683	0.00683
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00674	0.00674
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00665	0.00665
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00657	0.00657
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00648	0.00648
33:00:00	0.0000	0.0000	0.0000	0.0000	0.0064	0.0064
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00632	0.00632
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00624	0.00624
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00616	0.00616
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00608	0.00608

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.006	0.006
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00593	0.00593
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00585	0.00585
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00578	0.00578
37:30:00	0.0000	0.0000	0.0000	0.0000	0.0057	0.0057
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00563	0.00563
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00556	0.00556
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00549	0.00549
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00542	0.00542
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00535	0.00535
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00528	0.00528
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00521	0.00521
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00514	0.00514
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00508	0.00508
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00501	0.00501
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00495	0.00495
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00489	0.00489
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00482	0.00482
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00476	0.00476
45:00:00	0.0000	0.0000	0.0000	0.0000	0.0047	0.0047
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00464	0.00464
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00458	0.00458
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00452	0.00452
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00447	0.00447
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00441	0.00441
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00435	0.00435
48:30:00	0.0000	0.0000	0.0000	0.0000	0.0043	0.0043
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00424	0.00424
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00419	0.00419
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00413	0.00413
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00408	0.00408
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00403	0.00403
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00398	0.00398
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00393	0.00393
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00388	0.00388
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00383	0.00383

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.00378	0.00378
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00373	0.00373
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00368	0.00368
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00364	0.00364
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00359	0.00359
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00354	0.00354
56:30:00	0.0000	0.0000	0.0000	0.0000	0.0035	0.0035
57:00:00	0.0000	0.0000	0.0000	0.0000	0.00345	0.00345
57:30:00	0.0000	0.0000	0.0000	0.0000	0.00341	0.00341
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00337	0.00337
58:30:00	0.0000	0.0000	0.0000	0.0000	0.00332	0.00332
59:00:00	0.0000	0.0000	0.0000	0.0000	0.00328	0.00328
59:30:00	0.0000	0.0000	0.0000	0.0000	0.00324	0.00324
60:00:00	0.0000	0.0000	0.0000	0.0000	0.0032	0.0032
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00316	0.00316
61:00:00	0.0000	0.0000	0.0000	0.0000	0.00312	0.00312
61:30:00	0.0000	0.0000	0.0000	0.0000	0.00308	0.00308
62:00:00	0.0000	0.0000	0.0000	0.0000	0.00304	0.00304
62:30:00	0.0000	0.0000	0.0000	0.0000	0.003	0.003
63:00:00	0.0000	0.0000	0.0000	0.0000	0.00296	0.00296
63:30:00	0.0000	0.0000	0.0000	0.0000	0.00292	0.00292
64:00:00	0.0000	0.0000	0.0000	0.0000	0.00288	0.00288
64:30:00	0.0000	0.0000	0.0000	0.0000	0.00285	0.00285
65:00:00	0.0000	0.0000	0.0000	0.0000	0.00281	0.00281
65:30:00	0.0000	0.0000	0.0000	0.0000	0.00278	0.00278
66:00:00	0.0000	0.0000	0.0000	0.0000	0.00274	0.00274
66:30:00	0.0000	0.0000	0.0000	0.0000	0.0027	0.0027
67:00:00	0.0000	0.0000	0.0000	0.0000	0.00267	0.00267
67:30:00	0.0000	0.0000	0.0000	0.0000	0.00264	0.00264
68:00:00	0.0000	0.0000	0.0000	0.0000	0.0026	0.0026
68:30:00	0.0000	0.0000	0.0000	0.0000	0.00257	0.00257
69:00:00	0.0000	0.0000	0.0000	0.0000	0.00254	0.00254
69:30:00	0.0000	0.0000	0.0000	0.0000	0.0025	0.0025
70:00:00	0.0000	0.0000	0.0000	0.0000	0.00247	0.00247
70:30:00	0.0000	0.0000	0.0000	0.0000	0.00244	0.00244
71:00:00	0.0000	0.0000	0.0000	0.0000	0.00241	0.00241

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.00238	0.00238
72:00:00	0.0000	0.0000	0.0000	0.0000	0.00235	0.00235
72:30:00	0.0000	0.0000	0.0000	0.0000	0.00232	0.00232
73:00:00	0.0000	0.0000	0.0000	0.0000	0.00229	0.00229
73:30:00	0.0000	0.0000	0.0000	0.0000	0.00226	0.00226
74:00:00	0.0000	0.0000	0.0000	0.0000	0.00223	0.00223
74:30:00	0.0000	0.0000	0.0000	0.0000	0.0022	0.0022
75:00:00	0.0000	0.0000	0.0000	0.0000	0.00217	0.00217
75:30:00	0.0000	0.0000	0.0000	0.0000	0.00215	0.00215
76:00:00	0.0000	0.0000	0.0000	0.0000	0.00212	0.00212
76:30:00	0.0000	0.0000	0.0000	0.0000	0.00209	0.00209
77:00:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
77:30:00	0.0000	0.0000	0.0000	0.0000	0.00204	0.00204
78:00:00	0.0000	0.0000	0.0000	0.0000	0.00201	0.00201
78:30:00	0.0000	0.0000	0.0000	0.0000	0.00199	0.00199
79:00:00	0.0000	0.0000	0.0000	0.0000	0.00196	0.00196
79:30:00	0.0000	0.0000	0.0000	0.0000	0.00194	0.00194
80:00:00	0.0000	0.0000	0.0000	0.0000	0.00191	0.00191
80:30:00	0.0000	0.0000	0.0000	0.0000	0.00189	0.00189
81:00:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
81:30:00	0.0000	0.0000	0.0000	0.0000	0.00184	0.00184
82:00:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00182
82:30:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
83:00:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
83:30:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
84:00:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
84:30:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
85:00:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
85:30:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
86:00:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
86:30:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162
87:00:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
87:30:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
88:00:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
88:30:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
89:00:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
89:30:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
90:00:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

APPENDIX B - INFILTRATION TESTING

GEOSPHERE ENVIRONMENTAL

Our Ref: 4118,SK,PC,SG

Your Ref: Land off Kelvedon Road

Marden Homes Ltd
C/O Evans River & Coastal
19 St Andrews Avenue
Thorpe St Andrew
Norwich
NR7 0RG

Date: 04 September 2019

For the attention of Mr Rupert Evans

By Email:
rupert.evans@evansriversandcoastal.co.uk

Dear Rupert,

INFILTRATION TESTING AT LAND OFF KELVEDON ROAD, TIPTREE, ESSEX

1. Introduction

This letter report has been prepared on behalf of Evans River & Coastal for Marden Homes Ltd.

The primary objective of this ground investigation was to assess the infiltration potential of the natural soils beneath the site.

This was achieved by:

- Excavating a number of machine-dug trial pits across the site;
- Undertaking soakage testing in line with BRE Digest 365 guidance; and
- Undertaking infiltration calculations to allow for an assessment of the suitability of soakaways or infiltration techniques for the future development of the site.

It is understood that the proposed development will comprise residential properties with associated access roads and garden areas. A Proposed Development Plan was not available at the time this report was prepared.

A Site Location Plan, Drawing ref. 4118,SK/001/Rev0, is presented at the end of this letter report in Appendix 4.

The purpose of this letter report is to provide factual data only.

2. Site Works

2.1 Methodology

This ground investigation was carried out on the basis of the practices set out in BRE Digest 365, 'Soakaway Design' 2016, which requires, in summary, a total of three infiltration tests to be undertaken in succession over a 24-hour period or tests to be undertaken on consecutive days.

The exploratory holes were positioned based upon client provided preferred locations and to ensure good coverage of the site subject to access restrictions.

In general, where a test location showed limited or no infiltration, it was allowed to continue for circa 24 hours, the data obtained and the test ceased. Where a test exhibited appreciable infiltration and the "75%" infiltration level was achieved, a further infiltration "run", or more was undertaken.

2.2 Scope

Site works were carried out on 21 and 22 August 2019, and comprised the following:

- Excavation of eight machine excavated trial pits, (SK1 to SK8), to a depth of 2.0m bgl;
- Undertaking infiltration testing in line with BRE Digest 365 guidance; and
- Undertaking infiltration calculations to allow for an assessment of the suitability of soakaways for the future development of the site.

A Site Plan and Exploratory Hole Location Plan, Drawing ref. 4118,SK/002/Rev0, is presented at the end of this letter report in Appendix 4.

2.3 Ground Conditions Encountered

The sequence of the strata encountered during the investigation generally confirms the anticipated geology as interpreted from geological mapping.

The sequence and indicative thickness of strata are summarised in Table 1 below, with the Exploratory Hole Logs provided in Appendix 2:

Table 1 - Ground Conditions

Strata	Depth Encountered (mgl)		Strata Thickness (m)	Location and Composition
	From	To		
Topsoil	0.00	0.35 – 0.45	0.35 – 0.45	All exploratory holes: Generally, a brown slightly gravelly slightly silty SAND.
London Clay Formation	0.35	2.00	Unproven	All exploratory holes; A light brown slightly gravelly CLAY with grey mottling SK3 only: With pockets of chalk recovered as a sand.

2.4 Groundwater

No groundwater was encountered in any of the exploratory holes during the intrusive investigation.

GEOSPHERE ENVIRONMENTAL

2.5 Infiltration Testing Results

Soil infiltration testing did not indicate any appreciable infiltration to have occurred within any of the testing locations.

Full results are provided in full in Appendix 3, presented at the end of this letter report.

We trust the above is clear and acceptable. If you have any questions, please do not hesitate to contact us.

Yours sincerely

Peter Coyne
Technical Assistant
Geosphere Environmental Ltd
peter@geosphere-environmental.co.uk

Enclosures:
Appendix 1 – Report Limitations and Conditions
Appendix 2 – Exploratory Hole Logs
Appendix 3 – Infiltration Testing Results
Appendix 4 – Drawings

GEOSPHERE ENVIRONMENTAL

APPENDICES

GEOSPHERE ENVIRONMENTAL

APPENDIX 1 – REPORT LIMITATIONS AND CONDITIONS

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report has been prepared for the sole use of the Client for the purposes described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

This report is prepared and written for the use stated herein; it should not be used for any other purposes without reference to Geosphere Environmental Limited. The report has been prepared in relation to the proposed end use, should another end use be intended, a further re-assessment may be required. It is likely that over time practises will improve and the relevant guidance and legislation be amended or superseded, which may necessitate a re-assessment of the site.

The accuracy of any map extracts cannot be guaranteed. It is possible that different conditions existed onsite, between and subsequent to the various map surveys appended.

Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes discussed or on the possible presence of features based upon visual, verbal or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

GEOSPHERE ENVIRONMENTAL

APPENDIX 2 – EXPLORATORY HOLE LOGS

Trial Pit Logs
(SK1 to SK8)

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

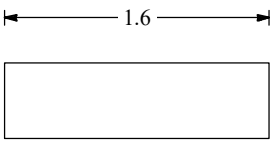
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK1**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	20-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.40	Brown slightly silty slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.40-2.00	Light brown gravelly CLAY with fine active roots. Gravel is fine and medium subangular to rounded flint (LONDON CLAY FORMATION)				
	1.70 Occasional light grey mottling present with depth				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

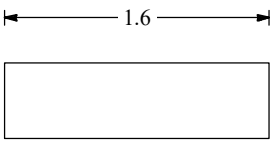
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK2**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	20-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.35	Brown slightly silty slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.35-2.00	Light orangish brown with occasional light grey mottling slightly gravelly CLAY. Gravel is fine subangular to subrounded flint (LONDON CLAY FORMATION)				
	1.60 Becoming grey mottled with depth				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

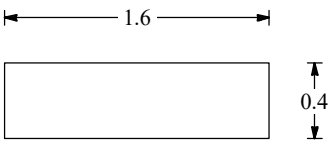
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK3**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	20-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.40	Brown slightly silty slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.40-2.00	Light brown slightly gravelly CLAY. Gravel is fine flint (LONDON CLAY FORMATION)				
	1.40 With pockets of off-white chalk recovered as a fine sand				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

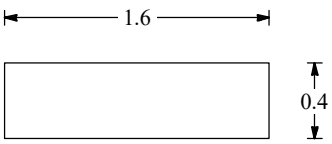
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK4**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	20-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.40	Brown slightly silty slightly gravelly SAND. Gravel is fine to coarse subangular to subrounded flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.40-2.00	Light brown slightly gravelly CLAY. Gravel is fine flint (LONDON CLAY FORMATION)				
	1.60 Becoming grey mottled with depth				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

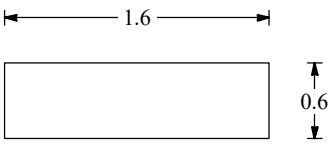
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK5**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	21-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.45	Dark brown silty organic fine SAND (TOPSOIL)				Trial pit remained dry and stable upon completion
0.45-2.00	Light brown slightly gravelly CLAY. Gravel is fine subangular and subrounded flint (LONDON CLAY FORMATION)				Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

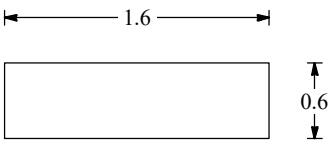
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK6**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	21-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.35	Brown slightly gravelly fine SAND. Gravel is fine and medium flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.35-2.00	Light brown slightly gravelly CLAY. Gravel is fine flint (LONDON CLAY FORMATION)				
	1.40 Becoming light grey mottled with depth				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

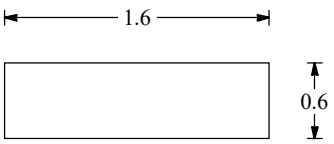
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK7**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	21-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.35	Brown slightly gravelly fine SAND. Gravel is fine and medium flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.35-2.00	Light brown occasionally light grey mottled slightly gravelly CLAY. Gravel is fine flint (LONDON CLAY FORMATION)				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

Geosphere Environmental Ltd
Brightwell Barns, Ipswich Road
Brightwell, Suffolk, IP10 0BJ
Telephone: 01603 298076

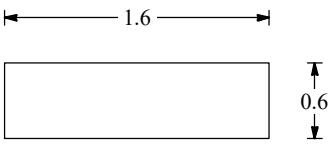
TRIAL PIT LOG

Project	Client	TRIAL PIT No
Land off Kelvedon Road, Tiptree	Marden Homes	**SK8**

Job No	Date	Ground Level (m)	Coordinates ()
4118,SK	21-08-19		,

Fieldwork By	Logged By	Sheet
Laser	PC	1 of 1

Depth	DESCRIPTION	Legend	Depth	No	Remarks/Tests
0.00-0.35	Brown slightly gravelly fine SAND. Gravel is fine and medium flint (TOPSOIL)				Trial pit remained dry and stable upon completion
0.35-2.00	Light brown occasionally light grey mottled slightly gravelly CLAY. Gravel is fine flint (LONDON CLAY FORMATION)				
					Trial pit completed at 2.0m. Infiltration testing undertaken



Shoring/Support: Gravel backfill
Stability: Stable

All dimensions in metres Scale 1:20.8333333333333	Method Trial Pit/trench	Plant Used MECHANICAL EXCAVATOR	Checked By SG

GEOSPHERE ENVIRONMENTAL

APPENDIX 3 – INFILTRATION TEST RESULTS

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

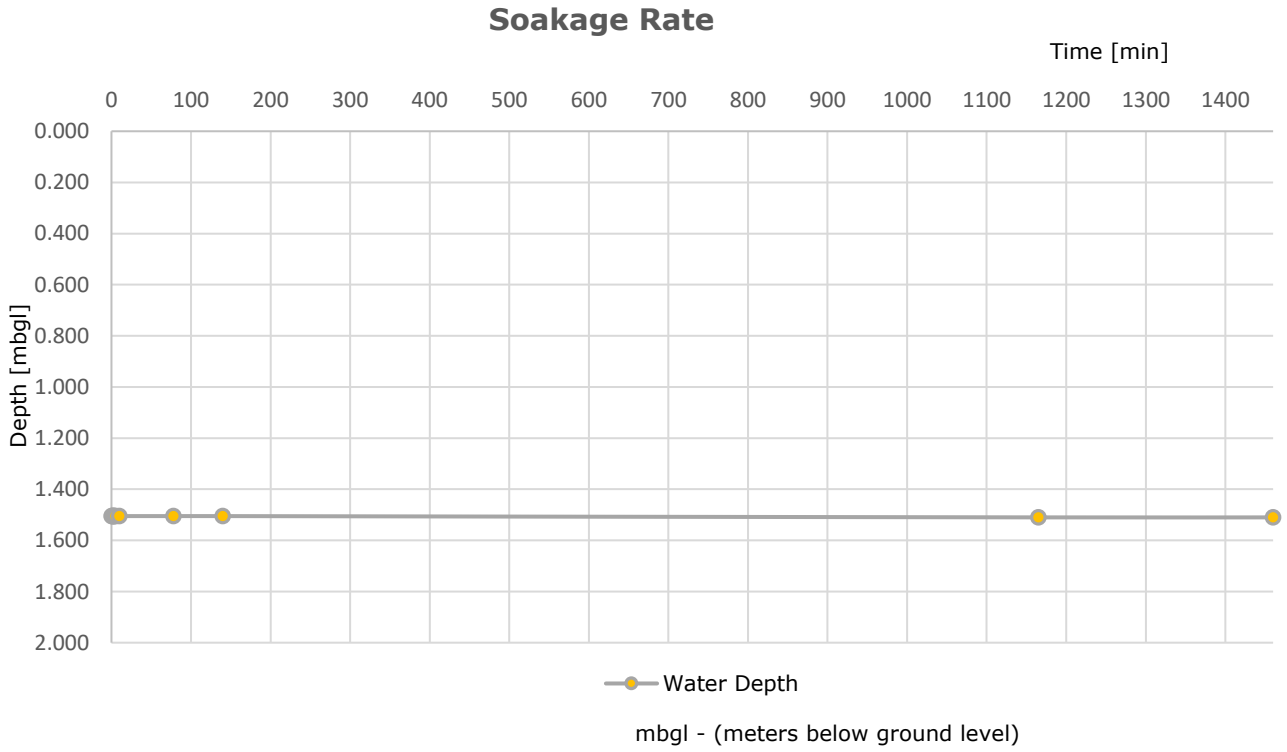
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.505
1	1.505
2	1.505
3	1.505
4	1.505
5	1.505
10	1.505
78	1.505
140	1.505
1165	1.510
1460	1.510

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.4	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK1
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

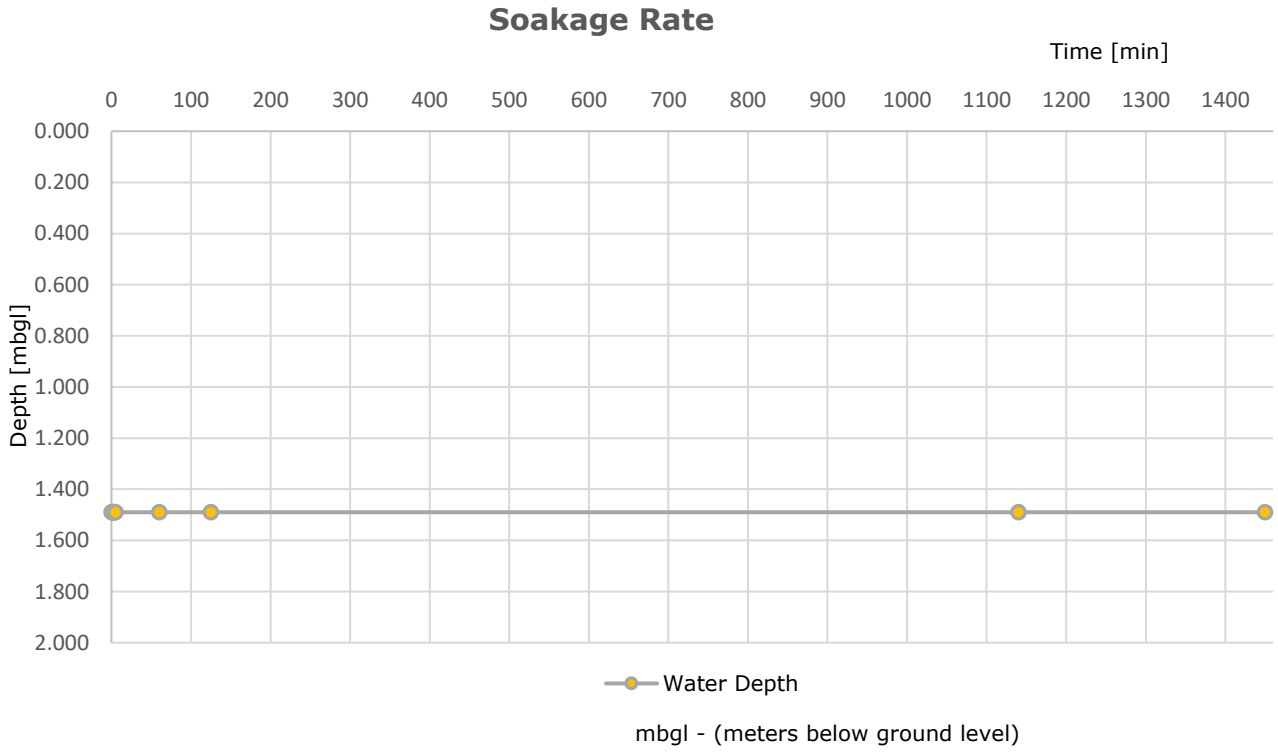
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.490
1	1.490
2	1.490
3	1.490
4	1.490
5	1.490
60	1.490
125	1.490
1140	1.490
1450	1.490

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.4	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK2
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

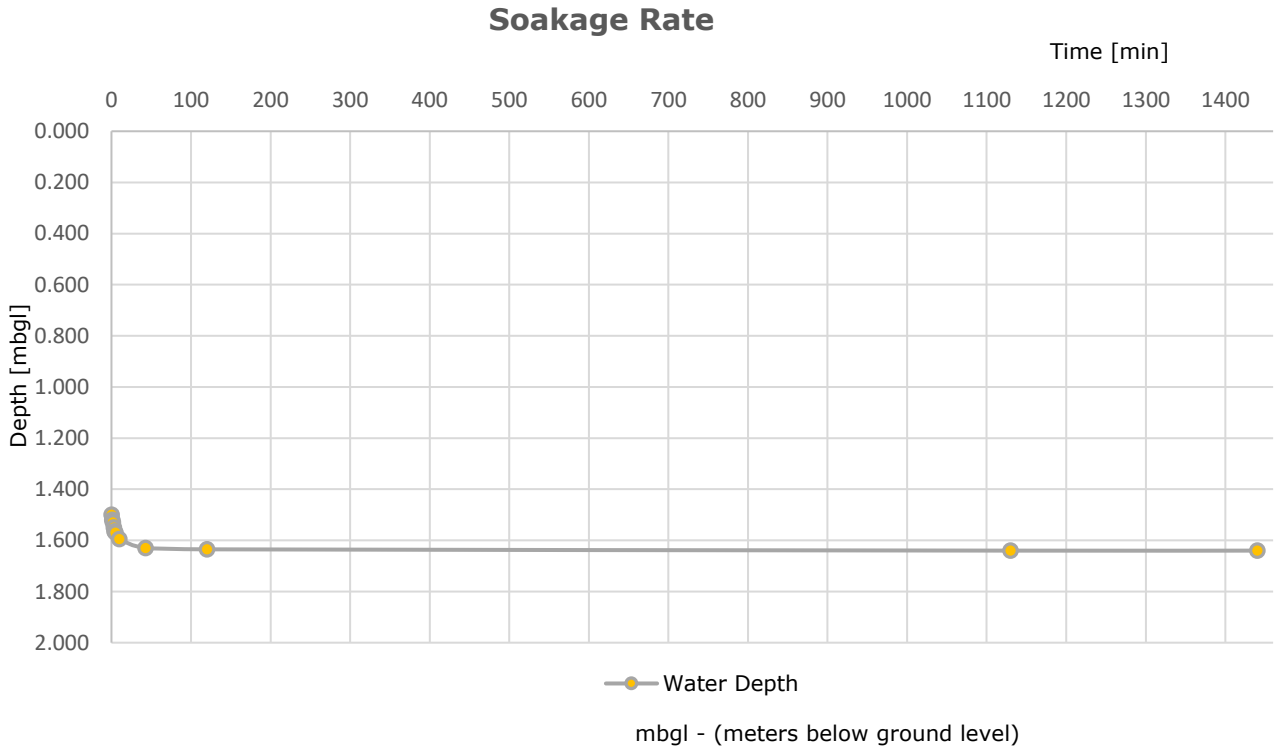
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.500
1	1.520
2	1.530
3	1.550
4	1.565
5	1.570
10	1.595
43	1.630
120	1.635
1130	1.640
1440	1.640

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.4	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK3
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

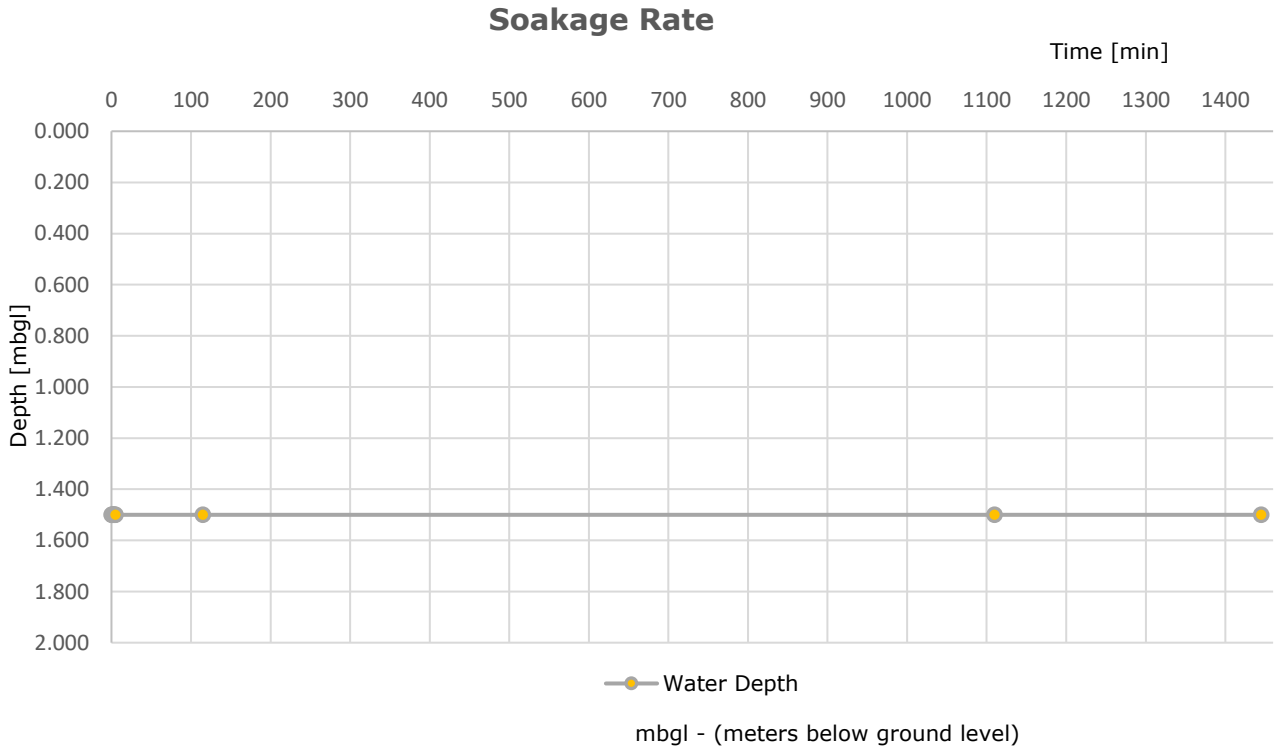
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.500
1	1.500
2	1.500
3	1.500
4	1.500
5	1.500
115	1.500
1110	1.500
1445	1.500

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.4	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK4
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

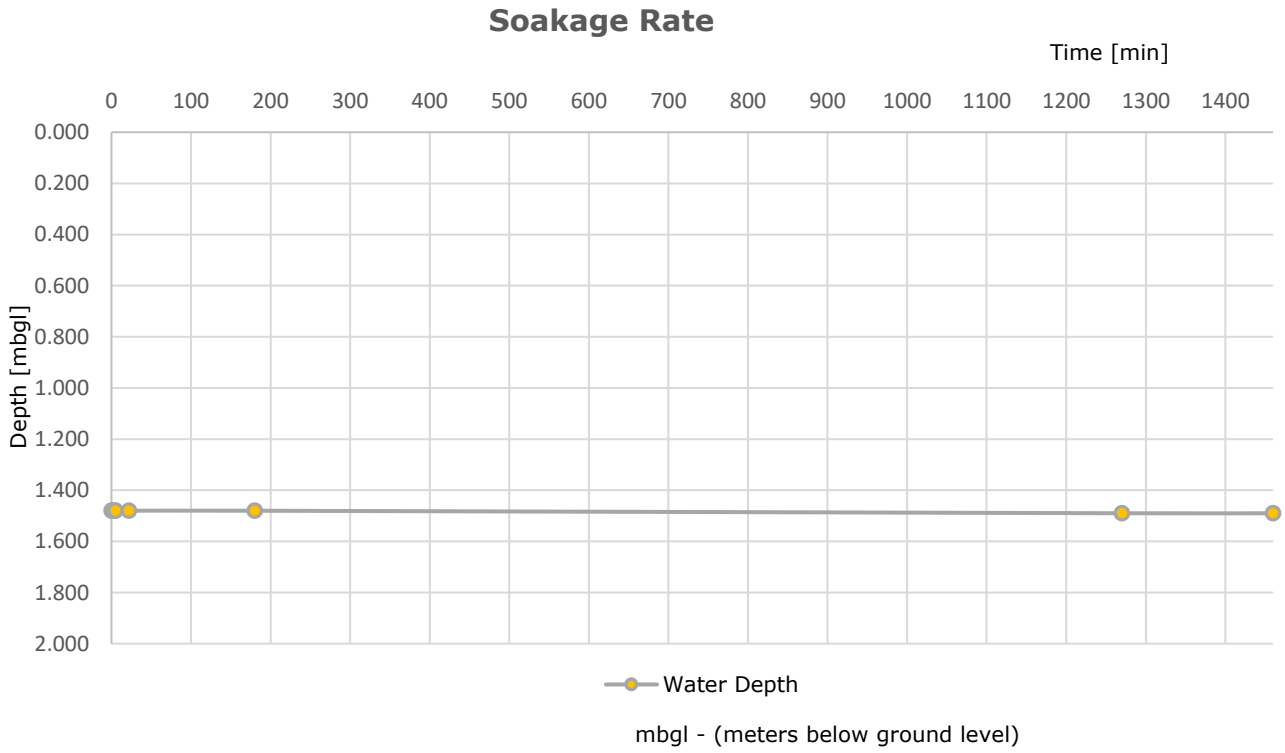
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.480
1	1.480
2	1.480
3	1.480
4	1.480
5	1.480
22	1.480
180	1.480
1270	1.490
1460	1.490

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.6	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK5
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

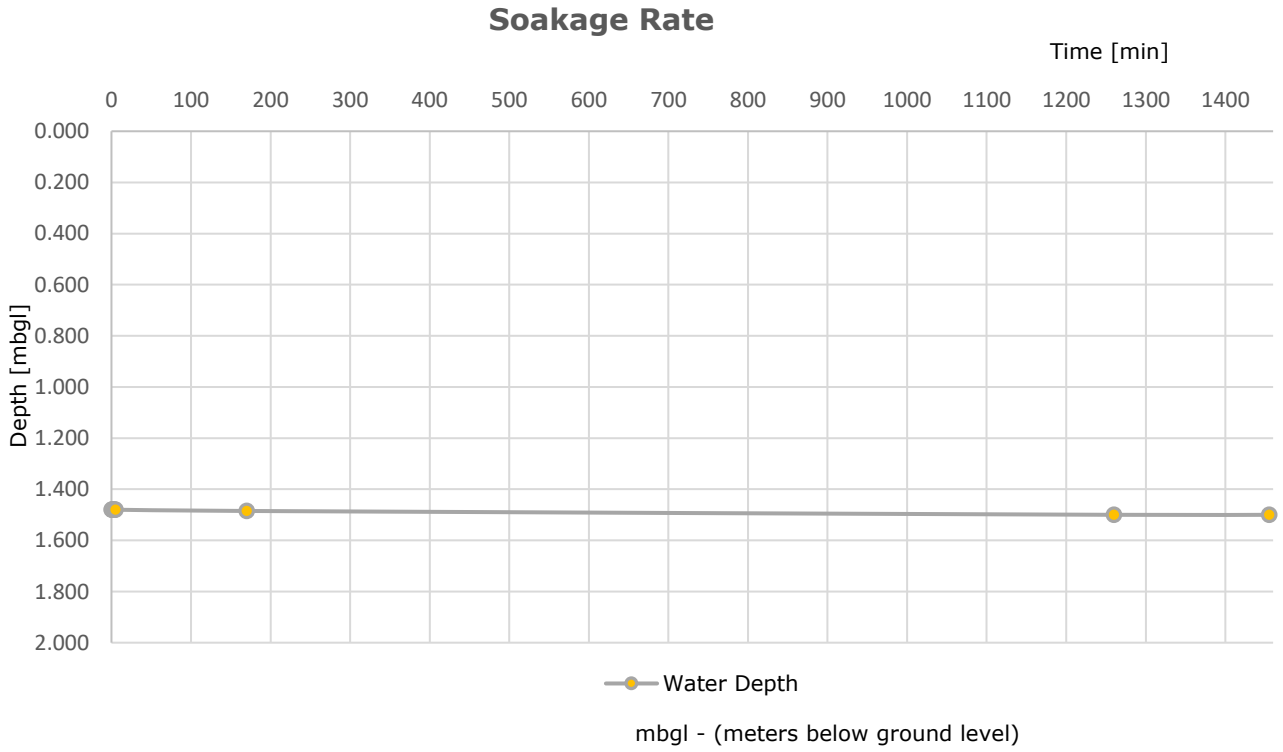
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.480
1	1.480
2	1.480
3	1.480
4	1.480
5	1.480
170	1.485
1260	1.500
1455	1.500

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.6	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK6
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

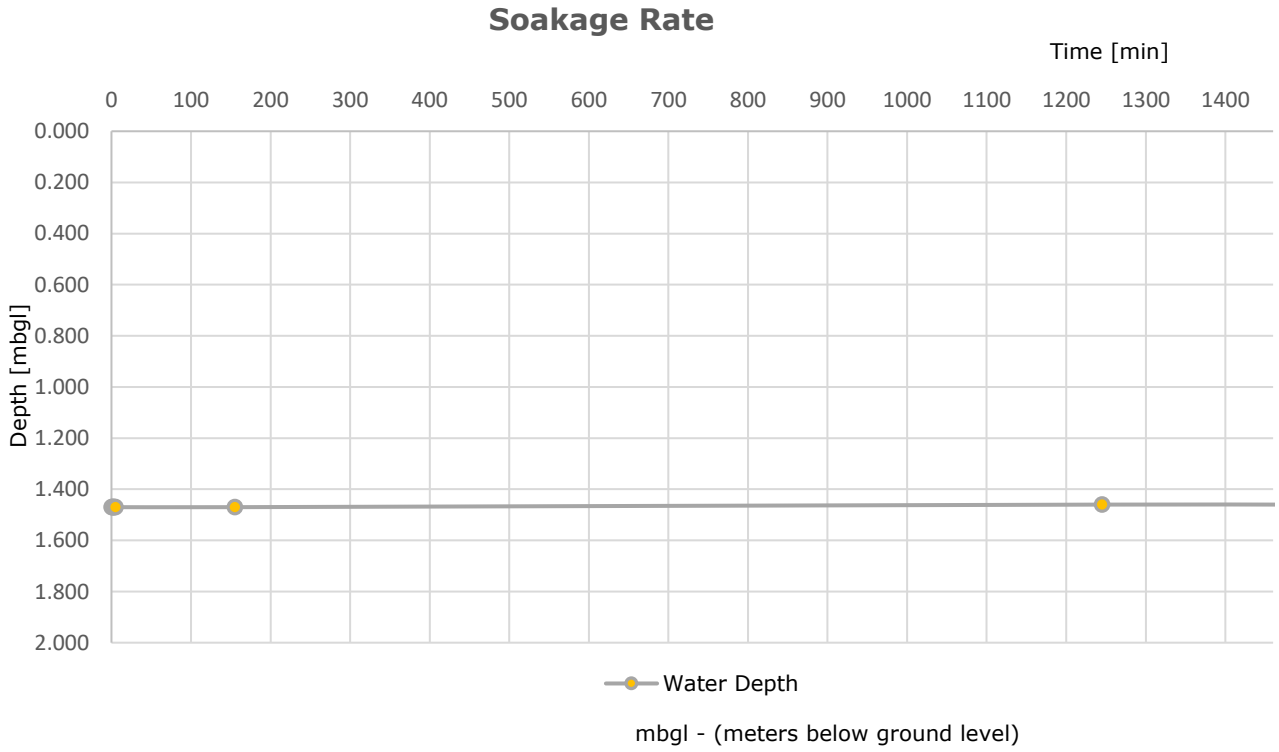
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.470
1	1.470
2	1.470
3	1.470
4	1.470
5	1.470
155	1.470
1245	1.460
1470	1.460

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.6	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK7
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



Calculated by: PC Checked by: SG

TRIAL PIT INFILTRATION TEST - BRE DIGEST 365

Project Number: 4118,SK **Date:** 04/09/2019

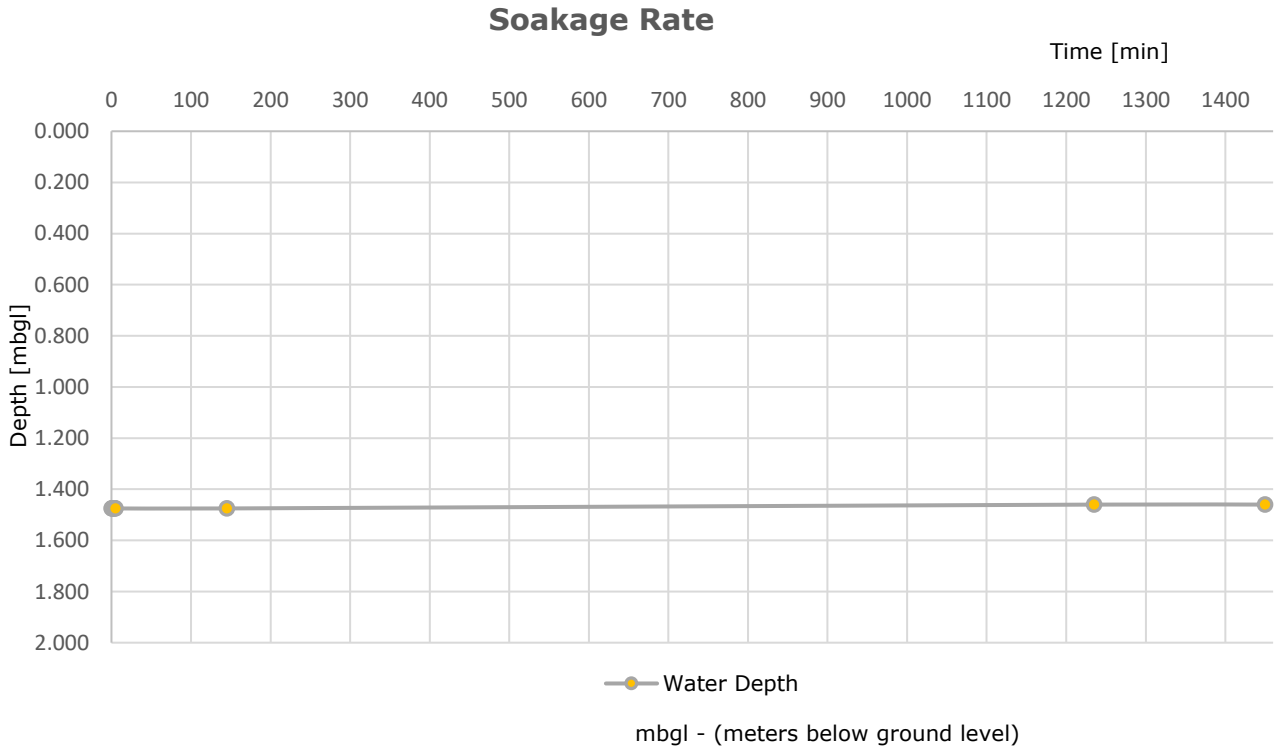
Project Name: Land off Kelvedon Road, Tiptree, Essex

Time [min]	Depth to Water [mbgl]
0	1.475
1	1.475
2	1.475
3	1.475
4	1.475
5	1.475
145	1.475
1235	1.460
1450	1.460

Pit Size [m]		
Length	**Width**	**Depth**
1.6	0.6	2.00

It was not possible to undertake full-depth soakaway test.

Trial Pit: SK8
Run: 1 of 1
Test Date: 21 August 2019
Groundwater Encountered: n/a



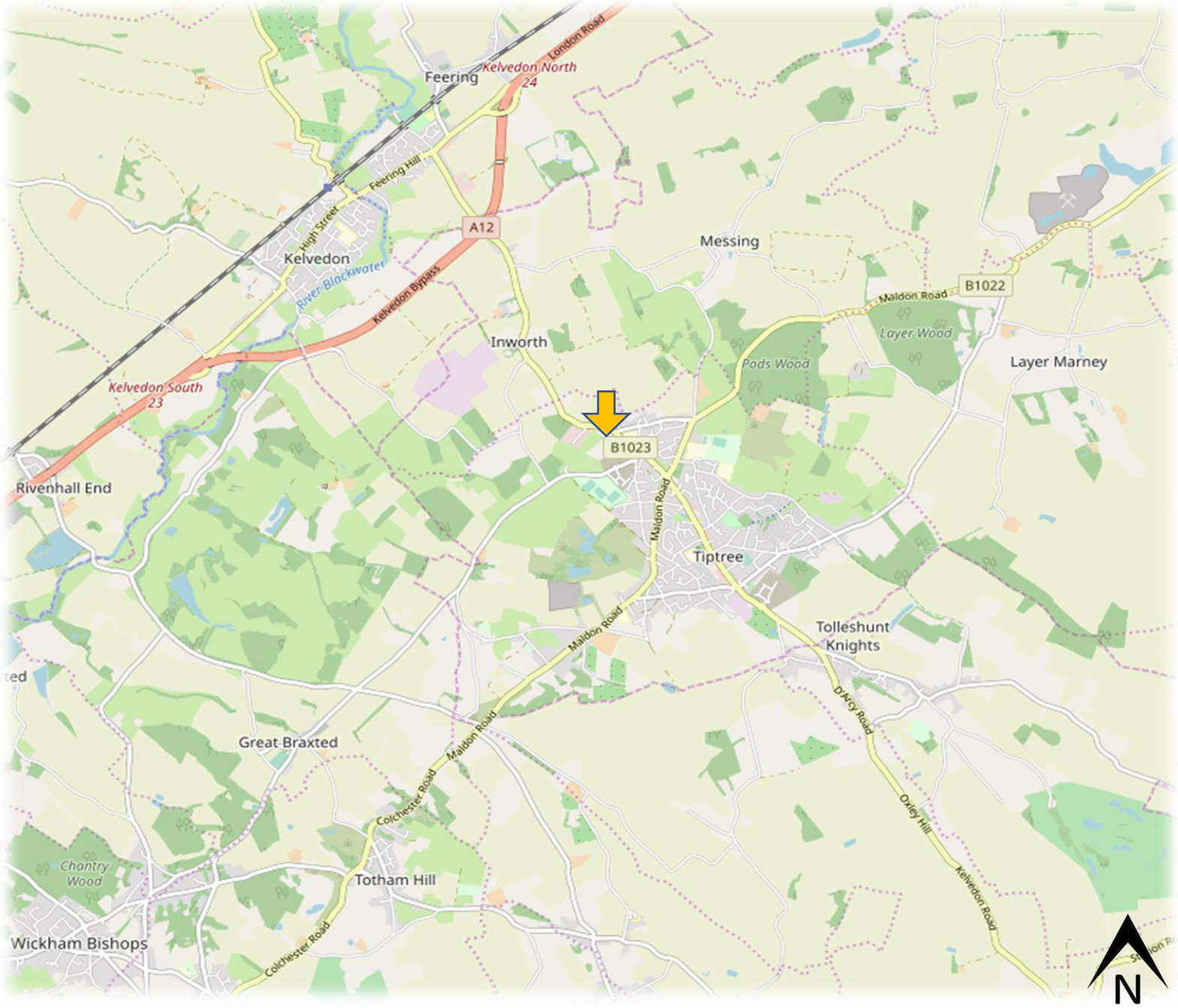
Calculated by: PC Checked by: SG

GEOSPHERE ENVIRONMENTAL

APPENDIX 4 – DRAWINGS

Site Location Plan – Drawing ref. 4118,SK/001/Rev0

Site and Exploratory Hole Location Plan – Drawing ref. 4118,SK/002/Rev0



GEO
GEOSPHERE ENVIRONMENTAL

LEGEND

Site Location

SOURCE

© OpenStreetMap contributors

PROJECT

Land off Kelvedon Road, Tiptree, Essex

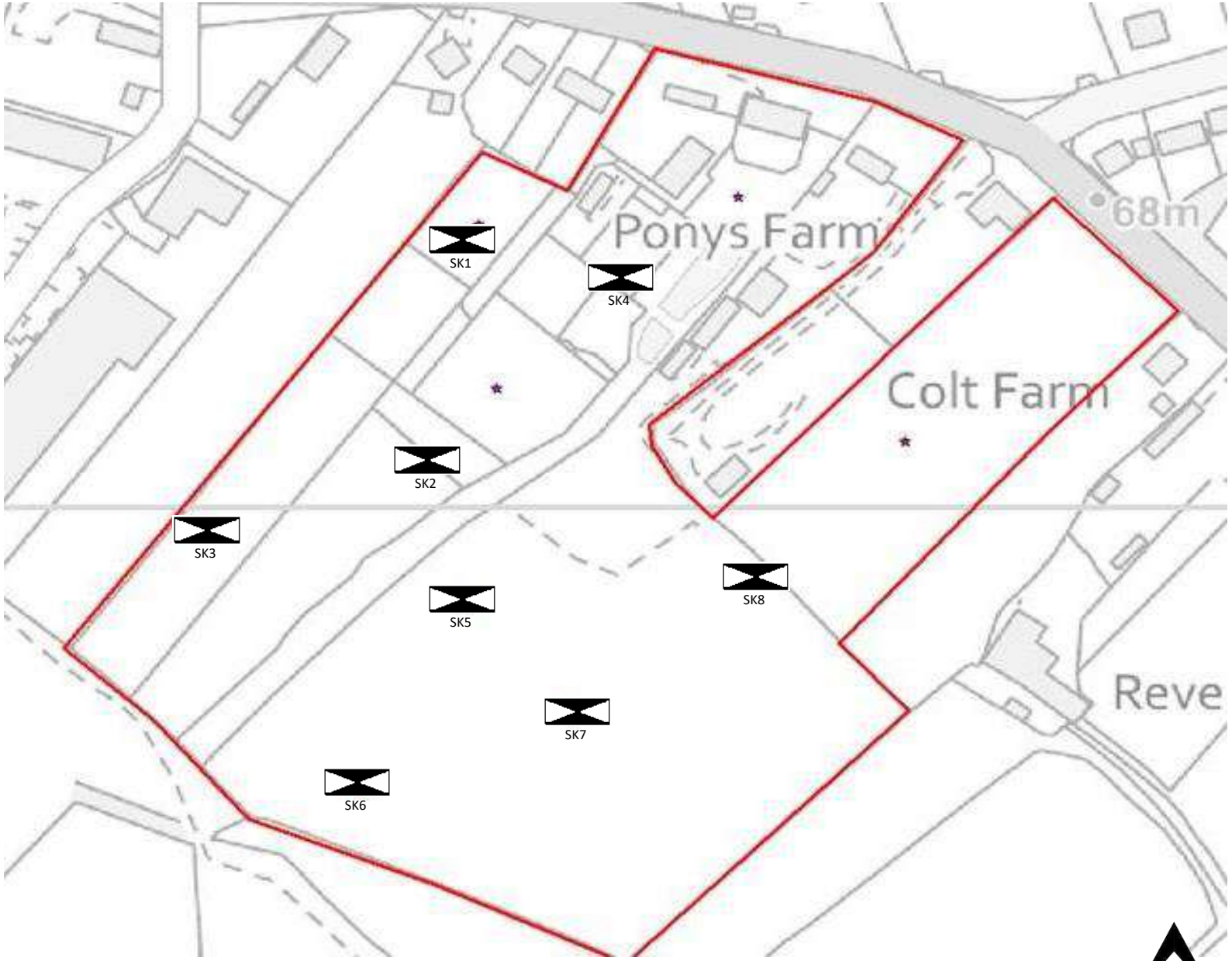
TITLE

Site Location Plan

DRAWING NUMBER

4118,SK/001/Rev0

SCALE	DATE
NTS	29/08/2019
DRAWN BY	**CHECKED BY**
PC	SG



GEOSPHERE ENVIRONMENTAL

LEGEND

Site boundary

Infiltration Pit

SOURCE

Provided by client

PROJECT

Land off Kelvedon Road, Tiptree, Essex

TITLE

Site and Exploratory Hole Location Plan

DRAWING NUMBER

4118,SK/002/Rev0

SCALE	DATE
NTS	29/08/2019
DRAWN BY	**CHECKED BY**
PC	SG

GEOSPHERE ENVIRONMENTAL

Ec Ecology.

Fr Flood Risk.

Ge Geotechnical.

En Environmental.

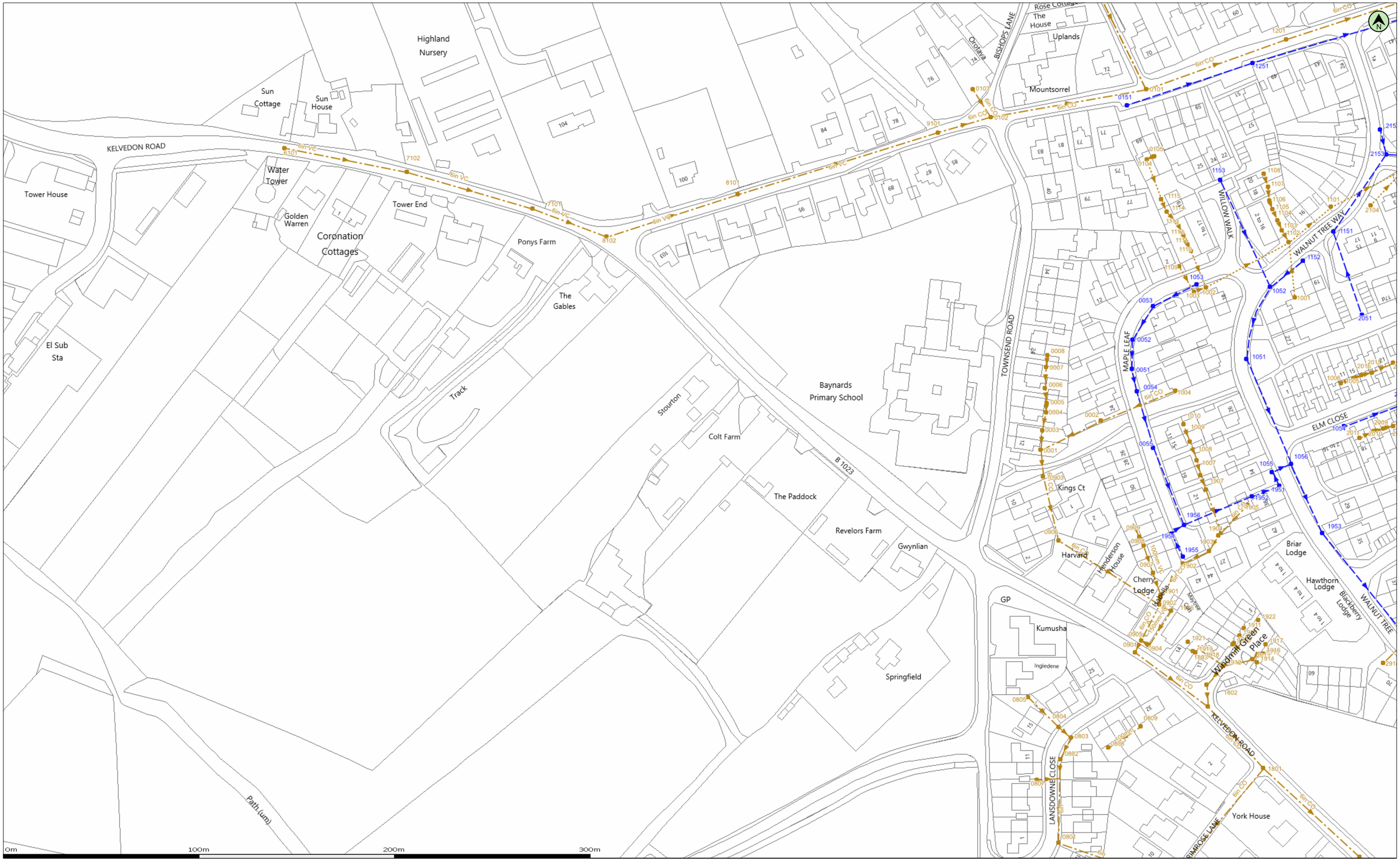
Kw Knotweed.

GEOSPHERE ENVIRONMENTAL LTD

Brightwell Barns, Ipswich Road, Brightwell, Suffolk, IP10 0BJ

T: 01603 298076 | 01473 353519 | **E**: info@geosphere-environmental.co.uk | **W**: geosphere-environmental.co.uk

APPENDIX C - ANGLIAN WATER PLANS



Date: 13/01/19

Scale: 1:1250

Map Centre: 588865,217025

Data updated: 01/11/18

Our Ref: 294182 - 1

Wastewater Plan A2

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

*(Colour denotes effluent type)

rupert.evans@evansriversandcoastal.co.uk

Tiptree

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	-	-	2.6
0002	F	-	-	1.77
0003	F	-	-	-
0004	F	-	1.91	-
0005	F	-	1.86	-
0006	F	-	1.87	-
0007	F	-	1.74	-
0008	F	-	1.1	-
0101	F	67.63	64.68	2.95
0102	F	-	-	2.37
0103	F	-	-	1.2
0104	F	-	-	1.47
0105	F	-	-	1.28
0801	F	-	-	1.61
0802	F	-	-	0.54
0803	F	-	-	0.56
0804	F	-	-	1.08
0805	F	-	-	0.59
0807	F	-	-	0.62
0808	F	-	-	-
0809	F	-	-	-
0901	F	-	-	2.24
0902	F	-	-	1.9
0903	F	-	-	2.52
0904	F	63.5	61.46	2.04
0905	F	63.57	61.4	2.17
0906	F	-	-	-
0907	F	-	-	-
0908	F	-	-	-
0909	F	-	-	-
1001	F	-	-	0.75
1002	F	-	-	1.32
1003	F	-	-	1.3
1004	F	-	-	1.2
1005	F	-	-	0.92
1006	F	-	-	0.95
1007	F	-	-	-
1008	F	-	-	-
1009	F	-	-	-
1010	F	-	-	-
1101	F	-	-	1.4
1102	F	-	-	1.36
1103	F	-	-	1.4
1104	F	-	-	1.05
1105	F	-	-	1
1106	F	-	-	0.95
1107	F	0.85	-	0.85
1108	F	-	-	0.9
1109	F	-	-	1.31
1110	F	-	-	1.4
1111	F	-	-	1.3
1112	F	-	-	1.2
1113	F	-	-	1.24
1114	F	-	-	1.24
1115	F	-	-	1.3
1201	F	66.49	64.1	2.39
1801	F	62.155	60.402	1.753
1802	F	62.904	61.103	1.801
1803	F	62.555	61.205	1.35
1901	F	-	-	1.75
1902	F	-	-	7.75
1903	F	-	-	1.51
1904	F	-	-	1.45
1905	F	-	-	1.14
1906	F	63.6	61.7	1.9
1907	F	-	-	-
1908	F	-	-	-
1909	F	-	-	-
1910	F	-	-	-
1911	F	-	-	-
1912	F	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
1913	F	-	-	-
1914	F	-	-	-
1915	F	-	-	-
1916	F	-	-	-
1917	F	-	-	-
1918	F	-	-	-
1919	F	-	-	-
1920	F	-	-	-
1921	F	-	-	-
1922	F	-	-	-
2008	F	-	-	1.11
2009	F	-	-	1.1
2010	F	-	-	1
2011	F	-	-	0.88
2013	F	-	-	1.49
2015	F	-	-	1.12
2016	F	-	-	1.06
2104	F	-	-	1.44
2801	F	61.08	59.38	1.7
2914	F	-	-	-
6101	F	70.01	68.34	1.67
7101	F	69.43	67.62	1.81
7102	F	69.754	67.94	1.814
8101	F	68.53	66.83	1.7
8102	F	69.06	67.26	1.8
9101	F	67.925	65.45	2.475
0051	S	-	-	-
0052	S	-	-	-
0053	S	-	-	-
0054	S	-	-	-
0055	S	-	-	-
0151	S	-	-	-
1051	S	-	-	-
1052	S	-	-	-
1053	S	-	-	-
1054	S	-	-	-
1055	S	-	-	-
1056	S	-	-	-
1151	S	-	-	-
1152	S	-	-	-
1153	S	-	-	-
1251	S	-	-	-
1951	S	-	-	-
1952	S	-	-	-
1953	S	-	-	-
1954	S	-	-	-
1955	S	-	-	-
1956	S	-	-	-
2051	S	-	-	-
2152	S	-	-	-
2153	S	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX D - POST-DEVELOPMENT EQUIVALENT GREENFIELD RUNOFF CALCULATIONS

ReFH 2 - prop rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

1 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 3.02
Total rainfall (mm): 13.29

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.1
Total flow vol. (ML): 0.285
Peak flow (m³/s): 0.00555

Results (urbanised)

Direct runoff vol. (ML) 0.1
Total flow vol. (ML): 0.285
Peak flow (m³/s): 0.00555

Graph series

- [x] Input rainfall
- [x] Net rainfall
- [x] Direct runoff
- [x] Baseflow
- [x] Total flow

Project checksum

C338-6498

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

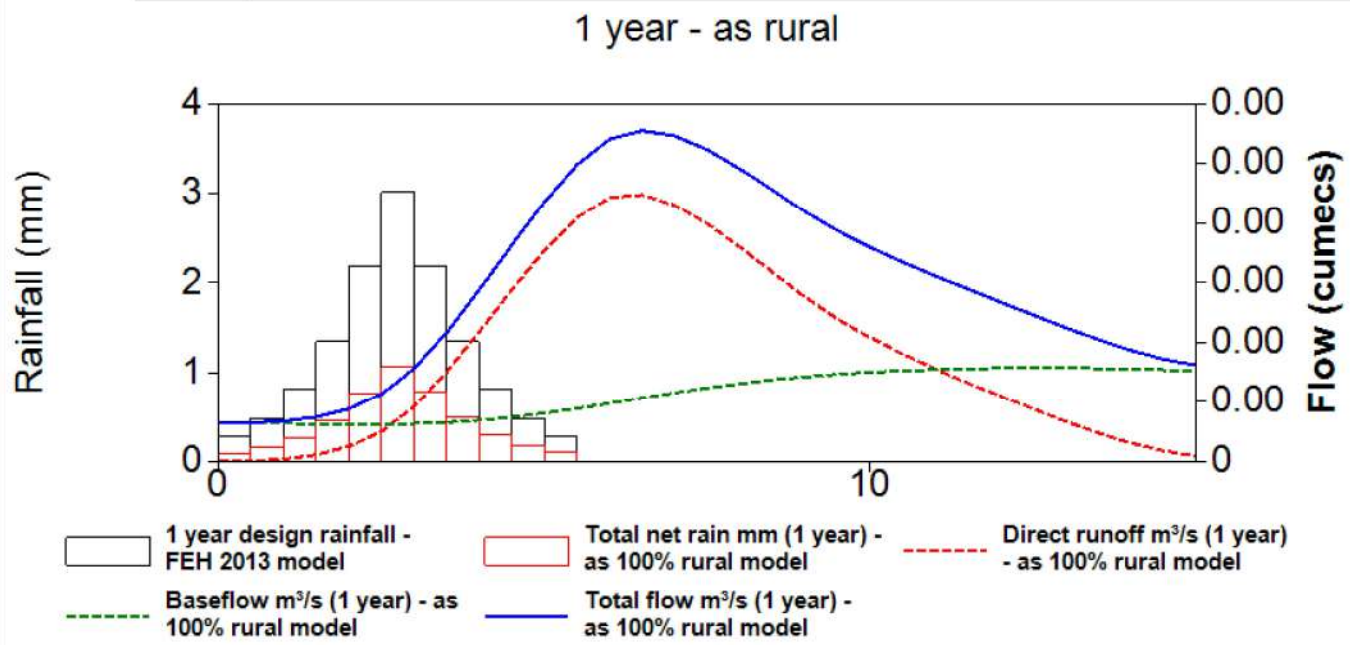
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.02144

Area (ha): 2.144

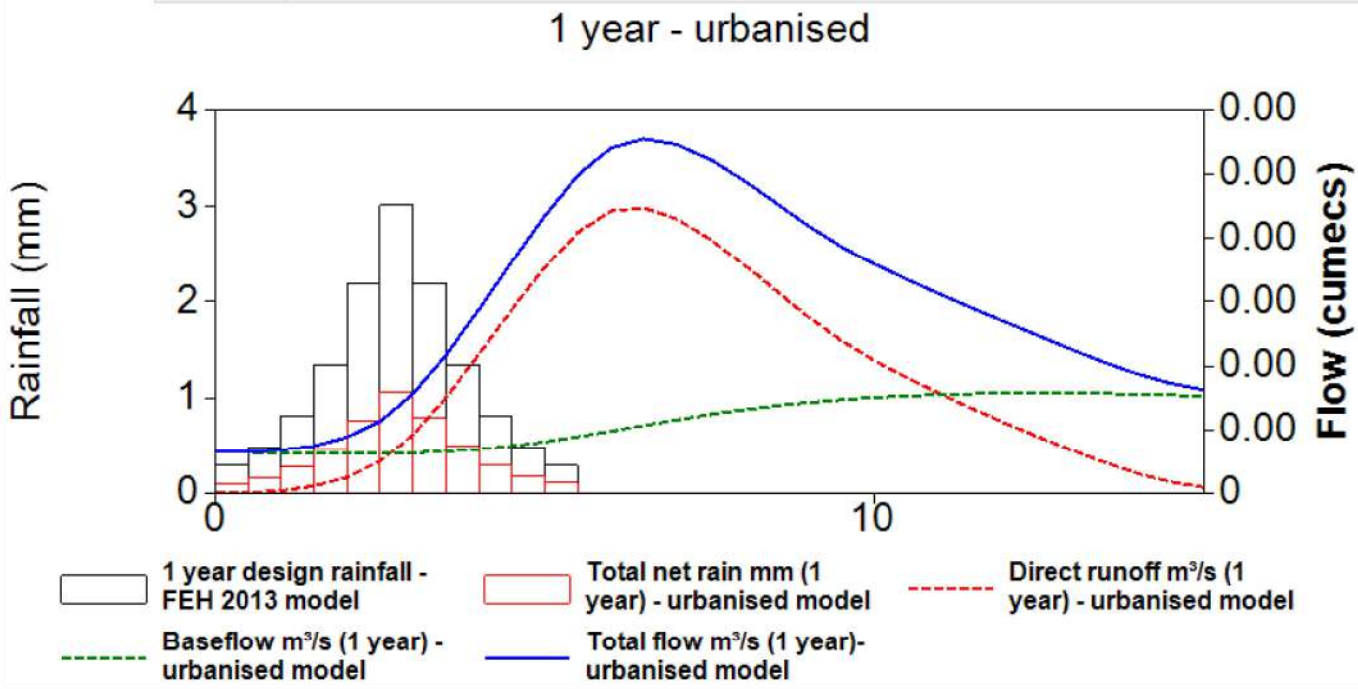
Reset all Apply

1 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:40:01 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: C338-6498

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH 2013 model (mm):	20.75	Total runoff (ML):	0.10
Total Rainfall (mm):	13.29	Total flow (ML):	0.29
Peak Rainfall (mm):	3.02	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.34]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [32.37]	Yes
BR	1.84	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.2918	0.0000	0.0976	0.0000	0.000658	0.000658
00:30:00	0.4888	0.0000	0.1641	0.0000	0.000649	0.000658
01:00:00	0.8147	0.0000	0.2749	0.0000	0.000642	0.000683
01:30:00	1.3471	0.0000	0.4587	0.0001	0.000635	0.00075
02:00:00	2.1923	0.0000	0.7573	0.0003	0.000631	0.000887
02:30:00	3.0201	0.0000	1.0652	0.0005	0.000632	0.00114
03:00:00	2.1923	0.0000	0.7892	0.0009	0.000641	0.00157
03:30:00	1.3471	0.0000	0.4916	0.0015	0.000661	0.00217
04:00:00	0.8147	0.0000	0.2998	0.0022	0.000696	0.00288
04:30:00	0.4888	0.0000	0.1808	0.0029	0.000747	0.00363
05:00:00	0.2918	0.0000	0.1082	0.0035	0.000813	0.00436
05:30:00	0.0000	0.0000	0.0000	0.0041	0.000892	0.00498
06:00:00	0.0000	0.0000	0.0000	0.0044	0.00098	0.00541
06:30:00	0.0000	0.0000	0.0000	0.0045	0.00107	0.00555
07:00:00	0.0000	0.0000	0.0000	0.0043	0.00116	0.00547
07:30:00	0.0000	0.0000	0.0000	0.0040	0.00124	0.00524
08:00:00	0.0000	0.0000	0.0000	0.0036	0.00132	0.00492
08:30:00	0.0000	0.0000	0.0000	0.0032	0.00138	0.00456
09:00:00	0.0000	0.0000	0.0000	0.0028	0.00143	0.0042
09:30:00	0.0000	0.0000	0.0000	0.0024	0.00147	0.00387
10:00:00	0.0000	0.0000	0.0000	0.0021	0.00151	0.00359
10:30:00	0.0000	0.0000	0.0000	0.0018	0.00153	0.00335
11:00:00	0.0000	0.0000	0.0000	0.0016	0.00155	0.00312
11:30:00	0.0000	0.0000	0.0000	0.0013	0.00157	0.0029
12:00:00	0.0000	0.0000	0.0000	0.0011	0.00158	0.00268
12:30:00	0.0000	0.0000	0.0000	0.0009	0.00158	0.00247
13:00:00	0.0000	0.0000	0.0000	0.0007	0.00158	0.00226
13:30:00	0.0000	0.0000	0.0000	0.0005	0.00157	0.00206
14:00:00	0.0000	0.0000	0.0000	0.0003	0.00156	0.00187
14:30:00	0.0000	0.0000	0.0000	0.0002	0.00155	0.00173
15:00:00	0.0000	0.0000	0.0000	0.0001	0.00153	0.00163
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00156
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00151
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
18:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00137	0.00137
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00135	0.00135
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
21:30:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
24:30:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
31:30:00	0.0000	0.0000	0.0000	0.0000	0.001	0.001
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00099	0.00099
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000978	0.000978
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000965	0.000965
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000953	0.000953
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000941	0.000941
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000929	0.000929
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000917	0.000917

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000893	0.000893
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000882	0.000882
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000871	0.000871
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00086	0.00086
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000849	0.000849
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000838	0.000838
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000827	0.000827
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000816	0.000816
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000806	0.000806
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000796	0.000796
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000786	0.000786
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000776	0.000776
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000766	0.000766
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000756	0.000756
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000746	0.000746
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000718	0.000718
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000709	0.000709
45:30:00	0.0000	0.0000	0.0000	0.0000	0.0007	0.0007
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000691	0.000691
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000682	0.000682
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000673	0.000673
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000665	0.000665

Appendix

Catchment descriptors

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

ReFH 2 - prop rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

2 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 3.46
Total rainfall (mm): 15.23

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.116
Total flow vol. (ML): 0.326
Peak flow (m³/s): 0.00632

Results (urbanised)

Direct runoff vol. (ML) 0.116
Total flow vol. (ML): 0.326
Peak flow (m³/s): 0.00632

Graph series

- [x] Input rainfall
- [x] Net rainfall
- [x] Direct runoff
- [x] Baseflow
- [x] Total flow

Project checksum

C338-6498

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

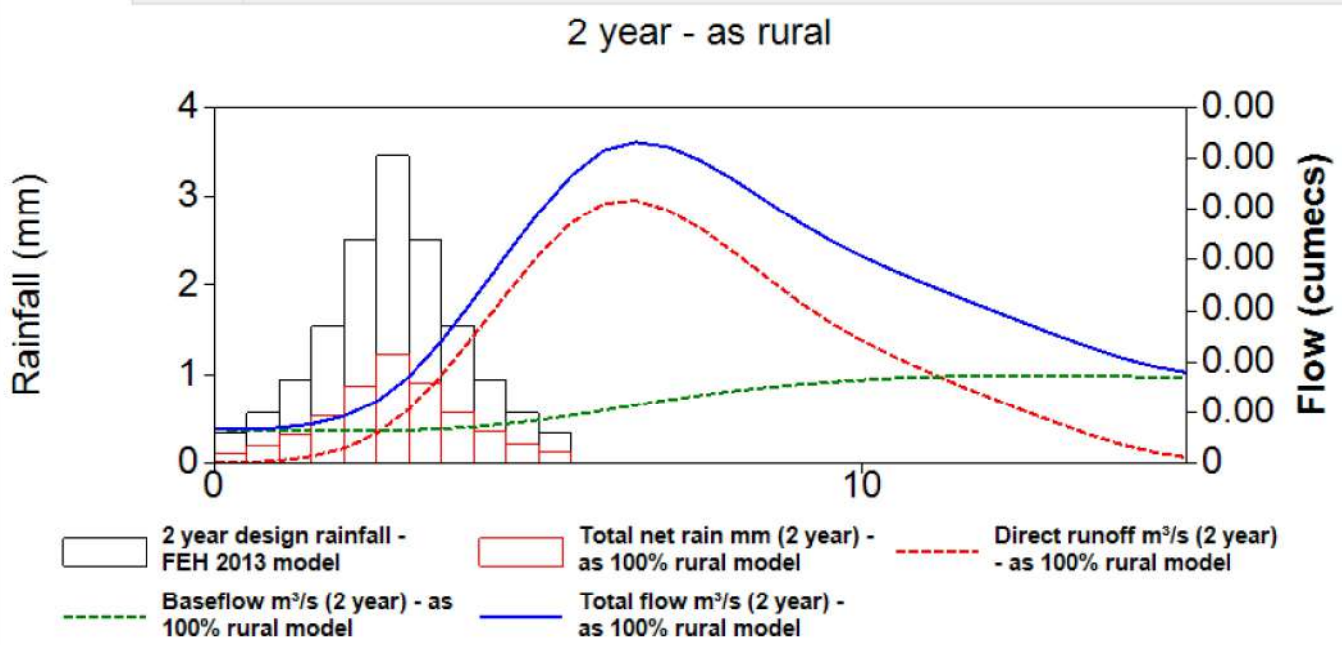
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.02144

Area (ha): 2.144

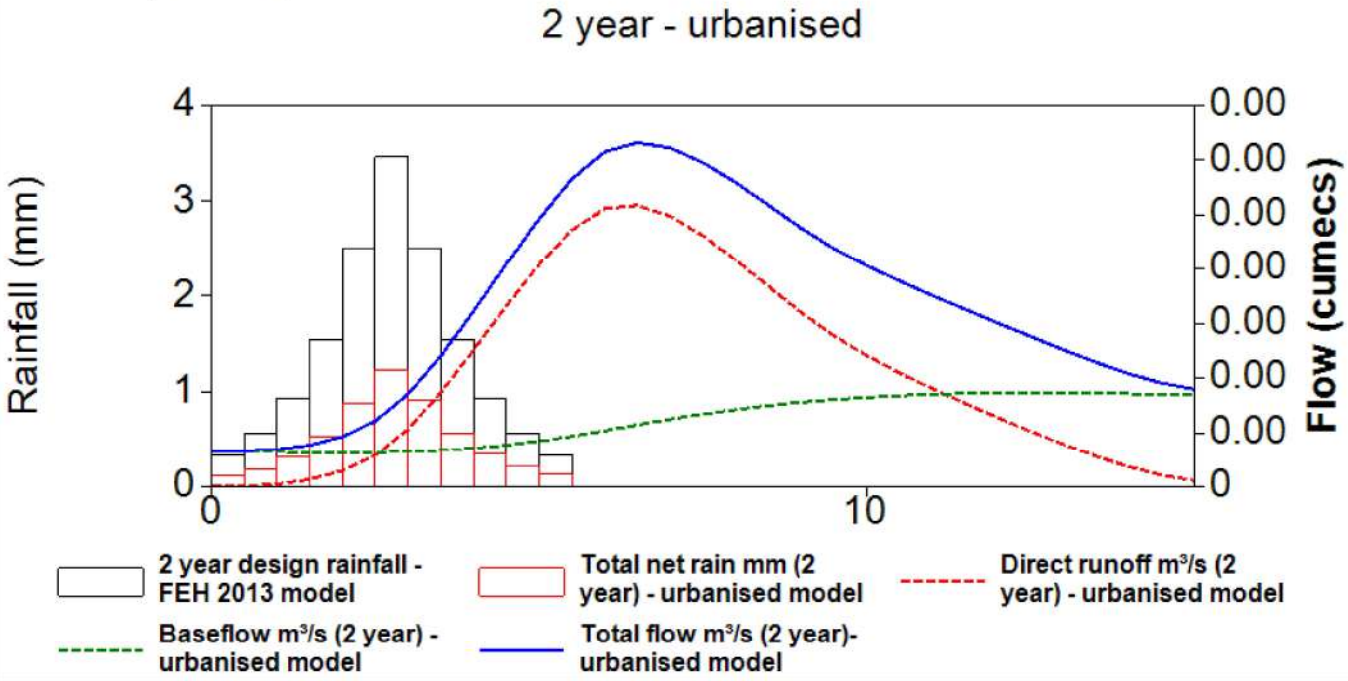
Reset all Apply

2 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:43:00 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: C338-6498

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 model (mm):	23.78	Total runoff (ML):	0.12
Total Rainfall (mm):	15.23	Total flow (ML):	0.33
Peak Rainfall (mm):	3.46	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.34]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [32.37]	Yes
BR	1.81	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.3344	0.0000	0.1119	0.0000	0.000658	0.000658
00:30:00	0.5602	0.0000	0.1881	0.0000	0.000649	0.00066
01:00:00	0.9337	0.0000	0.3155	0.0000	0.000642	0.00069
01:30:00	1.5438	0.0000	0.5271	0.0001	0.000636	0.000767
02:00:00	2.5124	0.0000	0.8720	0.0003	0.000632	0.000925
02:30:00	3.4610	0.0000	1.2301	0.0006	0.000634	0.00122
03:00:00	2.5124	0.0000	0.9140	0.0011	0.000645	0.00171
03:30:00	1.5438	0.0000	0.5704	0.0017	0.00067	0.00241
04:00:00	0.9337	0.0000	0.3482	0.0025	0.00071	0.00323
04:30:00	0.5602	0.0000	0.2101	0.0033	0.000769	0.00409
05:00:00	0.3344	0.0000	0.1258	0.0041	0.000845	0.00493
05:30:00	0.0000	0.0000	0.0000	0.0047	0.000936	0.00566
06:00:00	0.0000	0.0000	0.0000	0.0051	0.00104	0.00615
06:30:00	0.0000	0.0000	0.0000	0.0052	0.00114	0.00632
07:00:00	0.0000	0.0000	0.0000	0.0050	0.00125	0.00622
07:30:00	0.0000	0.0000	0.0000	0.0046	0.00134	0.00596
08:00:00	0.0000	0.0000	0.0000	0.0042	0.00143	0.00559
08:30:00	0.0000	0.0000	0.0000	0.0037	0.0015	0.00518
09:00:00	0.0000	0.0000	0.0000	0.0032	0.00156	0.00476
09:30:00	0.0000	0.0000	0.0000	0.0028	0.00161	0.00438
10:00:00	0.0000	0.0000	0.0000	0.0024	0.00165	0.00406
10:30:00	0.0000	0.0000	0.0000	0.0021	0.00168	0.00378
11:00:00	0.0000	0.0000	0.0000	0.0018	0.0017	0.00351
11:30:00	0.0000	0.0000	0.0000	0.0015	0.00172	0.00326
12:00:00	0.0000	0.0000	0.0000	0.0013	0.00173	0.00301
12:30:00	0.0000	0.0000	0.0000	0.0010	0.00174	0.00276
13:00:00	0.0000	0.0000	0.0000	0.0008	0.00173	0.00252
13:30:00	0.0000	0.0000	0.0000	0.0006	0.00173	0.00229
14:00:00	0.0000	0.0000	0.0000	0.0004	0.00172	0.00208
14:30:00	0.0000	0.0000	0.0000	0.0002	0.0017	0.00191
15:00:00	0.0000	0.0000	0.0000	0.0001	0.00168	0.00179
15:30:00	0.0000	0.0000	0.0000	0.0001	0.00166	0.00172
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00166
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00163
17:00:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
19:30:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00139	0.00139
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00137	0.00137
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
31:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000996	0.000996
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000983	0.000983
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00097	0.00097
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000958	0.000958
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000946	0.000946
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000934	0.000934
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000922	0.000922
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00091	0.00091
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000898	0.000898
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000887	0.000887
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000875	0.000875
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000864	0.000864
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000842	0.000842
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000832	0.000832
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000821	0.000821
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00081	0.00081
44:00:00	0.0000	0.0000	0.0000	0.0000	0.0008	0.0008
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00079	0.00079
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00078	0.00078
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00077	0.00077
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00076	0.00076
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00075	0.00075
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000741	0.000741
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000731	0.000731
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000722	0.000722
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000713	0.000713
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000704	0.000704
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000695	0.000695
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000686	0.000686
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000677	0.000677
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668

Appendix

Catchment descriptors

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

ReFH 2 - prop rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

30 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 7.09
Total rainfall (mm): 31.22

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.253
Total flow vol. (ML): 0.67
Peak flow (m³/s): 0.013

Results (urbanised)

Direct runoff vol. (ML) 0.253
Total flow vol. (ML): 0.67
Peak flow (m³/s): 0.013

Graph series

☑ Input rainfall
☑ Net rainfall
☑ Direct runoff
☑ Baseflow
☑ Total flow

Project checksum

C338-6498

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

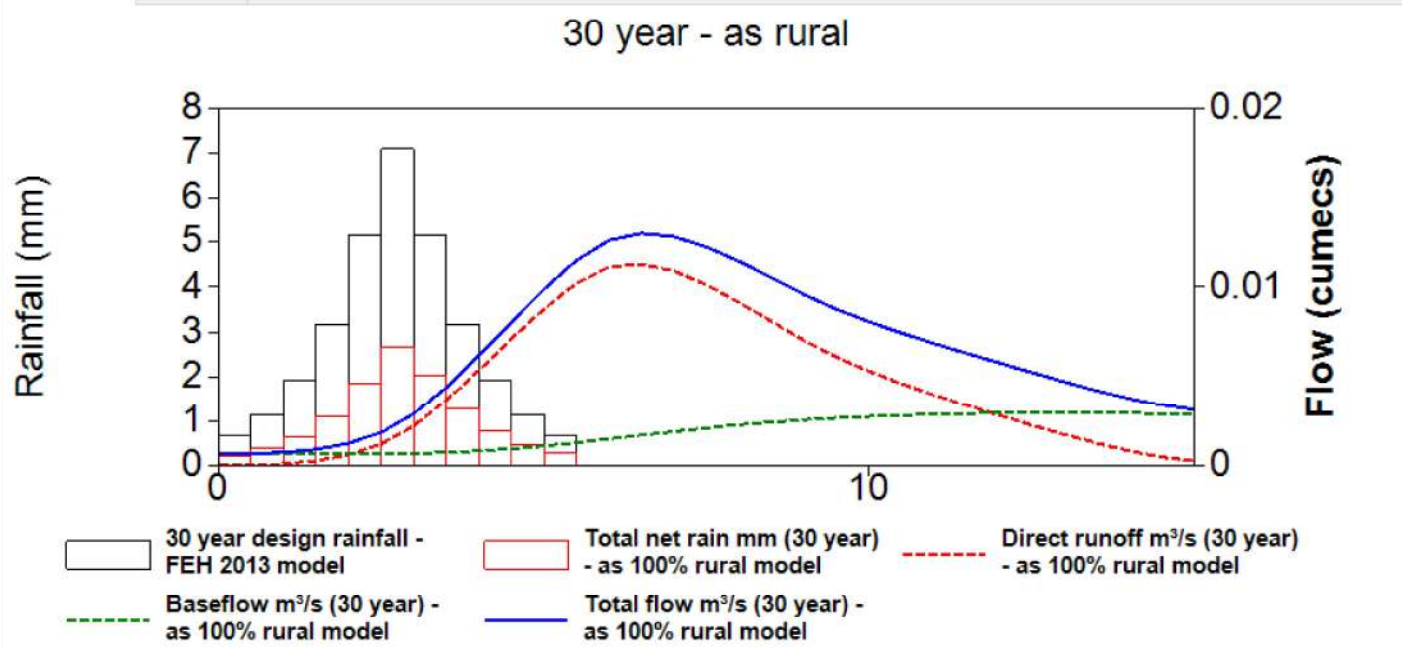
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.02144

Area (ha): 2.144

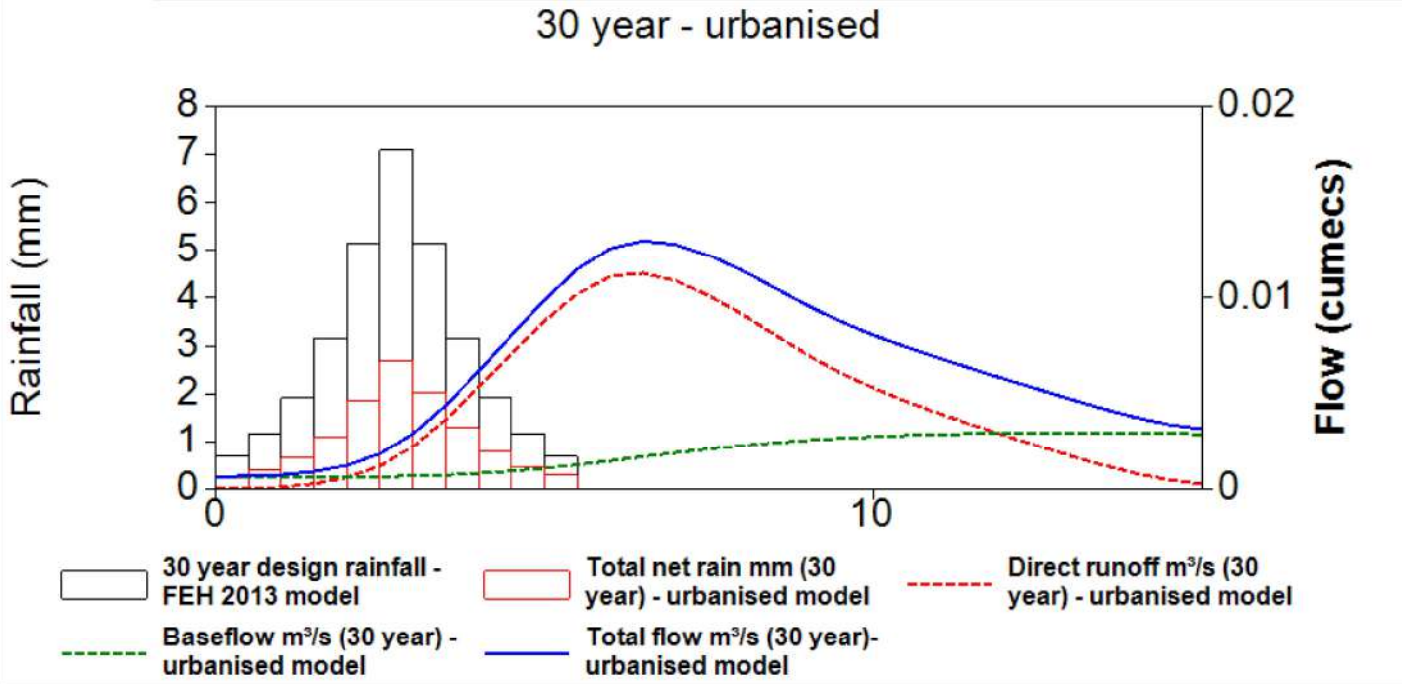
Reset all Apply

30 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:45:56 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: C338-6498

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 2013 model (mm):	48.74	Total runoff (ML):	0.25
Total Rainfall (mm):	31.22	Total flow (ML):	0.67
Peak Rainfall (mm):	7.09	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.34]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [32.37]	Yes
BR	1.65	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.6854	0.0000	0.2297	0.0000	0.000658	0.000658
00:30:00	1.1483	0.0000	0.3877	0.0000	0.000649	0.00067
01:00:00	1.9138	0.0000	0.6544	0.0001	0.000642	0.000741
01:30:00	3.1644	0.0000	1.1045	0.0003	0.000638	0.00091
02:00:00	5.1498	0.0000	1.8573	0.0006	0.000639	0.00124
02:30:00	7.0941	0.0000	2.6800	0.0012	0.00065	0.00186
03:00:00	5.1498	0.0000	2.0337	0.0022	0.000678	0.00291
03:30:00	3.1644	0.0000	1.2864	0.0037	0.000732	0.00441
04:00:00	1.9138	0.0000	0.7916	0.0054	0.000817	0.00618
04:30:00	1.1483	0.0000	0.4799	0.0071	0.000938	0.00806
05:00:00	0.6854	0.0000	0.2882	0.0088	0.00109	0.00989
05:30:00	0.0000	0.0000	0.0000	0.0102	0.00128	0.0115
06:00:00	0.0000	0.0000	0.0000	0.0111	0.00149	0.0126
06:30:00	0.0000	0.0000	0.0000	0.0113	0.0017	0.013
07:00:00	0.0000	0.0000	0.0000	0.0109	0.00192	0.0128
07:30:00	0.0000	0.0000	0.0000	0.0101	0.00211	0.0122
08:00:00	0.0000	0.0000	0.0000	0.0091	0.00229	0.0114
08:30:00	0.0000	0.0000	0.0000	0.0081	0.00244	0.0105
09:00:00	0.0000	0.0000	0.0000	0.0070	0.00257	0.0096
09:30:00	0.0000	0.0000	0.0000	0.0061	0.00267	0.00877
10:00:00	0.0000	0.0000	0.0000	0.0053	0.00276	0.00806
10:30:00	0.0000	0.0000	0.0000	0.0046	0.00283	0.00744
11:00:00	0.0000	0.0000	0.0000	0.0040	0.00288	0.00686
11:30:00	0.0000	0.0000	0.0000	0.0034	0.00292	0.00631
12:00:00	0.0000	0.0000	0.0000	0.0028	0.00295	0.00577
12:30:00	0.0000	0.0000	0.0000	0.0023	0.00297	0.00524
13:00:00	0.0000	0.0000	0.0000	0.0017	0.00297	0.00472
13:30:00	0.0000	0.0000	0.0000	0.0013	0.00296	0.00422
14:00:00	0.0000	0.0000	0.0000	0.0008	0.00295	0.00376
14:30:00	0.0000	0.0000	0.0000	0.0005	0.00292	0.0034
15:00:00	0.0000	0.0000	0.0000	0.0003	0.0029	0.00315
15:30:00	0.0000	0.0000	0.0000	0.0001	0.00286	0.00298
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00283	0.00288
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00279	0.00281
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00276	0.00276

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00272	0.00272
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00269	0.00269
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00265	0.00265
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00262	0.00262
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00258	0.00258
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00255	0.00255
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00252	0.00252
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00249	0.00249
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00245	0.00245
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00242	0.00242
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00239	0.00239
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00236	0.00236
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00233	0.00233
24:00:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00227	0.00227
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00224	0.00224
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00221	0.00221
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00219	0.00219
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00216	0.00216
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
27:30:00	0.0000	0.0000	0.0000	0.0000	0.0021	0.0021
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00208	0.00208
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00205	0.00205
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00202
29:30:00	0.0000	0.0000	0.0000	0.0000	0.002	0.002
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00195	0.00195
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
31:30:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00187	0.00187
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
33:30:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00176	0.00176
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00169	0.00169
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00139	0.00139
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
56:30:00	0.0000	0.0000	0.0000	0.0000	0.000998	0.000998
57:00:00	0.0000	0.0000	0.0000	0.0000	0.000985	0.000985
57:30:00	0.0000	0.0000	0.0000	0.0000	0.000973	0.000973
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00096	0.00096
58:30:00	0.0000	0.0000	0.0000	0.0000	0.000948	0.000948
59:00:00	0.0000	0.0000	0.0000	0.0000	0.000936	0.000936
59:30:00	0.0000	0.0000	0.0000	0.0000	0.000924	0.000924
60:00:00	0.0000	0.0000	0.0000	0.0000	0.000912	0.000912
60:30:00	0.0000	0.0000	0.0000	0.0000	0.0009	0.0009
61:00:00	0.0000	0.0000	0.0000	0.0000	0.000889	0.000889
61:30:00	0.0000	0.0000	0.0000	0.0000	0.000878	0.000878
62:00:00	0.0000	0.0000	0.0000	0.0000	0.000866	0.000866
62:30:00	0.0000	0.0000	0.0000	0.0000	0.000855	0.000855
63:00:00	0.0000	0.0000	0.0000	0.0000	0.000844	0.000844
63:30:00	0.0000	0.0000	0.0000	0.0000	0.000834	0.000834
64:00:00	0.0000	0.0000	0.0000	0.0000	0.000823	0.000823
64:30:00	0.0000	0.0000	0.0000	0.0000	0.000812	0.000812
65:00:00	0.0000	0.0000	0.0000	0.0000	0.000802	0.000802
65:30:00	0.0000	0.0000	0.0000	0.0000	0.000792	0.000792
66:00:00	0.0000	0.0000	0.0000	0.0000	0.000782	0.000782
66:30:00	0.0000	0.0000	0.0000	0.0000	0.000772	0.000772
67:00:00	0.0000	0.0000	0.0000	0.0000	0.000762	0.000762
67:30:00	0.0000	0.0000	0.0000	0.0000	0.000752	0.000752
68:00:00	0.0000	0.0000	0.0000	0.0000	0.000743	0.000743
68:30:00	0.0000	0.0000	0.0000	0.0000	0.000733	0.000733
69:00:00	0.0000	0.0000	0.0000	0.0000	0.000724	0.000724
69:30:00	0.0000	0.0000	0.0000	0.0000	0.000714	0.000714
70:00:00	0.0000	0.0000	0.0000	0.0000	0.000705	0.000705
70:30:00	0.0000	0.0000	0.0000	0.0000	0.000696	0.000696
71:00:00	0.0000	0.0000	0.0000	0.0000	0.000687	0.000687

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.000679	0.000679
72:00:00	0.0000	0.0000	0.0000	0.0000	0.00067	0.00067
72:30:00	0.0000	0.0000	0.0000	0.0000	0.000661	0.000661

Appendix

Catchment descriptors

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

ReFH 2 - prop rate.rxml (FEH_Point_Descriptors_588788_217031)

File Tools Help

Rainfall - FEH 2013 model

100 year

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 8.95
Total rainfall (mm): 39.40

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.329
Total flow vol. (ML): 0.845
Peak flow (m³/s): 0.0167

Results (urbanised)

Direct runoff vol. (ML) 0.329
Total flow vol. (ML): 0.845
Peak flow (m³/s): 0.0167

Graph series

- [x] Input rainfall
- [x] Net rainfall
- [x] Direct runoff
- [x] Baseflow
- [x] Total flow

Project checksum

C338-6498

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

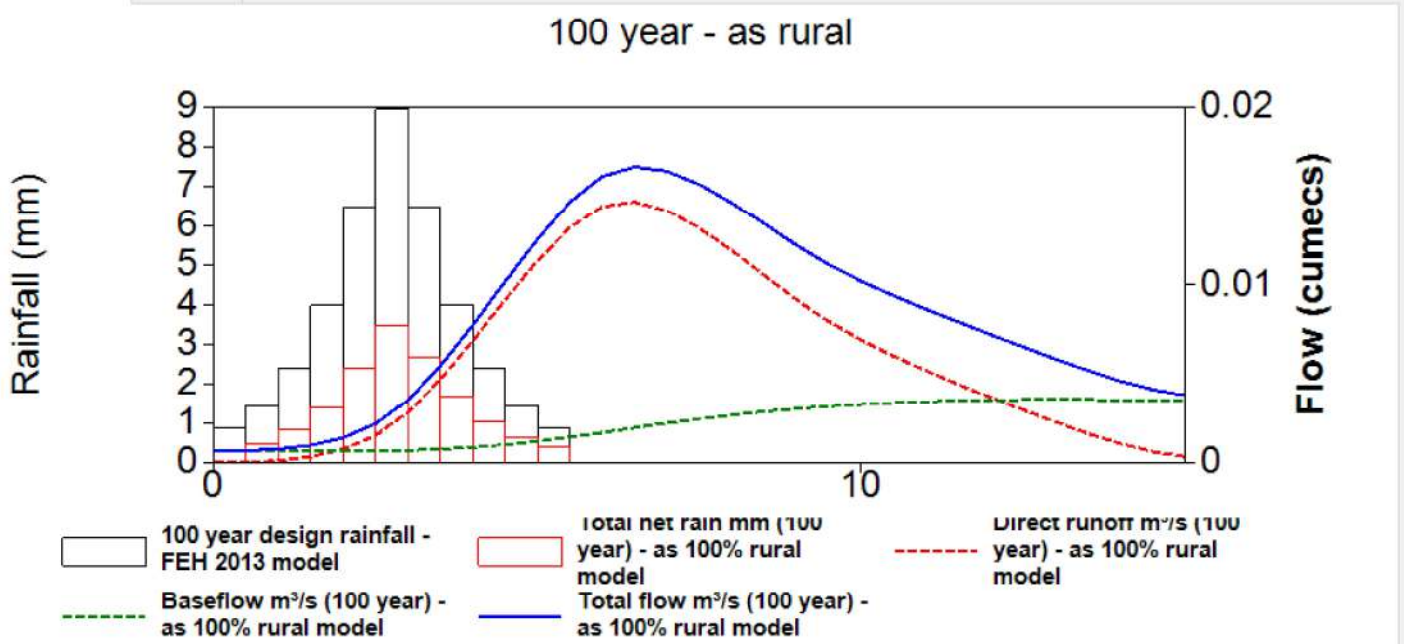
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.02144

Area (ha): 2.144

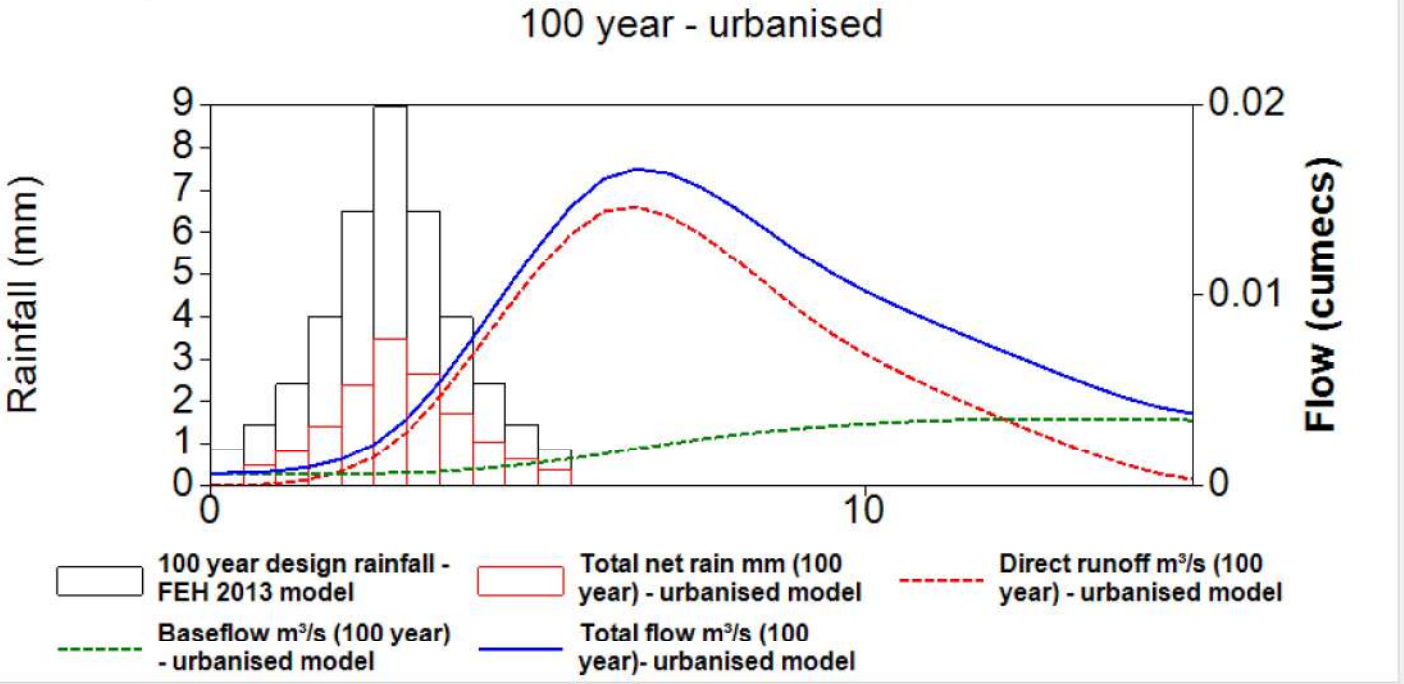
Reset all Apply

100 year design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:47:59 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: C338-6498

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	61.50	Total runoff (ML):	0.33
Total Rainfall (mm):	39.40	Total flow (ML):	0.84
Peak Rainfall (mm):	8.95	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.34]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [32.37]	Yes
BR	1.57	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.8649	0.0000	0.2900	0.0000	0.000658	0.000658
00:30:00	1.4491	0.0000	0.4906	0.0000	0.000649	0.000676
01:00:00	2.4151	0.0000	0.8307	0.0001	0.000643	0.000767
01:30:00	3.9934	0.0000	1.4094	0.0003	0.000639	0.000983
02:00:00	6.4989	0.0000	2.3891	0.0008	0.000642	0.00141
02:30:00	8.9525	0.0000	3.4845	0.0015	0.000657	0.0022
03:00:00	6.4989	0.0000	2.6699	0.0028	0.000693	0.00354
03:30:00	3.9934	0.0000	1.6992	0.0047	0.00076	0.00547
04:00:00	2.4151	0.0000	1.0493	0.0069	0.000866	0.00776
04:30:00	1.4491	0.0000	0.6374	0.0092	0.00102	0.0102
05:00:00	0.8649	0.0000	0.3833	0.0114	0.00121	0.0126
05:30:00	0.0000	0.0000	0.0000	0.0132	0.00144	0.0147
06:00:00	0.0000	0.0000	0.0000	0.0144	0.0017	0.0161
06:30:00	0.0000	0.0000	0.0000	0.0147	0.00197	0.0167
07:00:00	0.0000	0.0000	0.0000	0.0142	0.00223	0.0164
07:30:00	0.0000	0.0000	0.0000	0.0132	0.00248	0.0157
08:00:00	0.0000	0.0000	0.0000	0.0119	0.0027	0.0146
08:30:00	0.0000	0.0000	0.0000	0.0106	0.00289	0.0134
09:00:00	0.0000	0.0000	0.0000	0.0092	0.00305	0.0122
09:30:00	0.0000	0.0000	0.0000	0.0080	0.00319	0.0111
10:00:00	0.0000	0.0000	0.0000	0.0069	0.00329	0.0102
10:30:00	0.0000	0.0000	0.0000	0.0060	0.00338	0.0094
11:00:00	0.0000	0.0000	0.0000	0.0052	0.00345	0.00865
11:30:00	0.0000	0.0000	0.0000	0.0044	0.0035	0.00793
12:00:00	0.0000	0.0000	0.0000	0.0037	0.00354	0.00723
12:30:00	0.0000	0.0000	0.0000	0.0030	0.00356	0.00654
13:00:00	0.0000	0.0000	0.0000	0.0023	0.00357	0.00586
13:30:00	0.0000	0.0000	0.0000	0.0016	0.00356	0.00521
14:00:00	0.0000	0.0000	0.0000	0.0011	0.00354	0.00462
14:30:00	0.0000	0.0000	0.0000	0.0006	0.00352	0.00414
15:00:00	0.0000	0.0000	0.0000	0.0003	0.00348	0.00381
15:30:00	0.0000	0.0000	0.0000	0.0002	0.00344	0.0036
16:00:00	0.0000	0.0000	0.0000	0.0001	0.0034	0.00346
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00336	0.00337
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00331	0.00332

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00327	0.00327
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00323	0.00323
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00319	0.00319
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00315	0.00315
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00311	0.00311
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00307	0.00307
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00303	0.00303
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00299	0.00299
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00295	0.00295
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00291	0.00291
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00288	0.00288
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00284	0.00284
23:30:00	0.0000	0.0000	0.0000	0.0000	0.0028	0.0028
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00277	0.00277
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00273	0.00273
25:00:00	0.0000	0.0000	0.0000	0.0000	0.0027	0.0027
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00266	0.00266
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00263	0.00263
26:30:00	0.0000	0.0000	0.0000	0.0000	0.0026	0.0026
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00256	0.00256
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00253	0.00253
28:00:00	0.0000	0.0000	0.0000	0.0000	0.0025	0.0025
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00247	0.00247
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00243	0.00243
29:30:00	0.0000	0.0000	0.0000	0.0000	0.0024	0.0024
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00237	0.00237
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00234	0.00234
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00231	0.00231
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00228	0.00228
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00225	0.00225
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00222	0.00222
33:00:00	0.0000	0.0000	0.0000	0.0000	0.0022	0.0022
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00217	0.00217
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00214	0.00214
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00211	0.00211
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00209	0.00209

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00203	0.00203
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00201	0.00201
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00196	0.00196
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00193
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00191	0.00191
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00188	0.00188
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00181	0.00181
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00176	0.00176
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
43:00:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
50:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00135	0.00135
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
56:30:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
57:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
57:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
58:30:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
59:00:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
59:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
60:00:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
61:00:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
61:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
62:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
62:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
63:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
63:30:00	0.0000	0.0000	0.0000	0.0000	0.001	0.001
64:00:00	0.0000	0.0000	0.0000	0.0000	0.00099	0.00099
64:30:00	0.0000	0.0000	0.0000	0.0000	0.000977	0.000977
65:00:00	0.0000	0.0000	0.0000	0.0000	0.000964	0.000964
65:30:00	0.0000	0.0000	0.0000	0.0000	0.000952	0.000952
66:00:00	0.0000	0.0000	0.0000	0.0000	0.00094	0.00094
66:30:00	0.0000	0.0000	0.0000	0.0000	0.000928	0.000928
67:00:00	0.0000	0.0000	0.0000	0.0000	0.000916	0.000916
67:30:00	0.0000	0.0000	0.0000	0.0000	0.000904	0.000904
68:00:00	0.0000	0.0000	0.0000	0.0000	0.000893	0.000893
68:30:00	0.0000	0.0000	0.0000	0.0000	0.000881	0.000881
69:00:00	0.0000	0.0000	0.0000	0.0000	0.00087	0.00087
69:30:00	0.0000	0.0000	0.0000	0.0000	0.000859	0.000859
70:00:00	0.0000	0.0000	0.0000	0.0000	0.000848	0.000848
70:30:00	0.0000	0.0000	0.0000	0.0000	0.000837	0.000837
71:00:00	0.0000	0.0000	0.0000	0.0000	0.000827	0.000827

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.000816	0.000816
72:00:00	0.0000	0.0000	0.0000	0.0000	0.000806	0.000806
72:30:00	0.0000	0.0000	0.0000	0.0000	0.000795	0.000795
73:00:00	0.0000	0.0000	0.0000	0.0000	0.000785	0.000785
73:30:00	0.0000	0.0000	0.0000	0.0000	0.000775	0.000775
74:00:00	0.0000	0.0000	0.0000	0.0000	0.000765	0.000765
74:30:00	0.0000	0.0000	0.0000	0.0000	0.000755	0.000755
75:00:00	0.0000	0.0000	0.0000	0.0000	0.000746	0.000746
75:30:00	0.0000	0.0000	0.0000	0.0000	0.000736	0.000736
76:00:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
76:30:00	0.0000	0.0000	0.0000	0.0000	0.000717	0.000717
77:00:00	0.0000	0.0000	0.0000	0.0000	0.000708	0.000708
77:30:00	0.0000	0.0000	0.0000	0.0000	0.000699	0.000699
78:00:00	0.0000	0.0000	0.0000	0.0000	0.00069	0.00069
78:30:00	0.0000	0.0000	0.0000	0.0000	0.000682	0.000682
79:00:00	0.0000	0.0000	0.0000	0.0000	0.000673	0.000673
79:30:00	0.0000	0.0000	0.0000	0.0000	0.000664	0.000664

Appendix

Catchment descriptors

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

ReFH 2 - prop rate.rxml (FEH_Point_Descriptors_588788_217031)

ile Tools Help

Rainfall - FEH 2013 model

100 year 1.4 CC

Timestep (hh:mm:ss) : 00:30:00
Duration (hh:mm:ss): 05:30:00
Peak rainfall (mm): 12.53
Total rainfall (mm): 55.15

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.486
Total flow vol. (ML): 1.18
Peak flow (m³/s): 0.0242

Results (urbanised)

Direct runoff vol. (ML) 0.486
Total flow vol. (ML): 1.18
Peak flow (m³/s): 0.0242

Graph series

- [x] Input rainfall
- [x] Net rainfall
- [x] Direct runoff
- [x] Baseflow
- [x] Total flow

Project checksum

C338-6498

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

Key descriptors

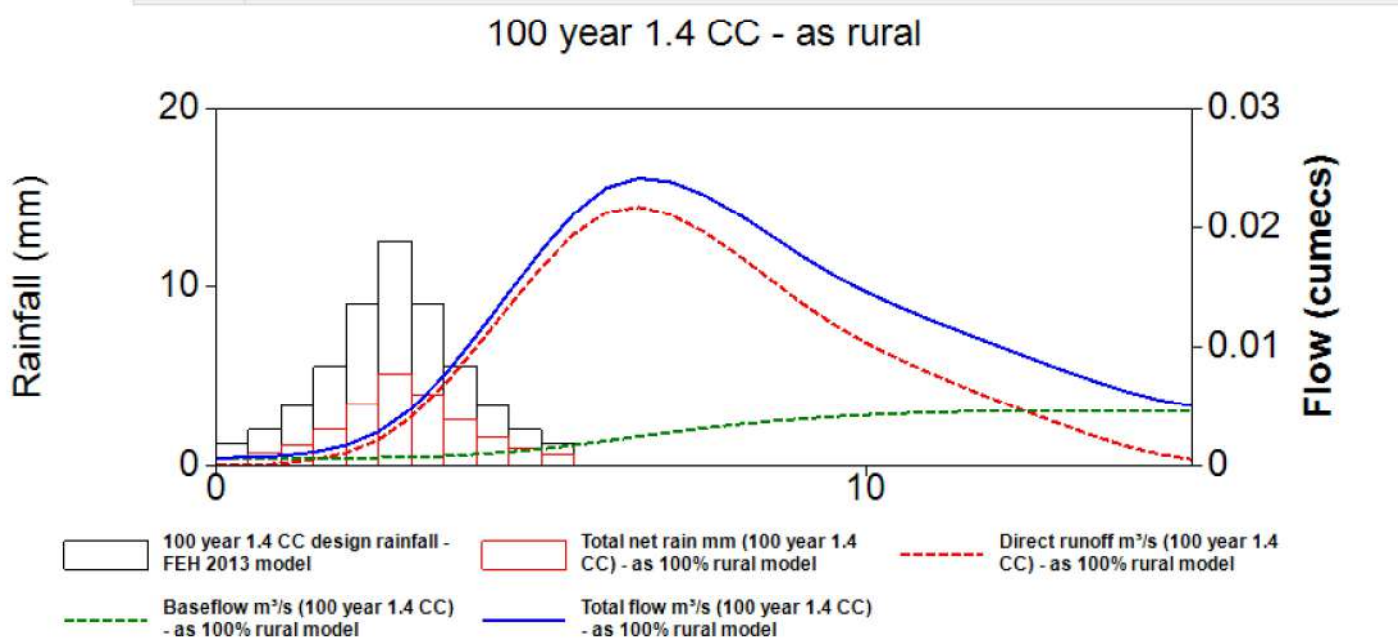
BFIHOST19:	0.417
BFIHOST:	0.382
DPLBAR:	0
DPSBAR:	0
SAAR:	569
PROPWET:	0.23
Area (km²):	0.02144

Area (ha): 2.144

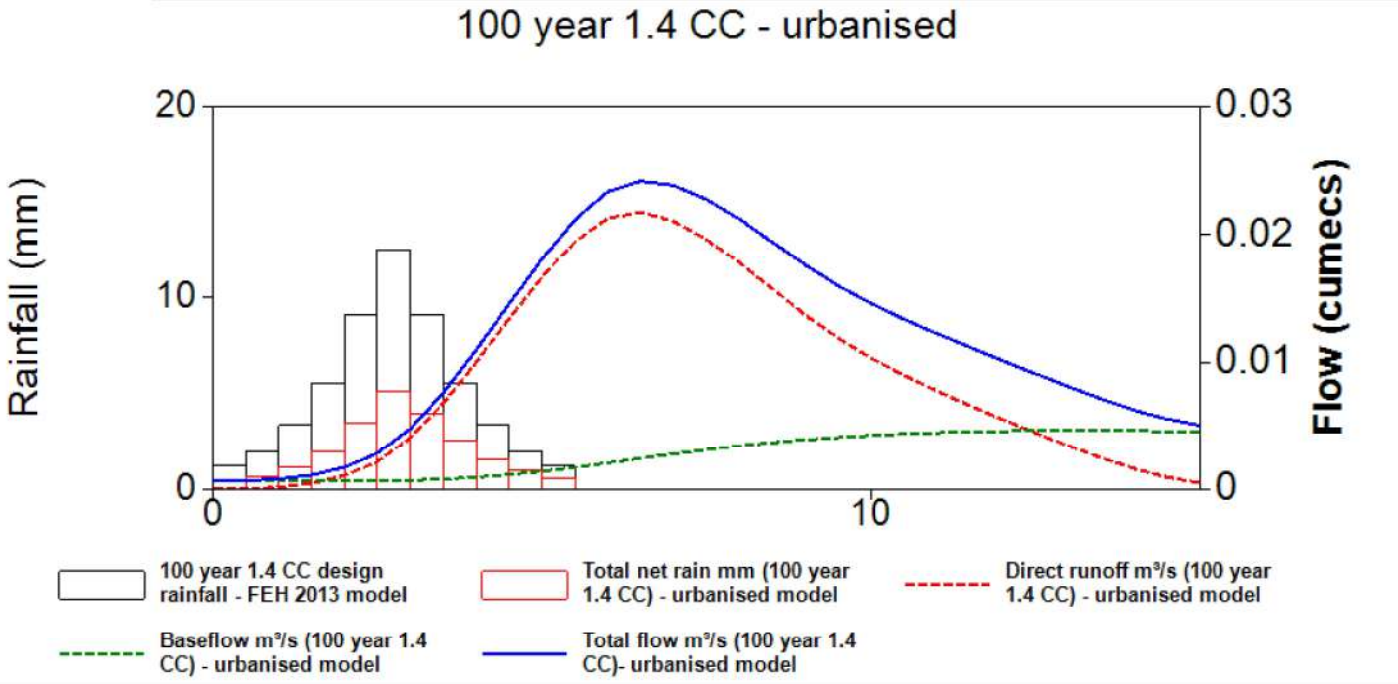
Reset all Apply

100 year 1.4 CC design rainfall - FEH 2013 model

Graph (as rural) | Grid (as rural) Export



Graph (urbanised) | Grid (urbanised) Export



UK Design Flood Estimation

Generated on 05 May 2021 08:51:45 by User
Printed from the ReFH2 Flood Modelling software package, version 3.1.7439.12207

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: C338-6498

Site name: FEH_Point_Descriptors_588788_217031

Easting: 588788

Northing: 217031

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.02

Using plot scale calculations: Yes

Model: ReFH2.3

Site description: None

Model run: 100 year 1.4 CC

Summary of results

Rainfall - FEH 2013 model (mm):	86.11	Total runoff (ML):	0.49
Total Rainfall (mm):	55.15	Total flow (ML):	1.18
Peak Rainfall (mm):	12.53	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	05:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No
Climate change factor	1.40	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	119.46	No
Cmax (mm)	357.53	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.25 [1.34]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	38.89 [32.37]	Yes
BR	1.43	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.2109	0.0000	0.4067	0.0000	0.000658	0.000658
00:30:00	2.0287	0.0000	0.6905	0.0000	0.00065	0.000687
01:00:00	3.3812	0.0000	1.1764	0.0002	0.000643	0.000818
01:30:00	5.5908	0.0000	2.0153	0.0005	0.000641	0.00112
02:00:00	9.0985	0.0000	3.4666	0.0011	0.000647	0.00173
02:30:00	12.5336	0.0000	5.1545	0.0022	0.000669	0.00286
03:00:00	9.0985	0.0000	4.0171	0.0041	0.000718	0.0048
03:30:00	5.5908	0.0000	2.5832	0.0068	0.000808	0.00761
04:00:00	3.3812	0.0000	1.6047	0.0100	0.000951	0.011
04:30:00	2.0287	0.0000	0.9782	0.0134	0.00115	0.0145
05:00:00	1.2109	0.0000	0.5894	0.0167	0.00141	0.0181
05:30:00	0.0000	0.0000	0.0000	0.0195	0.00173	0.0212
06:00:00	0.0000	0.0000	0.0000	0.0213	0.00208	0.0234
06:30:00	0.0000	0.0000	0.0000	0.0218	0.00244	0.0242
07:00:00	0.0000	0.0000	0.0000	0.0211	0.0028	0.0239
07:30:00	0.0000	0.0000	0.0000	0.0196	0.00314	0.0228
08:00:00	0.0000	0.0000	0.0000	0.0178	0.00344	0.0212
08:30:00	0.0000	0.0000	0.0000	0.0157	0.0037	0.0194
09:00:00	0.0000	0.0000	0.0000	0.0137	0.00393	0.0176
09:30:00	0.0000	0.0000	0.0000	0.0119	0.00411	0.016
10:00:00	0.0000	0.0000	0.0000	0.0103	0.00426	0.0146
10:30:00	0.0000	0.0000	0.0000	0.0090	0.00438	0.0134
11:00:00	0.0000	0.0000	0.0000	0.0078	0.00448	0.0122
11:30:00	0.0000	0.0000	0.0000	0.0066	0.00455	0.0112
12:00:00	0.0000	0.0000	0.0000	0.0055	0.00461	0.0101
12:30:00	0.0000	0.0000	0.0000	0.0045	0.00464	0.0091
13:00:00	0.0000	0.0000	0.0000	0.0034	0.00465	0.00809
13:30:00	0.0000	0.0000	0.0000	0.0025	0.00465	0.00713
14:00:00	0.0000	0.0000	0.0000	0.0016	0.00462	0.00626
14:30:00	0.0000	0.0000	0.0000	0.0010	0.00459	0.00554
15:00:00	0.0000	0.0000	0.0000	0.0005	0.00454	0.00505
15:30:00	0.0000	0.0000	0.0000	0.0002	0.00449	0.00474
16:00:00	0.0000	0.0000	0.0000	0.0001	0.00444	0.00454
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00438	0.00441
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00433	0.00433

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00427	0.00427
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00422	0.00422
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00416	0.00416
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00411	0.00411
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00406	0.00406
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00401	0.00401
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00395	0.00395
21:00:00	0.0000	0.0000	0.0000	0.0000	0.0039	0.0039
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00385	0.00385
22:00:00	0.0000	0.0000	0.0000	0.0000	0.0038	0.0038
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00376	0.00376
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00371	0.00371
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00366	0.00366
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00361	0.00361
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00357	0.00357
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00352	0.00352
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00348	0.00348
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00343	0.00343
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00339	0.00339
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00335	0.00335
27:30:00	0.0000	0.0000	0.0000	0.0000	0.0033	0.0033
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00326	0.00326
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00322	0.00322
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00318	0.00318
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00314	0.00314
30:00:00	0.0000	0.0000	0.0000	0.0000	0.0031	0.0031
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00306	0.00306
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00302	0.00302
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00298	0.00298
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00294	0.00294
32:30:00	0.0000	0.0000	0.0000	0.0000	0.0029	0.0029
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00287	0.00287
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00283	0.00283
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00279	0.00279
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00276	0.00276
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00272	0.00272

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00269	0.00269
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00265	0.00265
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00262	0.00262
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00259	0.00259
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00255	0.00255
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00252	0.00252
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00249	0.00249
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00246	0.00246
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00243	0.00243
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00239	0.00239
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00236	0.00236
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00233	0.00233
41:30:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00227	0.00227
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00225	0.00225
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00222	0.00222
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00219	0.00219
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00216	0.00216
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00211	0.00211
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00208	0.00208
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00205	0.00205
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00203	0.00203
47:00:00	0.0000	0.0000	0.0000	0.0000	0.002	0.002
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00195	0.00195
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
49:00:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00188	0.00188
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
51:00:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00176	0.00176
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
53:30:00	0.0000	0.0000	0.0000	0.0000	0.00169	0.00169
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
56:30:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
57:00:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
57:30:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
58:30:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
59:00:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
59:30:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
60:00:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
61:00:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
61:30:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
62:00:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
62:30:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
63:00:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
63:30:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
64:00:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
64:30:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
65:00:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
65:30:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
66:00:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
66:30:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
67:00:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
67:30:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
68:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
68:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
69:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
69:30:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
70:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
70:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
71:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
71:30:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
72:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
72:30:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
73:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
73:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
74:00:00	0.0000	0.0000	0.0000	0.0000	0.000999	0.000999
74:30:00	0.0000	0.0000	0.0000	0.0000	0.000986	0.000986
75:00:00	0.0000	0.0000	0.0000	0.0000	0.000974	0.000974
75:30:00	0.0000	0.0000	0.0000	0.0000	0.000961	0.000961
76:00:00	0.0000	0.0000	0.0000	0.0000	0.000949	0.000949
76:30:00	0.0000	0.0000	0.0000	0.0000	0.000937	0.000937
77:00:00	0.0000	0.0000	0.0000	0.0000	0.000925	0.000925
77:30:00	0.0000	0.0000	0.0000	0.0000	0.000913	0.000913
78:00:00	0.0000	0.0000	0.0000	0.0000	0.000901	0.000901
78:30:00	0.0000	0.0000	0.0000	0.0000	0.00089	0.00089
79:00:00	0.0000	0.0000	0.0000	0.0000	0.000878	0.000878
79:30:00	0.0000	0.0000	0.0000	0.0000	0.000867	0.000867
80:00:00	0.0000	0.0000	0.0000	0.0000	0.000856	0.000856
80:30:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
81:00:00	0.0000	0.0000	0.0000	0.0000	0.000834	0.000834
81:30:00	0.0000	0.0000	0.0000	0.0000	0.000824	0.000824
82:00:00	0.0000	0.0000	0.0000	0.0000	0.000813	0.000813
82:30:00	0.0000	0.0000	0.0000	0.0000	0.000803	0.000803
83:00:00	0.0000	0.0000	0.0000	0.0000	0.000793	0.000793
83:30:00	0.0000	0.0000	0.0000	0.0000	0.000782	0.000782
84:00:00	0.0000	0.0000	0.0000	0.0000	0.000772	0.000772
84:30:00	0.0000	0.0000	0.0000	0.0000	0.000763	0.000763
85:00:00	0.0000	0.0000	0.0000	0.0000	0.000753	0.000753
85:30:00	0.0000	0.0000	0.0000	0.0000	0.000743	0.000743
86:00:00	0.0000	0.0000	0.0000	0.0000	0.000734	0.000734
86:30:00	0.0000	0.0000	0.0000	0.0000	0.000724	0.000724
87:00:00	0.0000	0.0000	0.0000	0.0000	0.000715	0.000715
87:30:00	0.0000	0.0000	0.0000	0.0000	0.000706	0.000706
88:00:00	0.0000	0.0000	0.0000	0.0000	0.000697	0.000697
88:30:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
89:00:00	0.0000	0.0000	0.0000	0.0000	0.000679	0.000679

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
89:30:00	0.0000	0.0000	0.0000	0.0000	0.000671	0.000671
90:00:00	0.0000	0.0000	0.0000	0.0000	0.000662	0.000662

Appendix

Catchment descriptors

Name	Value	User-defined value used?
BFIHOST	0.38	No
BFIHOST19	0.42	No
PROPWET (mm)	0.23	No
SAAR (mm)	569	No

APPENDIX E – DETENTION BASIN

2 YEAR EVENT

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.081	0.081	3.2	142.7	O K
30 min Summer	0.102	0.102	4.4	180.3	O K
60 min Summer	0.123	0.123	5.4	218.1	O K
120 min Summer	0.170	0.170	5.6	305.2	O K
180 min Summer	0.194	0.194	5.6	351.8	O K
240 min Summer	0.209	0.209	5.6	380.0	O K
360 min Summer	0.224	0.224	5.6	408.2	O K
480 min Summer	0.229	0.229	5.6	417.7	O K
600 min Summer	0.230	0.230	5.6	419.2	O K
720 min Summer	0.229	0.229	5.6	418.6	O K
960 min Summer	0.227	0.227	5.6	414.2	O K
1440 min Summer	0.220	0.220	5.6	400.8	O K
2160 min Summer	0.208	0.208	5.6	377.7	O K
2880 min Summer	0.196	0.196	5.6	355.0	O K
4320 min Summer	0.176	0.176	5.6	317.5	O K
5760 min Summer	0.161	0.161	5.6	288.0	O K
7200 min Summer	0.149	0.149	5.6	265.8	O K
8640 min Summer	0.139	0.139	5.5	248.7	O K
10080 min Summer	0.132	0.132	5.5	235.9	O K
15 min Winter	0.091	0.091	3.7	159.7	O K
30 min Winter	0.114	0.114	5.0	202.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	32.617	0.0	100.5	19
30 min Summer	20.831	0.0	136.0	33
60 min Summer	12.872	0.0	200.2	62
120 min Summer	9.257	0.0	296.6	122
180 min Summer	7.282	0.0	353.1	182
240 min Summer	6.033	0.0	391.4	242
360 min Summer	4.518	0.0	440.6	360
480 min Summer	3.628	0.0	471.6	480
600 min Summer	3.045	0.0	494.1	550
720 min Summer	2.632	0.0	511.5	604
960 min Summer	2.085	0.0	537.6	722
1440 min Summer	1.500	0.0	571.6	982
2160 min Summer	1.085	0.0	669.1	1384
2880 min Summer	0.869	0.0	713.1	1788
4320 min Summer	0.649	0.0	789.5	2552
5760 min Summer	0.535	0.0	897.6	3288
7200 min Summer	0.467	0.0	975.8	4032
8640 min Summer	0.420	0.0	1050.7	4752
10080 min Summer	0.387	0.0	1120.2	5448
15 min Winter	32.617	0.0	115.9	19
30 min Winter	20.831	0.0	155.9	33

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.137	0.137	5.5	244.9	O K
120 min Winter	0.190	0.190	5.6	343.9	O K
180 min Winter	0.218	0.218	5.6	397.3	O K
240 min Winter	0.235	0.235	5.6	430.1	O K
360 min Winter	0.253	0.253	5.6	464.4	O K
480 min Winter	0.260	0.260	5.6	478.0	O K
600 min Winter	0.262	0.262	5.6	481.8	O K
720 min Winter	0.261	0.261	5.6	480.2	O K
960 min Winter	0.255	0.255	5.6	469.2	O K
1440 min Winter	0.244	0.244	5.6	446.8	O K
2160 min Winter	0.224	0.224	5.6	407.5	O K
2880 min Winter	0.204	0.204	5.6	369.3	O K
4320 min Winter	0.170	0.170	5.6	306.6	O K
5760 min Winter	0.146	0.146	5.6	260.2	O K
7200 min Winter	0.129	0.129	5.5	229.2	O K
8640 min Winter	0.120	0.120	5.2	212.4	O K
10080 min Winter	0.113	0.113	4.9	200.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	12.872	0.0	226.8	62
120 min Winter	9.257	0.0	334.6	120
180 min Winter	7.282	0.0	397.5	180
240 min Winter	6.033	0.0	440.1	238
360 min Winter	4.518	0.0	494.7	352
480 min Winter	3.628	0.0	529.0	466
600 min Winter	3.045	0.0	553.8	576
720 min Winter	2.632	0.0	572.9	684
960 min Winter	2.085	0.0	601.1	790
1440 min Winter	1.500	0.0	637.1	1080
2160 min Winter	1.085	0.0	750.9	1516
2880 min Winter	0.869	0.0	800.5	1932
4320 min Winter	0.649	0.0	887.7	2720
5760 min Winter	0.535	0.0	1006.7	3408
7200 min Winter	0.467	0.0	1094.7	4104
8640 min Winter	0.420	0.0	1179.2	4760
10080 min Winter	0.387	0.0	1258.5	5456

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 588788 217031 TL 88788 17031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.359

Time (mins) From:	To:	Area (ha)
0	4	2.359

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1724.0	0.700	2367.0	1.400	2660.0	2.100	2660.0
0.100	1812.0	0.800	2463.0	1.500	2660.0	2.200	2660.0
0.200	1902.0	0.900	2561.0	1.600	2660.0	2.300	2660.0
0.300	1992.0	1.000	2660.0	1.700	2660.0	2.400	2660.0
0.400	2084.0	1.100	2660.0	1.800	2660.0	2.500	2660.0
0.500	2177.0	1.200	2660.0	1.900	2660.0		
0.600	2271.0	1.300	2660.0	2.000	2660.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0120-5600-0300-5600
Design Head (m)	0.300
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	120
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.300	5.6
Flush-Flo™	0.168	5.6
Kick-Flo®	0.256	5.2
Mean Flow over Head Range	-	4.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.3	1.200	10.7	3.000	16.6	7.000	25.3
0.200	5.5	1.400	11.5	3.500	17.8	7.500	26.1
0.300	5.6	1.600	12.3	4.000	19.0	8.000	27.0
0.400	6.4	1.800	13.0	4.500	20.2	8.500	27.8
0.500	7.1	2.000	13.7	5.000	21.3	9.000	28.7
0.600	7.7	2.200	14.3	5.500	22.4	9.500	29.5
0.800	8.9	2.400	14.9	6.000	23.4		
1.000	9.8	2.600	15.5	6.500	24.3		

30 YEAR EVENT

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.176	0.176	5.2	317.0	O K
30 min Summer	0.225	0.225	5.4	410.5	O K
60 min Summer	0.275	0.275	5.5	507.7	O K
120 min Summer	0.340	0.340	5.6	637.2	O K
180 min Summer	0.374	0.374	5.6	707.2	O K
240 min Summer	0.395	0.395	5.6	750.4	O K
360 min Summer	0.417	0.417	5.6	796.3	O K
480 min Summer	0.426	0.426	5.6	816.1	O K
600 min Summer	0.430	0.430	5.6	823.3	O K
720 min Summer	0.430	0.430	5.6	823.1	O K
960 min Summer	0.423	0.423	5.6	809.7	O K
1440 min Summer	0.406	0.406	5.6	774.3	O K
2160 min Summer	0.387	0.387	5.6	733.1	O K
2880 min Summer	0.369	0.369	5.6	697.5	O K
4320 min Summer	0.339	0.339	5.6	636.4	O K
5760 min Summer	0.314	0.314	5.6	585.6	O K
7200 min Summer	0.294	0.294	5.6	545.7	O K
8640 min Summer	0.277	0.277	5.5	512.2	O K
10080 min Summer	0.263	0.263	5.5	484.2	O K
15 min Winter	0.196	0.196	5.3	355.3	O K
30 min Winter	0.251	0.251	5.5	460.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.378	0.0	250.1	19
30 min Summer	47.098	0.0	326.4	34
60 min Summer	29.401	0.0	476.9	64
120 min Summer	18.743	0.0	608.0	124
180 min Summer	14.072	0.0	681.2	182
240 min Summer	11.360	0.0	728.3	242
360 min Summer	8.266	0.0	783.3	362
480 min Summer	6.536	0.0	812.6	482
600 min Summer	5.427	0.0	828.7	602
720 min Summer	4.653	0.0	836.4	720
960 min Summer	3.638	0.0	835.6	960
1440 min Summer	2.570	0.0	803.1	1170
2160 min Summer	1.824	0.0	1124.4	1536
2880 min Summer	1.439	0.0	1176.4	1936
4320 min Summer	1.043	0.0	1251.8	2764
5760 min Summer	0.840	0.0	1411.7	3568
7200 min Summer	0.717	0.0	1505.8	4328
8640 min Summer	0.635	0.0	1595.7	5104
10080 min Summer	0.576	0.0	1678.3	5856
15 min Winter	72.378	0.0	281.6	19
30 min Winter	47.098	0.0	362.4	33

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.306	0.306	5.6	569.4	O K
120 min Winter	0.378	0.378	5.6	715.9	O K
180 min Winter	0.417	0.417	5.6	795.6	O K
240 min Winter	0.440	0.440	5.6	845.3	O K
360 min Winter	0.465	0.465	5.6	899.3	O K
480 min Winter	0.477	0.477	5.6	924.3	O K
600 min Winter	0.482	0.482	5.6	935.3	O K
720 min Winter	0.483	0.483	5.6	938.1	O K
960 min Winter	0.480	0.480	5.6	929.6	O K
1440 min Winter	0.461	0.461	5.6	889.4	O K
2160 min Winter	0.433	0.433	5.6	831.0	O K
2880 min Winter	0.409	0.409	5.6	780.5	O K
4320 min Winter	0.364	0.364	5.6	687.4	O K
5760 min Winter	0.325	0.325	5.6	607.0	O K
7200 min Winter	0.292	0.292	5.6	541.6	O K
8640 min Winter	0.265	0.265	5.5	487.0	O K
10080 min Winter	0.241	0.241	5.5	441.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	29.401	0.0	535.0	64
120 min Winter	18.743	0.0	678.6	122
180 min Winter	14.072	0.0	756.3	180
240 min Winter	11.360	0.0	803.9	240
360 min Winter	8.266	0.0	853.5	356
480 min Winter	6.536	0.0	873.0	474
600 min Winter	5.427	0.0	878.1	590
720 min Winter	4.653	0.0	875.3	702
960 min Winter	3.638	0.0	861.2	926
1440 min Winter	2.570	0.0	823.9	1354
2160 min Winter	1.824	0.0	1257.3	1664
2880 min Winter	1.439	0.0	1313.4	2108
4320 min Winter	1.043	0.0	1386.3	2984
5760 min Winter	0.840	0.0	1582.1	3816
7200 min Winter	0.717	0.0	1688.0	4616
8640 min Winter	0.635	0.0	1789.8	5440
10080 min Winter	0.576	0.0	1884.4	6152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 588788 217031 TL 88788 17031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.359

Time (mins) From:	To:	Area (ha)
0	4	2.359

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1724.0	0.700	2367.0	1.400	2660.0	2.100	2660.0
0.100	1812.0	0.800	2463.0	1.500	2660.0	2.200	2660.0
0.200	1902.0	0.900	2561.0	1.600	2660.0	2.300	2660.0
0.300	1992.0	1.000	2660.0	1.700	2660.0	2.400	2660.0
0.400	2084.0	1.100	2660.0	1.800	2660.0	2.500	2660.0
0.500	2177.0	1.200	2660.0	1.900	2660.0		
0.600	2271.0	1.300	2660.0	2.000	2660.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0108-5600-1200-5600
Design Head (m)	1.200
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.6
Flush-Flo™	0.354	5.6
Kick-Flo®	0.750	4.5
Mean Flow over Head Range	-	4.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.6	3.000	8.6	7.000	12.9
0.200	5.3	1.400	6.0	3.500	9.3	7.500	13.3
0.300	5.6	1.600	6.4	4.000	9.9	8.000	13.7
0.400	5.6	1.800	6.8	4.500	10.4	8.500	14.1
0.500	5.5	2.000	7.1	5.000	11.0	9.000	14.5
0.600	5.3	2.200	7.4	5.500	11.5	9.500	14.9
0.800	4.6	2.400	7.7	6.000	12.0		
1.000	5.1	2.600	8.0	6.500	12.4		

100 YEAR EVENT

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.221	0.221	5.4	402.0	O K
30 min Summer	0.285	0.285	5.5	527.6	O K
60 min Summer	0.349	0.349	5.6	655.7	O K
120 min Summer	0.424	0.424	5.6	811.9	O K
180 min Summer	0.466	0.466	5.6	900.6	O K
240 min Summer	0.492	0.492	5.6	957.7	O K
360 min Summer	0.522	0.522	5.6	1022.7	O K
480 min Summer	0.537	0.537	5.6	1055.1	O K
600 min Summer	0.544	0.544	5.6	1071.1	O K
720 min Summer	0.547	0.547	5.6	1077.3	O K
960 min Summer	0.545	0.545	5.6	1072.1	O K
1440 min Summer	0.525	0.525	5.6	1029.4	O K
2160 min Summer	0.498	0.498	5.6	969.9	O K
2880 min Summer	0.476	0.476	5.6	921.4	O K
4320 min Summer	0.436	0.436	5.6	836.3	O K
5760 min Summer	0.402	0.402	5.6	765.4	O K
7200 min Summer	0.375	0.375	5.6	709.7	O K
8640 min Summer	0.353	0.353	5.6	663.2	O K
10080 min Summer	0.333	0.333	5.6	624.0	O K
15 min Winter	0.246	0.246	5.5	450.5	O K
30 min Winter	0.317	0.317	5.6	591.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	91.665	0.0	318.5	19
30 min Summer	60.400	0.0	404.6	34
60 min Summer	37.816	0.0	614.0	64
120 min Summer	23.722	0.0	759.7	124
180 min Summer	17.755	0.0	835.0	184
240 min Summer	14.327	0.0	875.1	244
360 min Summer	10.434	0.0	901.7	362
480 min Summer	8.259	0.0	900.7	482
600 min Summer	6.861	0.0	894.2	602
720 min Summer	5.883	0.0	885.7	722
960 min Summer	4.598	0.0	866.2	962
1440 min Summer	3.235	0.0	823.7	1372
2160 min Summer	2.282	0.0	1396.3	1684
2880 min Summer	1.788	0.0	1442.5	2048
4320 min Summer	1.274	0.0	1459.8	2852
5760 min Summer	1.011	0.0	1700.8	3640
7200 min Summer	0.854	0.0	1793.2	4464
8640 min Summer	0.748	0.0	1882.1	5192
10080 min Summer	0.673	0.0	1963.5	6048
15 min Winter	91.665	0.0	354.3	19
30 min Winter	60.400	0.0	435.3	34

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.388	0.388	5.6	735.3	O K
120 min Winter	0.471	0.471	5.6	911.9	O K
180 min Winter	0.518	0.518	5.6	1012.6	O K
240 min Winter	0.547	0.547	5.6	1078.2	O K
360 min Winter	0.581	0.581	5.6	1154.0	O K
480 min Winter	0.599	0.599	5.6	1193.5	O K
600 min Winter	0.608	0.608	5.6	1214.7	O K
720 min Winter	0.613	0.613	5.6	1225.1	O K
960 min Winter	0.613	0.613	5.6	1226.2	O K
1440 min Winter	0.598	0.598	5.6	1192.4	O K
2160 min Winter	0.564	0.564	5.6	1115.4	O K
2880 min Winter	0.535	0.535	5.6	1050.8	O K
4320 min Winter	0.480	0.480	5.6	931.3	O K
5760 min Winter	0.430	0.430	5.6	824.5	O K
7200 min Winter	0.388	0.388	5.6	736.7	O K
8640 min Winter	0.352	0.352	5.6	662.3	O K
10080 min Winter	0.321	0.321	5.6	599.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	37.816	0.0	685.2	64
120 min Winter	23.722	0.0	835.6	122
180 min Winter	17.755	0.0	897.7	182
240 min Winter	14.327	0.0	916.6	240
360 min Winter	10.434	0.0	916.3	358
480 min Winter	8.259	0.0	908.0	476
600 min Winter	6.861	0.0	897.9	592
720 min Winter	5.883	0.0	887.4	708
960 min Winter	4.598	0.0	866.7	940
1440 min Winter	3.235	0.0	827.1	1384
2160 min Winter	2.282	0.0	1547.0	1988
2880 min Winter	1.788	0.0	1583.0	2220
4320 min Winter	1.274	0.0	1536.6	3112
5760 min Winter	1.011	0.0	1905.5	3976
7200 min Winter	0.854	0.0	2009.0	4824
8640 min Winter	0.748	0.0	2109.3	5616
10080 min Winter	0.673	0.0	2203.1	6360

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 588788 217031 TL 88788 17031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.359

Time (mins) From:	To:	Area (ha)
0	4	2.359

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1724.0	0.700	2367.0	1.400	2660.0	2.100	2660.0
0.100	1812.0	0.800	2463.0	1.500	2660.0	2.200	2660.0
0.200	1902.0	0.900	2561.0	1.600	2660.0	2.300	2660.0
0.300	1992.0	1.000	2660.0	1.700	2660.0	2.400	2660.0
0.400	2084.0	1.100	2660.0	1.800	2660.0	2.500	2660.0
0.500	2177.0	1.200	2660.0	1.900	2660.0		
0.600	2271.0	1.300	2660.0	2.000	2660.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0108-5600-1200-5600
Design Head (m)	1.200
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.6
Flush-Flo™	0.354	5.6
Kick-Flo®	0.750	4.5
Mean Flow over Head Range	-	4.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.6	3.000	8.6	7.000	12.9
0.200	5.3	1.400	6.0	3.500	9.3	7.500	13.3
0.300	5.6	1.600	6.4	4.000	9.9	8.000	13.7
0.400	5.6	1.800	6.8	4.500	10.4	8.500	14.1
0.500	5.5	2.000	7.1	5.000	11.0	9.000	14.5
0.600	5.3	2.200	7.4	5.500	11.5	9.500	14.9
0.800	4.6	2.400	7.7	6.000	12.0		
1.000	5.1	2.600	8.0	6.500	12.4		

100 YEAR PLUS (40%) CLIMATE CHANGE

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.303	0.303	5.6	563.8	O K
30 min Summer	0.390	0.390	5.6	740.8	O K
60 min Summer	0.476	0.476	5.6	922.3	O K
120 min Summer	0.578	0.578	5.6	1146.0	O K
180 min Summer	0.635	0.635	5.6	1275.5	O K
240 min Summer	0.671	0.671	5.6	1361.0	O K
360 min Summer	0.715	0.715	5.6	1463.5	Flood Risk
480 min Summer	0.739	0.739	5.6	1520.9	Flood Risk
600 min Summer	0.753	0.753	5.6	1555.7	Flood Risk
720 min Summer	0.762	0.762	5.6	1576.6	Flood Risk
960 min Summer	0.769	0.769	5.6	1593.4	Flood Risk
1440 min Summer	0.763	0.763	5.6	1580.0	Flood Risk
2160 min Summer	0.738	0.738	5.6	1518.7	Flood Risk
2880 min Summer	0.707	0.707	5.6	1443.7	Flood Risk
4320 min Summer	0.659	0.659	5.6	1331.4	O K
5760 min Summer	0.622	0.622	5.6	1247.4	O K
7200 min Summer	0.595	0.595	5.6	1185.4	O K
8640 min Summer	0.573	0.573	5.6	1135.6	O K
10080 min Summer	0.554	0.554	5.6	1094.0	O K
15 min Winter	0.337	0.337	5.6	631.8	O K
30 min Winter	0.433	0.433	5.6	830.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.332	0.0	422.9	19
30 min Summer	84.560	0.0	467.4	34
60 min Summer	52.943	0.0	835.0	64
120 min Summer	33.210	0.0	929.7	124
180 min Summer	24.857	0.0	928.9	184
240 min Summer	20.057	0.0	917.8	244
360 min Summer	14.608	0.0	892.4	364
480 min Summer	11.563	0.0	869.5	482
600 min Summer	9.605	0.0	849.9	602
720 min Summer	8.236	0.0	833.8	722
960 min Summer	6.438	0.0	808.4	962
1440 min Summer	4.528	0.0	769.6	1442
2160 min Summer	3.194	0.0	1668.9	2160
2880 min Summer	2.503	0.0	1624.1	2480
4320 min Summer	1.784	0.0	1520.0	3152
5760 min Summer	1.415	0.0	2378.6	3920
7200 min Summer	1.195	0.0	2504.5	4752
8640 min Summer	1.048	0.0	2622.0	5536
10080 min Summer	0.942	0.0	2717.7	6352
15 min Winter	128.332	0.0	449.5	19
30 min Winter	84.560	0.0	474.2	34

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.527	0.527	5.6	1034.2	O K
120 min Winter	0.639	0.639	5.6	1286.6	O K
180 min Winter	0.702	0.702	5.6	1433.7	Flood Risk
240 min Winter	0.743	0.743	5.6	1531.7	Flood Risk
360 min Winter	0.792	0.792	5.6	1650.4	Flood Risk
480 min Winter	0.819	0.819	5.6	1717.5	Flood Risk
600 min Winter	0.836	0.836	5.6	1758.7	Flood Risk
720 min Winter	0.846	0.846	5.6	1784.4	Flood Risk
960 min Winter	0.856	0.856	5.6	1808.5	Flood Risk
1440 min Winter	0.855	0.855	5.6	1805.6	Flood Risk
2160 min Winter	0.837	0.837	5.6	1760.9	Flood Risk
2880 min Winter	0.811	0.811	5.6	1697.7	Flood Risk
4320 min Winter	0.752	0.752	5.6	1552.3	Flood Risk
5760 min Winter	0.700	0.700	5.6	1428.8	Flood Risk
7200 min Winter	0.658	0.658	5.6	1329.9	O K
8640 min Winter	0.621	0.621	5.6	1244.2	O K
10080 min Winter	0.588	0.588	5.6	1169.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	52.943	0.0	901.1	64
120 min Winter	33.210	0.0	933.6	122
180 min Winter	24.857	0.0	914.7	182
240 min Winter	20.057	0.0	890.5	242
360 min Winter	14.608	0.0	852.9	360
480 min Winter	11.563	0.0	830.7	478
600 min Winter	9.605	0.0	815.1	596
720 min Winter	8.236	0.0	802.9	714
960 min Winter	6.438	0.0	784.1	946
1440 min Winter	4.528	0.0	756.5	1412
2160 min Winter	3.194	0.0	1636.2	2092
2880 min Winter	2.503	0.0	1580.5	2740
4320 min Winter	1.784	0.0	1477.8	3504
5760 min Winter	1.415	0.0	2658.9	4328
7200 min Winter	1.195	0.0	2795.7	5192
8640 min Winter	1.048	0.0	2914.8	6056
10080 min Winter	0.942	0.0	2967.7	6952

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 588788 217031 TL 88788 17031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.359

Time (mins) From:	To:	Area (ha)
0	4	2.359

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1724.0	0.700	2367.0	1.400	2660.0	2.100	2660.0
0.100	1812.0	0.800	2463.0	1.500	2660.0	2.200	2660.0
0.200	1902.0	0.900	2561.0	1.600	2660.0	2.300	2660.0
0.300	1992.0	1.000	2660.0	1.700	2660.0	2.400	2660.0
0.400	2084.0	1.100	2660.0	1.800	2660.0	2.500	2660.0
0.500	2177.0	1.200	2660.0	1.900	2660.0		
0.600	2271.0	1.300	2660.0	2.000	2660.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0108-5600-1200-5600
Design Head (m)	1.200
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.6
Flush-Flo™	0.354	5.6
Kick-Flo®	0.750	4.5
Mean Flow over Head Range	-	4.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.6	3.000	8.6	7.000	12.9
0.200	5.3	1.400	6.0	3.500	9.3	7.500	13.3
0.300	5.6	1.600	6.4	4.000	9.9	8.000	13.7
0.400	5.6	1.800	6.8	4.500	10.4	8.500	14.1
0.500	5.5	2.000	7.1	5.000	11.0	9.000	14.5
0.600	5.3	2.200	7.4	5.500	11.5	9.500	14.9
0.800	4.6	2.400	7.7	6.000	12.0		
1.000	5.1	2.600	8.0	6.500	12.4		

APPENDIX F – DETENTION BASIN EXCEEDANCE (1000YR EVENT)

Summary of Results for 1000 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.354	0.354	5.6	666.0	O K
30 min Summer	0.461	0.461	5.6	889.4	O K
60 min Summer	0.567	0.567	5.6	1122.6	O K
120 min Summer	0.714	0.714	5.6	1462.2	Flood Risk
180 min Summer	0.800	0.800	5.6	1670.8	Flood Risk
240 min Summer	0.857	0.857	5.6	1811.5	Flood Risk
360 min Summer	0.924	0.924	5.6	1982.1	Flood Risk
480 min Summer	0.961	0.961	5.6	2079.9	Flood Risk
600 min Summer	0.984	0.984	5.6	2139.3	Flood Risk
720 min Summer	0.998	0.998	5.6	2176.1	Flood Risk
960 min Summer	1.010	1.010	5.6	2209.3	FLOOD
1440 min Summer	1.006	1.006	5.6	2199.1	FLOOD
2160 min Summer	0.975	0.975	5.6	2116.6	Flood Risk
2880 min Summer	0.935	0.935	5.6	2012.2	Flood Risk
4320 min Summer	0.862	0.862	5.6	1825.2	Flood Risk
5760 min Summer	0.804	0.804	5.6	1680.4	Flood Risk
7200 min Summer	0.755	0.755	5.6	1559.2	Flood Risk
8640 min Summer	0.706	0.706	5.6	1443.1	Flood Risk
10080 min Summer	0.665	0.665	5.6	1345.0	O K
15 min Winter	0.393	0.393	5.6	746.2	O K
30 min Winter	0.510	0.510	5.6	996.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	151.466	0.0	458.1	19
30 min Summer	101.386	0.0	476.1	34
60 min Summer	64.293	0.0	929.2	64
120 min Summer	42.153	0.0	915.2	124
180 min Summer	32.298	0.0	864.9	184
240 min Summer	26.425	0.0	836.9	244
360 min Summer	19.518	0.0	814.0	364
480 min Summer	15.553	0.0	807.7	484
600 min Summer	12.957	0.0	807.6	602
720 min Summer	11.120	0.0	809.8	722
960 min Summer	8.679	27.4	810.9	962
1440 min Summer	6.054	17.1	799.2	1442
2160 min Summer	4.190	0.0	1613.7	2160
2880 min Summer	3.224	0.0	1562.9	2880
4320 min Summer	2.233	0.0	1458.4	3544
5760 min Summer	1.726	0.0	2876.7	4264
7200 min Summer	1.420	0.0	2929.7	5048
8640 min Summer	1.214	0.0	2955.0	5792
10080 min Summer	1.066	0.0	2889.2	6552
15 min Winter	151.466	0.0	469.3	19
30 min Winter	101.386	0.0	476.5	34

Summary of Results for 1000 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.627	0.627	5.6	1258.8	O K
120 min Winter	0.788	0.788	5.6	1641.3	Flood Risk
180 min Winter	0.882	0.882	5.6	1875.6	Flood Risk
240 min Winter	0.944	0.944	5.6	2034.3	Flood Risk
360 min Winter	1.017	1.017	5.6	2228.3	FLOOD
480 min Winter	1.060	1.060	5.6	2340.9	FLOOD
600 min Winter	1.086	1.086	5.6	2410.6	FLOOD
720 min Winter	1.103	1.103	5.6	2454.9	FLOOD
960 min Winter	1.119	1.119	5.6	2498.2	FLOOD
1440 min Winter	1.119	1.119	5.6	2499.0	FLOOD
2160 min Winter	1.091	1.091	5.6	2424.8	FLOOD
2880 min Winter	1.054	1.054	5.6	2325.6	FLOOD
4320 min Winter	0.974	0.974	5.6	2112.6	Flood Risk
5760 min Winter	0.905	0.905	5.6	1934.2	Flood Risk
7200 min Winter	0.847	0.847	5.6	1785.4	Flood Risk
8640 min Winter	0.790	0.790	5.6	1645.6	Flood Risk
10080 min Winter	0.730	0.730	5.6	1499.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	64.293	0.0	938.6	64
120 min Winter	42.153	0.0	876.8	122
180 min Winter	32.298	0.0	834.8	182
240 min Winter	26.425	0.0	820.1	242
360 min Winter	19.518	46.4	822.8	360
480 min Winter	15.553	159.0	837.0	478
600 min Winter	12.957	228.7	844.9	596
720 min Winter	11.120	272.9	848.7	714
960 min Winter	8.679	316.3	848.9	950
1440 min Winter	6.054	317.1	835.1	1414
2160 min Winter	4.190	242.8	1633.8	2100
2880 min Winter	3.224	143.7	1598.3	2768
4320 min Winter	2.233	0.0	1528.4	4016
5760 min Winter	1.726	0.0	3165.9	4496
7200 min Winter	1.420	0.0	3115.0	5408
8640 min Winter	1.214	0.0	2999.9	6392
10080 min Winter	1.066	0.0	2936.5	7256

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1000
FEH Rainfall Version	2013
Site Location	GB 588788 217031 TL 88788 17031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.359

Time (mins) From:	To:	Area (ha)
0	4	2.359

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1724.0	0.700	2367.0	1.400	2660.0	2.100	2660.0
0.100	1812.0	0.800	2463.0	1.500	2660.0	2.200	2660.0
0.200	1902.0	0.900	2561.0	1.600	2660.0	2.300	2660.0
0.300	1992.0	1.000	2660.0	1.700	2660.0	2.400	2660.0
0.400	2084.0	1.100	2660.0	1.800	2660.0	2.500	2660.0
0.500	2177.0	1.200	2660.0	1.900	2660.0		
0.600	2271.0	1.300	2660.0	2.000	2660.0		

Hydro-Brake® Optimum Outflow Control

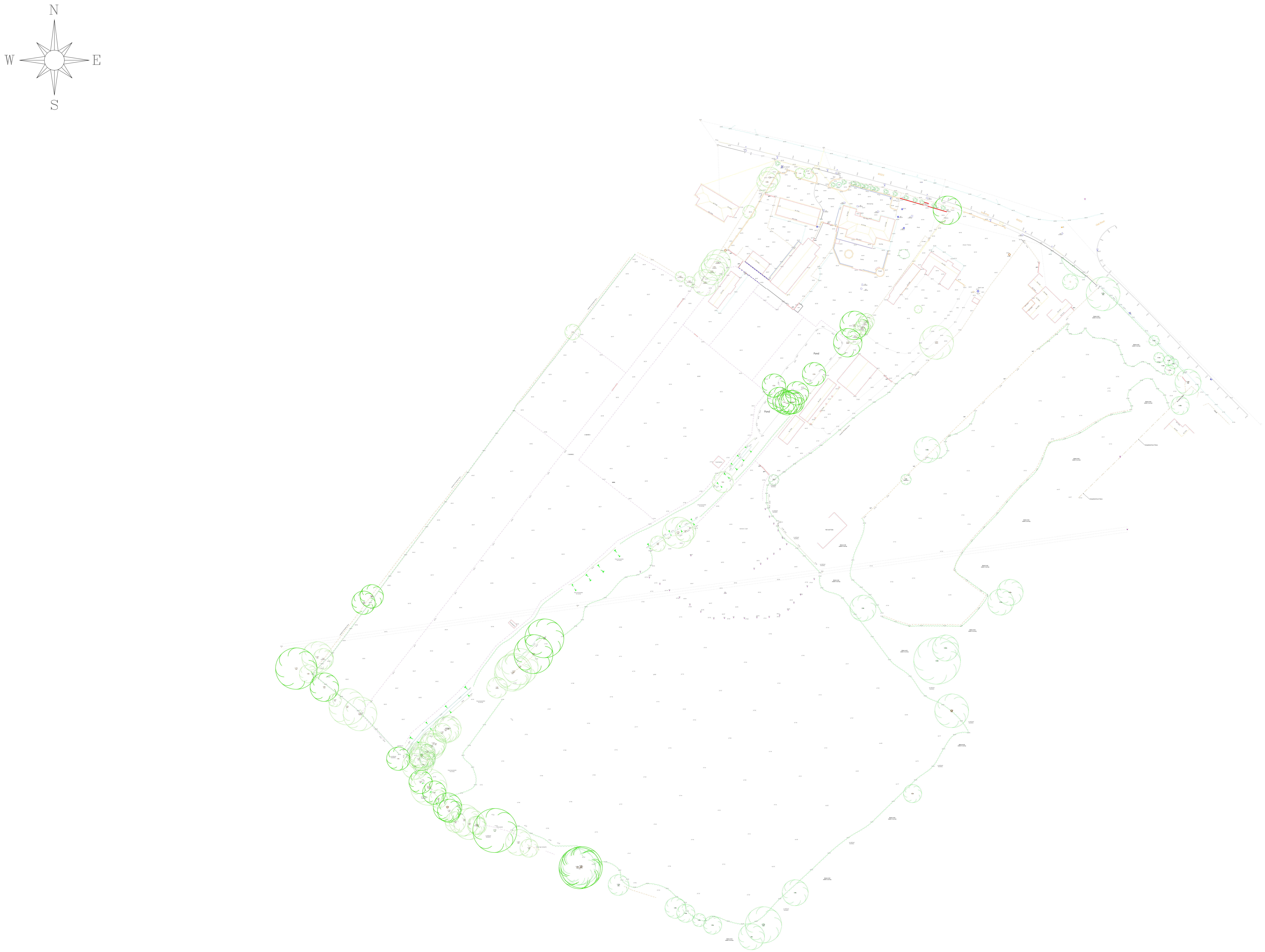
Unit Reference	MD-SHE-0108-5600-1200-5600
Design Head (m)	1.200
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.6
Flush-Flo™	0.354	5.6
Kick-Flo®	0.750	4.5
Mean Flow over Head Range	-	4.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.6	3.000	8.6	7.000	12.9
0.200	5.3	1.400	6.0	3.500	9.3	7.500	13.3
0.300	5.6	1.600	6.4	4.000	9.9	8.000	13.7
0.400	5.6	1.800	6.8	4.500	10.4	8.500	14.1
0.500	5.5	2.000	7.1	5.000	11.0	9.000	14.5
0.600	5.3	2.200	7.4	5.500	11.5	9.500	14.9
0.800	4.6	2.400	7.7	6.000	12.0		
1.000	5.1	2.600	8.0	6.500	12.4		

DRAWINGS



CONTROL STATION COORDINATES

Station	Easting	Northing	Level
GPS1	588708.597	217153.763	69.398
GPS2	588727.975	217148.798	69.213
GPS3	588750.012	217143.078	69.106
GPS4	588790.853	217129.436	68.808
GPS5	588832.090	217118.010	68.409

All levels related to Ordnance Survey (Leica Smartnet network)

Revision	Description	Date

L E G E N D

Survey control station — 5

Banking

Gate (double)

Tree Spread and Girth shown to scale

Abbreviations

Bollard	BD	Post	P
Borehole	BH	Pipe	PE
British Telecom Box	BTB	Road Sign	RS
BT Inspection Cover	BT	Rodding Eye	RE
Concrete Paving Slabs	CPS	Service Marker	MK
Cable Television Cover	CTV	Sign Post	SP
Electricity Cable Pit	EC	Sluice Valve	SV
Electricity Pole	EP	Stop Tap	ST
Earth Rod	ER	Stop Cock	SC
Fire Hydrant	FH	Telegraph Pole	TP
Flag Staff	FS	Telephone Call Box	TCB
Gas Valve	GV	Traffic Light	TL
Gate Post	GP	Underside	U\S
Gully	GY	Vent Pipe	VP
Inspection Cover	IC	Water Meter	WM
Kerb Outlet	KO	Eaves Tile Level	ETL
Lamp Post	LP	Ridge Level	RL
Manhole	MH	Roof Level	RFL
Marker Post	MK	Soffit Level	SFL
Parking Meter	PM	Stop Valve	SV
		Threshold Level	THL
Retaining Wall	RTW	Cover Level	CL
Barbed Wire Fence	BWF	Invert Level	IL
Close Boarded Fence	CBF	No Visible Connection	NVC
Chainlink Fence	CLF	Unable to Lift	UTL
Panel Fence	PF		
Post and Chain Fence	PCF		
Post and Rail Fence	PRF		
Post and Wire Fence	PWF		

JTaylor Site Surveying Limited

20 Heycroft Way
Nayland,
Colchester
CO6 4LN

Tel 07881631165

Email : jtaylorsiteeng@aol.co.uk

CLIENT:

Marden Homes Ltd

PROJECT:

Towers End,
Kelvedon Rd,
Tipree

TITLE:

Topographical Survey

SURVEYOR: JT/RC

DRAWN BY: JT/RC — SHEET SIZE: A0

DATE: Nov 17 — SCALE: 1:500 @A0

DRAWING No: 0 — JOB No:

BBS□BB□EGL□SU□00

Revision | Ori□inator | Initials | Detail | Type | □umber

□

Scale 1:1000 — 0 20 40 60 80 100

□otes□

AV	Air Valve	FH	Fire Hydrant	SP	Si□n Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Pavin□
BOL	Bollard	Hed□e	Hed□e	TB	Top Bank
BI□	Bin	IC	Inspection Cover	TBO□	Telephone Bo□
BS	Bus Stop	IL	Invert Level	TL	Traffic Li□ht
Bushes	Bush	KO	Kerb Outlet	TOK	Top Of Kerb
BT	BT Bo□	LP	Lamp Post	TP	Tele□raph Pole
CAB	Cabinet	MH	Manhole	TRK	Track
CH□L	Channel	MP	Marker Post	TS	Traffic Si□n MH
CL	Centreline	□B	□ame Board	VE□T	Vent
CO□C	Concrete	P□W	Partition Wall	W	Water Cover
COL	Column	PB	Post Bo□	WL	White Line
DB	Ditch Bottom	PM	Parkin□ Meter	WO	Wash Out
DCH□L	Draina□e Channel	PO	Post	YL	Yellow Line
Door	Door	RE	Roddin□ Eye		
EEB	Electric MH Cover	Rd□e	Rd□e Level		
EP	Electric Pole	RP	Reflector Post		
ER	Earth Rod	RS	Road Si□n		
ET	EP□Transformer	SETTS	Granite Setts		
Feeder	Feeder Pillar	SF	Safety Fence		

FCB	Close Boarded		Control Station
FCL	Chain Link		Column
FHD	Hoardin□	□.□□	Floor to Ceilin□ Hei□ht
FHR	Heras Fence	□.□□ F/C	Floor to False Ceilin□ Hei□ht
FPL	Pallisade		
FPR	Post □ Rail		
FPW	Post □ Wire		
RAIL	Railin□s		

Features

Fences — FCB 1.6h

Walls — Wall 1.2h

Hed□es — Hed□e 1.3h — Avera□e root line shown.

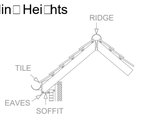
Overhead Line — OHL — Indicative position of cables.

Services

Foul Sewers — 0.225Ø — FW MH

Storm Sewers — 0.375Ø — SW MH — Pipe position and ali□nment is indicative only.

Buildin□ Hei□hts



SURVEY CARRIED OUT USI□G TRIMBLE S6 TOTAL STATIO□ □ TRIMBLE R10 GPS.

THE SURVEY HAS BEE□ ACCURATELY POSITIO□ED O□ THE ORD□A□CE SURVEY □ATIO□AL GRID SYSTEM USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □DST□15 OSGM15□.

LOCAL SCALE FACTOR HAS BEE□ REMOVED TO TRA□SFORM THE SURVEY TO A FLAT EARTH GRID □SCALE FACTOR 1.00000□.

ALL LEVELS RELATE TO ORD□A□CE SURVEY DATUM □EWLY□□□ VERTICAL CO□TROL HAS BEE□ ESTABLISHED USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □DST□15 OSGM15□.

ALL DIME□SIO□S ARE I□ METRES U□LESS OTHERWISE STATED.

A□Y CRITICAL DIME□SIO□S A□D MEASUREME□TS SHOULD BE BASED O□ THE ORIGI□AL DIGITAL DATA A□D CO□FIRMED WITH BB SURVEYS LTD.
A□Y ERRORS SHOULD BE □OTIFIED TO BB SURVEYS LTD.

□O ATTEMPT HAS BEE□ MADE TO E□TER A□Y CO□FI□ED SPACES O□ THIS SITE. WE HAVE MEASURED I□VERT DEPTHS□ESTIMATED PIPE SI□ES A□D SHOW□ THE DIRECTIO□ OF FLOW O□LY WHERE DRAI□AGE RU□S ARE ACTIVE AT THE TIME OF SURVEY. I□SPECTIO□ COVERS WHICH WE WERE U□ABLE TO LIFT BY MA□UAL METHODS ARE DE□OTED AS MH □TL□ WE DID □OT □UOTE FOR THE USE OF HYDRAULIC LIFT□G E□UIPME□T.

DRAI□AGE RU□S BETWEE□ I□SPECTIO□ COVERS HAVE □OT BEE□ I□VESTIGATED. A□Y SHOW□ ARE ESTIMATED A□D □OT CO□FIRMED. ALL DRAI□AGE RU□S SHOULD BE PROVED BY DYE TRACI□G A□D IF □ECESSARY BY RADIO DETECTIO□ METHODS PRIOR TO A□Y DESIG□ WORK. ALL PIPE SI□ES A□D CO□□ECTIO□S SHOULD ALSO BE CO□FIRMED WITH YOUR LOCAL DRAI□AGE AUTHORITY PRIOR TO A□Y DESIG□ WORK.

THERE MAY BE I□SPECTIO□ COVERS O□ SITE WHICH WERE □OT VISIBLE AT THE TIME OF SURVEY. THEY MAY HAVE BEE□ BURIED OR COVERED BY VEGETATIO□. YOU SHOULD CO□SULT YOUR LOCAL DRAI□AGE AUTHORITY OR COMMISSIO□ A CCTV DRAI□AGE SURVEY TO E□SURE THAT YOU LOCATE A□Y MISSI□G COVERS OR DRAI□AGE RU□S.

REV	Date	Created By	Comments
□	06.09.20	BB	First Issue

Scale at A1: 1□1000

Pro□ect □umber: 2219□1968

Drawin□ Status

- [X] E□istin□ Topo□raphic Survey
- [ ] As Built Survey
- [ ] For Information

BB SURVEYS LTD
1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client: Marden Homes Ltd

Pro□ect: Land off Kelvedon Road Tiptree

Title: E□istin□ Ground Level Survey Overview

BBS□BB□EGL□SU□00 — Ori□inator | Initials | Detail | Type | □umber — Revision □

Sheet Si□e A1 841 □594

Scale 1:250 — 0, 5, 10, 15, 20, 25

□otes□

AV	Air Valve	FH	Fire Hydrant	SP	Si□n Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Pavin□
BOL	Bollard	Hed□e	Hed□e	TB	Top Bank
BI□	Bin	IC	Inspection Cover	TBO□	Telephone Bo□
BS	Bus Stop	IL	Invert Level	TL	Traffic Li□ht
Bushes	Bush	KO	Kerb Outlet	TOK	Top Of Kerb
BT	BT Bo□	LP	Lamp Post	TP	Tele□raph Pole
CAB	Cabinet	MH	Manhole	TRK	Track
CH□L	Channel	MP	Marker Post	TS	Traffic Si□n MH
CL	Centreline	□B	□ame Board	VE□T	Vent
CO□C	Concrete	P□W	Partition Wall	W	Water Cover
COL	Column	PB	Post Bo□	WL	White Line
DB	Ditch Bottom	PM	Parkin□ Meter	WO	Wash Out
DCH□L	Draina□e Channel	PO	Post	YL	Yellow Line
Door	Door	RE	Roddin□ Eye		
EEB	Electric MH Cover	Rid□e	Rid□e Level		
EP	Electric Pole	RP	Reflector Post		
ER	Earth Rod	RS	Road Si□n		
ET	EP□Transformer	SETTS	Granite Setts		
Feeder	Feeder Pillar	SF	Safety Fence		

FCB	Close Boarded
FCL	Chain Link
FHD	Hoardin□
FHR	Heras Fence
FPL	Pallisade
FPR	Post □ Rail
FPW	Post □ Wire
RAIL	Railin□s

Control Station
Column
Floor to Ceilin□ Hei□ht
Floor to False Ceilin□ Hei□ht

Features

Fences — FCB 1.6h
Walls — Wall 1.2h
Hed□es — Hed□e 1.3h — Avera□e root line shown.
Overhead Line — OHL — Indicative position of cables.

Services

Foul Sewers — 0.225Ø — FW MH
Storm Sewers — 0.375Ø — SW MH
Pipe position and ali□nment is indicative only.

Buildin□ Hei□hts

RIDGE
TILE
EAVES
SOFFIT

SURVEY CARRIED OUT USI□G TRIMBLE S6 TOTAL STATIO□ □ TRIMBLE R10 GPS.

THE SURVEY HAS BEE□ ACCURATELY POSITIO□ED O□ THE ORD□A□CE SURVEY □ATIO□AL GRID SYSTEM USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OST□15□OSGM15□

LOCAL SCALE FACTOR HAS BEE□ REMOVED TO TRA□SFORM THE SURVEY TO A FLAT EARTH GRID □SCALE FACTOR 1.00000□

ALL LEVELS RELATE TO ORD□A□CE SURVEY DATUM □□EWLY□□ VERTICAL CO□TROL HAS BEE□ ESTABLISHED USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OST□15□OSGM15□

ALL DIME□SIO□S ARE I□ METRES U□LESS OTHERWISE STATED.

A□Y CRITICAL DIME□SIO□S A□D MEASUREME□TS SHOULD BE BASED O□ THE ORIGI□AL DIGITAL DATA A□D CO□FIRMED WITH BB SURVEYS LTD.
A□Y ERRORS SHOULD BE □OTIFIED TO BB SURVEYS LTD.

□O ATTEMPT HAS BEE□ MADE TO E□TER A□Y CO□FI□ED SPACES O□ THIS SITE. WE HAVE MEASURED I□VERT DEPTHS□ESTIMATED PIPE SI□ES A□D SHOW□ THE DIRECTIO□ OF FLOW O□LY WHERE DRAI□ RU□S ARE ACTIVE AT THE TIME OF SURVEY. I□SPECTIO□ COVERS WHICH WE WERE U□ABLE TO LIFT BY MA□UAL METHODS ARE DE□OTED AS MH □UTL□ WE DID □OT □UOTE FOR THE USE OF HYDRAULIC LIFTI□G E□UIPME□T.

DRAI□AGE RU□S BETWEE□ I□SPECTIO□ COVERS HAVE □OT BEE□ I□VESTIGATED. A□Y SHOW□ ARE ESTIMATED A□D □OT CO□FIRMED. ALL DRAI□AGE RU□S SHOULD BE PROVED BY DYE TRACI□G A□D IF □ECESSARY BY RADIO DETECTIO□ METHODS PRIOR TO A□Y DESIG□ WORK. ALL PIPE SI□ES A□D CO□□ECTIO□S SHOULD ALSO BE CO□FIRMED WITH YOUR LOCAL DRAI□AGE AUTHORITY PRIOR TO A□Y DESIG□ WORK.

THERE MAY BE I□SPECTIO□ COVERS O□ SITE WHICH WERE □OT VISIBLE AT THE TIME OF SURVEY. THEY MAY HAVE BEE□ BURIED OR COVERED BY VEGETATIO□. YOU SHOULD CO□SULT YOUR LOCAL DRAI□AGE AUTHORITY OR COMMISSIO□ A CCTV DRAI□AGE SURVEY TO E□SURE THAT YOU LOCATE A□Y MISSI□G COVERS OR DRAI□AGE RU□S.

REV	Date	Created By	Comments
□	06.09.20	BB	First Issue

Scale at A1	Pro□ect □umber
1□250	2219□1968

Drawin□ Status

- [X] E□istin□ Topo□raphic Survey
- [ ] As Built Survey
- [ ] For Information

BBS BB SURVEYS LTD
1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client

Marden Homes Ltd

Pro□ect

Land off Kelvedon Road
Tiptree

Title

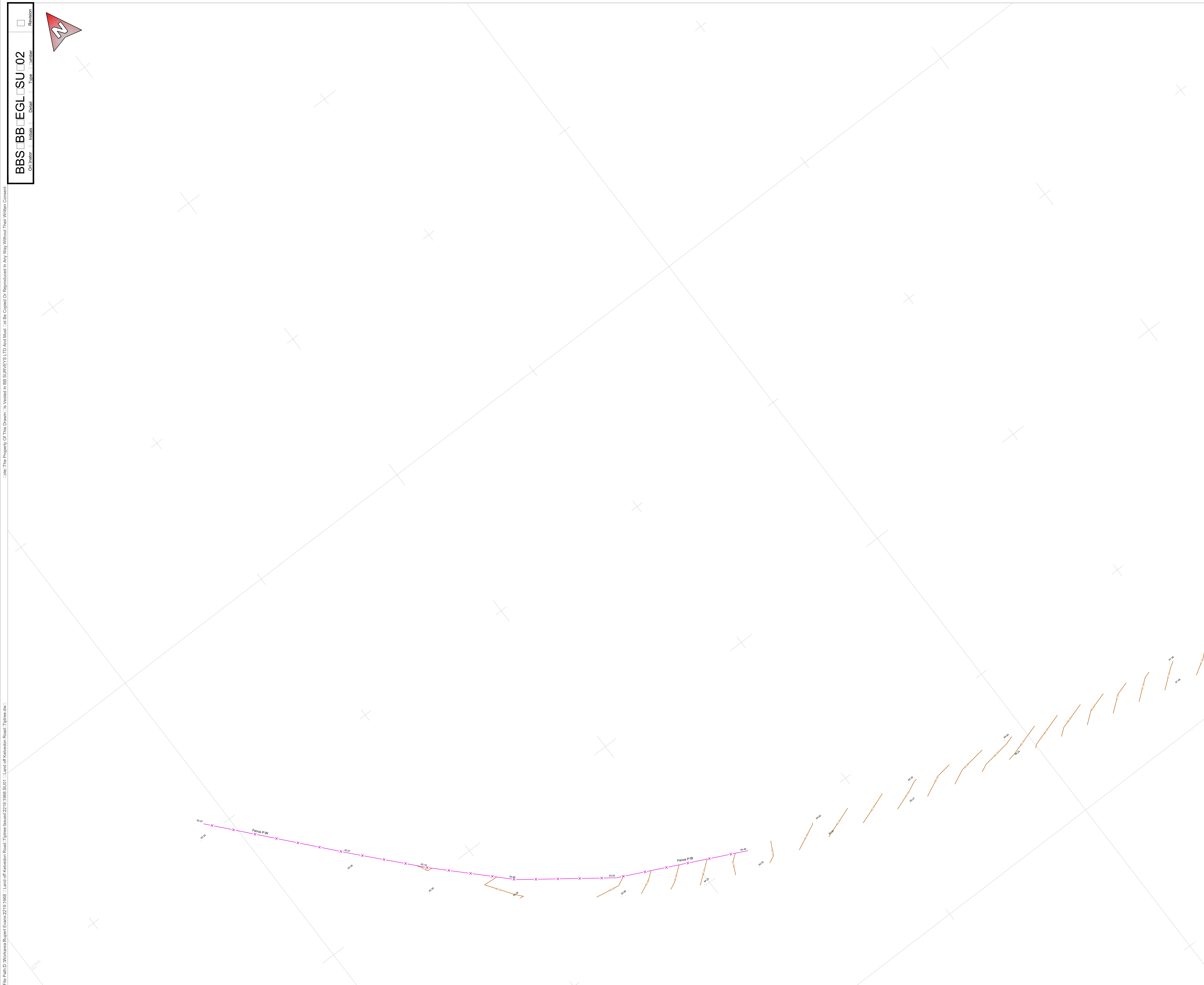
E□istin□ Ground Level Survey
Sheet 1

BBS□BB□EGL□SU□01

Ori□inator | Initials | Detail | Type | □umber | Revision □

BBS□BB□EGL□SU□01 — Ori□inator | Initials | Detail | Type | □umber | Revision □

BBS□BB□EGL□SU□02
Ori□inator | Initials | Detail | Type | □umber | Revision □



Scale 1:250 — 0, 5, 10, 15, 20, 25

□otes□

AV	Air Valve	FH	Fire Hydrant	SP	Si□n Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Pavin□
BOL	Bollard	Hed□e	Hed□e	TB	Top Bank
BI□	Bin	IC	Inspection Cover	TBO□	Telephone Bo□
BS	Bus Stop	IL	Invert Level	TL	Traffic Li□ht
Bushes	Bush	KO	Kerb Outlet	TOK	Top Of Kerb
BT	BT Bo□	LP	Lamp Post	TP	Tele□raph Pole
CAB	Cabinet	MH	Manhole	TRK	Track
CH□L	Channel	MP	Marker Post	TS	Traffic Si□n MH
CL	Centreline	□B	□ame Board	VE□T	Vent
CO□C	Concrete	P□W	Partition Wall	W	Water Cover
COL	Column	PB	Post Bo□	WL	White Line
DB	Ditch Bottom	PM	Parkin□ Meter	WO	Wash Out
DCH□L	Draina□e Channel	PO	Post	YL	Yellow Line
Door	Door	RE	Roddin□ Eye		
EEB	Electric MH Cover	Rid□e	Rid□e Level		
EP	Electric Pole	RP	Reflector Post		
ER	Earth Rod	RS	Road Si□n		
ET	EP□Transformer	SETTS	Granite Setts		
Feeder	Feeder Pillar	SF	Safety Fence		

FCB	Close Boarded
FCL	Chain Link
FHD	Hoardin□
FHR	Heras Fence
FPL	Pallisade
FPR	Post □ Rail
FPW	Post □ Wire
RAIL	Railin□s

Control Station
Column
□.□□ Floor to Ceilin□ Hei□ht
□.□□ F□C Floor to False Ceilin□ Hei□ht

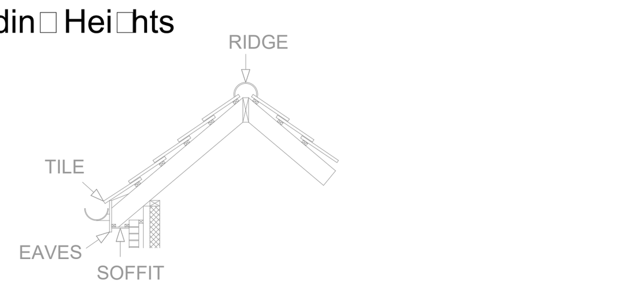
Features

Fences — FCB 1.6h
Walls — Wall 1.2h
Hed□es — Hed□e 1.3h — Avera□e root line shown.
Overhead Line — OHL — Indicative position of cables.

Services

Foul Sewers — 0.225Ø FW MH
Storm Sewers — 0.375Ø SW MH
Pipe position and ali□nment is indicative only.

Buildin□ Hei□hts



SURVEY CARRIED OUT USI□G TRIMBLE S6 TOTAL STATIO□ □ TRIMBLE R10 GPS.

THE SURVEY HAS BEE□ ACCURATELY POSITIO□ED O□ THE ORD□A□CE SURVEY □ATIO□AL GRID SYSTEM USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OST□15□OSGM15□

LOCAL SCALE FACTOR HAS BEE□ REMOVED TO TRA□SFORM THE SURVEY TO A FLAT EARTH GRID □SCALE FACTOR 1.00000□

ALL LEVELS RELATE TO ORD□A□CE SURVEY DATUM □□EWLY□□ VERTICAL CO□TROL HAS BEE□ ESTABLISHED USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OST□15□OSGM15□

ALL DIME□SIO□S ARE I□ METRES U□LESS OTHERWISE STATED.

A□Y CRITICAL DIME□SIO□S A□D MEASUREME□TS SHOULD BE BASED O□ THE ORIGI□AL DIGITAL DATA A□D CO□FIRMED WITH BB SURVEYS LTD.
A□Y ERRORS SHOULD BE □OTIFIED TO BB SURVEYS LTD.

□O ATTEMPT HAS BEE□ MADE TO E□TER A□Y CO□FI□ED SPACES O□ THIS SITE. WE HAVE MEASURED I□VERT DEPTHS□ESTIMATED PIPE SI□ES A□D SHOW□ THE DIRECTIO□ OF FLOW O□LY WHERE DRAI□ RU□S ARE ACTIVE AT THE TIME OF SURVEY. I□SPECTIO□ COVERS WHICH WE WERE U□ABLE TO LIFT BY MA□UAL METHODS ARE DE□OTED AS MH □UTL□ WE DID □OT □UOTE FOR THE USE OF HYDRAULIC LIFTI□G E□UIPME□T.

DRAI□AGE RU□S BETWEE□ I□SPECTIO□ COVERS HAVE □OT BEE□ I□VESTIGATED. A□Y SHOW□ ARE ESTIMATED A□D □OT CO□FIRMED. ALL DRAI□AGE RU□S SHOULD BE PROVED BY DYE TRACI□G A□D IF □ECESSARY BY RADIO DETECTIO□ METHODS PRIOR TO A□Y DESIG□ WORK. ALL PIPE SI□ES A□D CO□□ECTIO□S SHOULD ALSO BE CO□FIRMED WITH YOUR LOCAL DRAI□AGE AUTHORITY PRIOR TO A□Y DESIG□ WORK.

THERE MAY BE I□SPECTIO□ COVERS O□ SITE WHICH WERE □OT VISIBLE AT THE TIME OF SURVEY. THEY MAY HAVE BEE□ BURIED OR COVERED BY VEGETATIO□. YOU SHOULD CO□SULT YOUR LOCAL DRAI□AGE AUTHORITY OR COMMISSIO□ A CCTV DRAI□AGE SURVEY TO E□SURE THAT YOU LOCATE A□Y MISSI□G COVERS OR DRAI□AGE RU□S.

REV	Date	Created By	Comments
□	06.09.20	BB	First Issue

Scale at A1	Pro□ect □umber
1□250	2219□1968

Drawin□ Status
- [X] E□istin□ Topo□raphic Survey
- [ ] As Built Survey
- [ ] For Information

1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client
Marden Homes Ltd

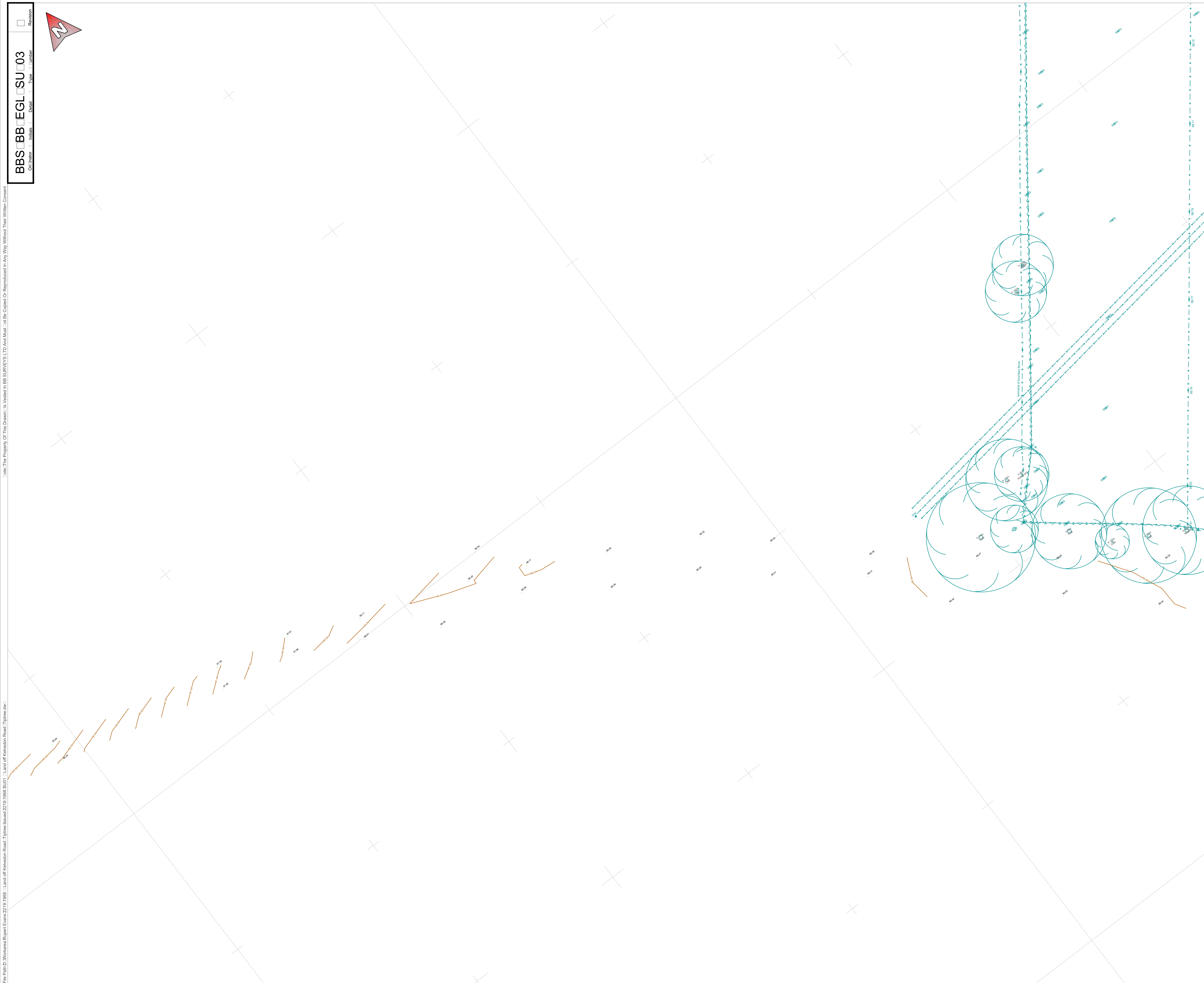
Pro□ect
Land off Kelvedon Road
Tiptree

Title
E□istin□ Ground Level Survey Sheet 2

BBS□BB□EGL□SU□02
Ori□inator | Initials | Detail | Type | □umber | Revision □

File Path□D□Workarea□Rupert Evans□2219□1968 □ Land off Kelvedon Road□Tiptree□Issued□2219□1968□SU01 □ Land off Kelvedon Road□Tiptree.dw□
Plot Date□07 September 2020 Plot Style□BB Surveys Std.ctb Saved By□Barry on 07 September 2020
Plot Scale Check 100mm

BBS-BB-EGL-SU-03
Originator | Initials | Detail | Type | Number | Revision



Scale 1:250
0 5 10 15 20 25

Notes:

AV	Air Valve	FH	Fire Hydrant	SP	Sign Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Paving
BOL	Bollard	Hedge	Hedge	TB	Top Bank
BIN	Bin	IC	Inspection Cover	TBOX	Telephone Box
BS	Bus Stop	IL	Invert Level	TL	Traffic Light
Bushes	Bush	KO	Kerb Outlet	TOK	Top Of Kerb
BT	BT Box	LP	Lamp Post	TP	Telegraph Pole
CAB	Cabinet	MH	Manhole	TRK	Track
CHNL	Channel	MP	Marker Post	TS	Traffic Sign MH
CL	Centreline	NB	Name Board	VENT	Vent
CONC	Concrete	P.W	Partition Wall	W	Water Cover
COL	Column	PB	Post Box	WL	White Line
DB	Ditch Bottom	PM	Parking Meter	WO	Wash Out
DCHNL	Drainage Channel	PO	Post	YL	Yellow Line
Door	Door	RE	Rodding Eye		
EEB	Electric MH Cover	Ridge	Ridge Level		
EP	Electric Pole	RP	Reflector Post		
ER	Earth Rod	RS	Road Sign		
ET	EP Transformer	SETTS	Granite Setts		
Feeder	Feeder Pillar	SF	Safety Fence		

FCB	Close Boarded
FCL	Chain Link
FHD	Hoarding
FHR	Heras Fence
FPL	Pallisade
FPR	Post & Rail
FPW	Post & Wire
RAIL	Railings

Control Station
Column
Floor to Ceiling Height
Floor to False Ceiling Height

Features

Fences — FCB 1.6h
Walls — Wall 1.2h
Hedges — Hedge 1.3h — Average root line shown.
Overhead Line — OHL — Indicative position of cables.

Services

Foul Sewers — 0.225Ø — FW MH
Storm Sewers — 0.375Ø — SW MH
Pipe position and alignment is indicative only.

Building Heights

RIDGE
TILE
EAVES
SOFFIT

SURVEY CARRIED OUT USING TRIMBLE S6 TOTAL STATION & TRIMBLE R10 GPS.

THE SURVEY HAS BEEN ACCURATELY POSITIONED ON THE ORDNANCE SURVEY NATIONAL GRID SYSTEM USING GPS OBSERVATIONS TO THE OS ACTIVE NETWORK AND AND THE LATEST ORDNANCE SURVEY TRANSFORMATION (OSTN15/OSGM15).

LOCAL SCALE FACTOR HAS BEEN REMOVED TO TRANSFORM THE SURVEY TO A FLAT EARTH GRID (SCALE FACTOR 1.00000).

ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM (NEWLYN). VERTICAL CONTROL HAS BEEN ESTABLISHED USING GPS OBSERVATIONS TO THE OS ACTIVE NETWORK AND AND THE LATEST ORDNANCE SURVEY TRANSFORMATION (OSTN15/OSGM15).

ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.

ANY CRITICAL DIMENSIONS AND MEASUREMENTS SHOULD BE BASED ON THE ORIGINAL DIGITAL DATA AND CONFIRMED WITH BB SURVEYS LTD.
ANY ERRORS SHOULD BE NOTIFIED TO BB SURVEYS LTD.

NO ATTEMPT HAS BEEN MADE TO ENTER ANY CONFINED SPACES ON THIS SITE. WE HAVE MEASURED INVERT DEPTHS, ESTIMATED PIPE SIZES AND SHOWN THE DIRECTION OF FLOW ONLY WHERE DRAIN RUNS ARE ACTIVE AT THE TIME OF SURVEY. INSPECTION COVERS WHICH WE WERE UNABLE TO LIFT BY MANUAL METHODS ARE DENOTED AS MH (UTL). WE DID NOT QUOTE FOR THE USE OF HYDRAULIC LIFTING EQUIPMENT.

DRAINAGE RUNS BETWEEN INSPECTION COVERS HAVE NOT BEEN INVESTIGATED. ANY SHOWN ARE ESTIMATED AND NOT CONFIRMED. ALL DRAINAGE RUNS SHOULD BE PROVED BY DYE TRACING AND IF NECESSARY BY RADIO DETECTION METHODS PRIOR TO ANY DESIGN WORK. ALL PIPE SIZES AND CONNECTIONS SHOULD ALSO BE CONFIRMED WITH YOUR LOCAL DRAINAGE AUTHORITY PRIOR TO ANY DESIGN WORK.

THERE MAY BE INSPECTION COVERS ON SITE WHICH WERE NOT VISIBLE AT THE TIME OF SURVEY. THEY MAY HAVE BEEN BURIED OR COVERED BY VEGETATION. YOU SHOULD CONSULT YOUR LOCAL DRAINAGE AUTHORITY OR COMMISSION A CCTV DRAINAGE SURVEY TO ENSURE THAT YOU LOCATE ANY MISSING COVERS OR DRAINAGE RUNS.

REV	Date	Created By	Comments
-	06.09.20	BB	First Issue

Scale at A1	Project Number
1:250	2219-1968

Drawing Status
- [X] Existing Topographic Survey
- [ ] As Built Survey
- [ ] For Information

BBS BB SURVEYS LTD
1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client
Marden Homes Ltd

Project
Land off Kelvedon Road
Tiptree

Title
Existing Ground Level Survey
Sheet 3

BBS-BB-EGL-SU-03
Originator | Initials | Detail | Type | Number | Revision

Sheet Size A1 841 x 594

BBS□BB□EGL□SU□04

Revision	Ori□inator	Initials	Detail	Type	□umber
□					

File Path D:\Workarea\Rupert Evans\2219.1968 □ Land off Kelvedon Road □Tiptree Issued\2219.1968.SU01 □ Land off Kelvedon Road □Tiptree.dwg

Scale 1:250 — 0 5 10 15 20 25

□otes□

AV	Air Valve	FH	Fire Hydrant	SP	Si□n Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Pavin□
BOL	Bollard	Hed□e	Inspection Cover	TB	Top Bank
BI□	Bin	IC	Invert Level	TBO□	Telephone Bo□
BS	Bus Stop	IL	Kerb Outlet	TL	Traffic Li□ht
Bushes	Bush	KO	Lamp Post	TOK	Top Of Kerb
BT	BT Bo□	LP	Manhole	TP	Tele□raph Pole
CAB	Cabinet	MH	Marker Post	TRK	Track
CH□L	Channel	MP	□ame Board	TS	Traffic Si□n MH
CL	Centreline	□B	Partition Wall	VE□T	Vent
CO□C	Concrete	P□W	Post Bo□	W	Water Cover
COL	Column	PB	Parkin□ Meter	WL	White Line
DB	Ditch Bottom	PM	Post	WO	Wash Out
DCH□L	Draina□e Channel	PO	Roddin□ Eye	YL	Yellow Line
Door	Door	RE	Rod□e Level		
EEB	Electric MH Cover	Rod□e	Reflector Post		
EP	Electric Pole	RP	Road Si□n		
ER	Earth Rod	RS	Granite Setts		
ET	EP□Transformer	SETTS	Safety Fence		
Feeder	Feeder Pillar	SF			

FCB	Close Boarded		Control Station
FCL	Chain Link		Column
FHD	Hoardin□	0.00	Floor to Ceilin□ Hei□ht
FHR	Heras Fence	0.00 FC	Floor to False Ceilin□ Hei□ht
FPL	Pallisade		
FPR	Post □ Rail		
FPW	Post □ Wire		
RAIL	Railin□s		

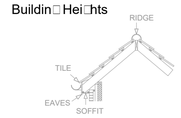
Features

Fences	FCB 1.6h	
Walls	Wall 1.2h	
Hed□es	Hed□e 1.3h	Avera□e root line shown.
Overhead Line	OHL	Indicative position of cables.

Services

Foul Sewers	0.225Ø FW MH	Pipe position and ali□nment is indicative only.
Storm Sewers	0.375Ø SW MH	

Buildin□ Hei□hts



SURVEY CARRIED OUT USI□G TRIMBLE S6 TOTAL STATIO□ □ TRIMBLE R10 GPS.

THE SURVEY HAS BEE□ ACCURATELY POSITIO□ED O□ THE ORD□A□CE SURVEY □ATIO□AL GRID SYSTEM USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OSTˆ15 OSGM15□.

LOCAL SCALE FACTOR HAS BEE□ REMOVED TO TRA□SFORM THE SURVEY TO A FLAT EARTH GRID □SCALE FACTOR 1.00000□.

ALL LEVELS RELATE TO ORD□A□CE SURVEY DATUM □EWLY□□□ VERTICAL CO□TROL HAS BEE□ ESTABLISHED USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □OSTˆ15 OSGM15□.

ALL DIME□SIO□S ARE I□ METRES U□LESS OTHERWISE STATED.

A□Y CRITICAL DIME□SIO□S A□D MEASUREME□TS SHOULD BE BASED O□ THE ORIGI□AL DIGITAL DATA A□D CO□FIRMED WITH BB SURVEYS LTD.
A□Y ERRORS SHOULD BE □OTIFIED TO BB SURVEYS LTD.

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DRAI□AGE RU□S BETWEE□ □ I□SPECTIO□ COVERS HAVE □OT BEE□ I□VESTIGATED. A□Y SHOW□ ARE ESTIMATED A□D □OT CO□FIRMED. ALL DRAI□AGE RU□S SHOULD BE PROVED BY DYE TRACI□G A□D IF □ECESSARY BY RADIO DETECTIO□ METHODS PRIOR TO A□Y DESIG□ WORK. ALL PIPE SI□ES A□D CO□□ ECTIO□S SHOULD ALSO BE CO□FIRMED WITH YOUR LOCAL DRAI□AGE AUTHORITY PRIOR TO A□Y DESIG□ WORK.

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REV	Date	Created By	Comments
□	06.09.20	BB	First Issue

Scale at A1: 1□250

Pro□ect □umber: 2219□1968

Drawin□ Status

- [x] E□istin□ Topo□raphic Survey
- [ ] As Built Survey
- [ ] For Information

1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client

Marden Homes Ltd

Pro□ect

Land off Kelvedon Road
Tiptree

Title

E□istin□ Ground Level Survey
Sheet 4

BBS□BB□EGL□SU□04

Ori□inator	Initials	Detail	Type	□umber	Revision
					□

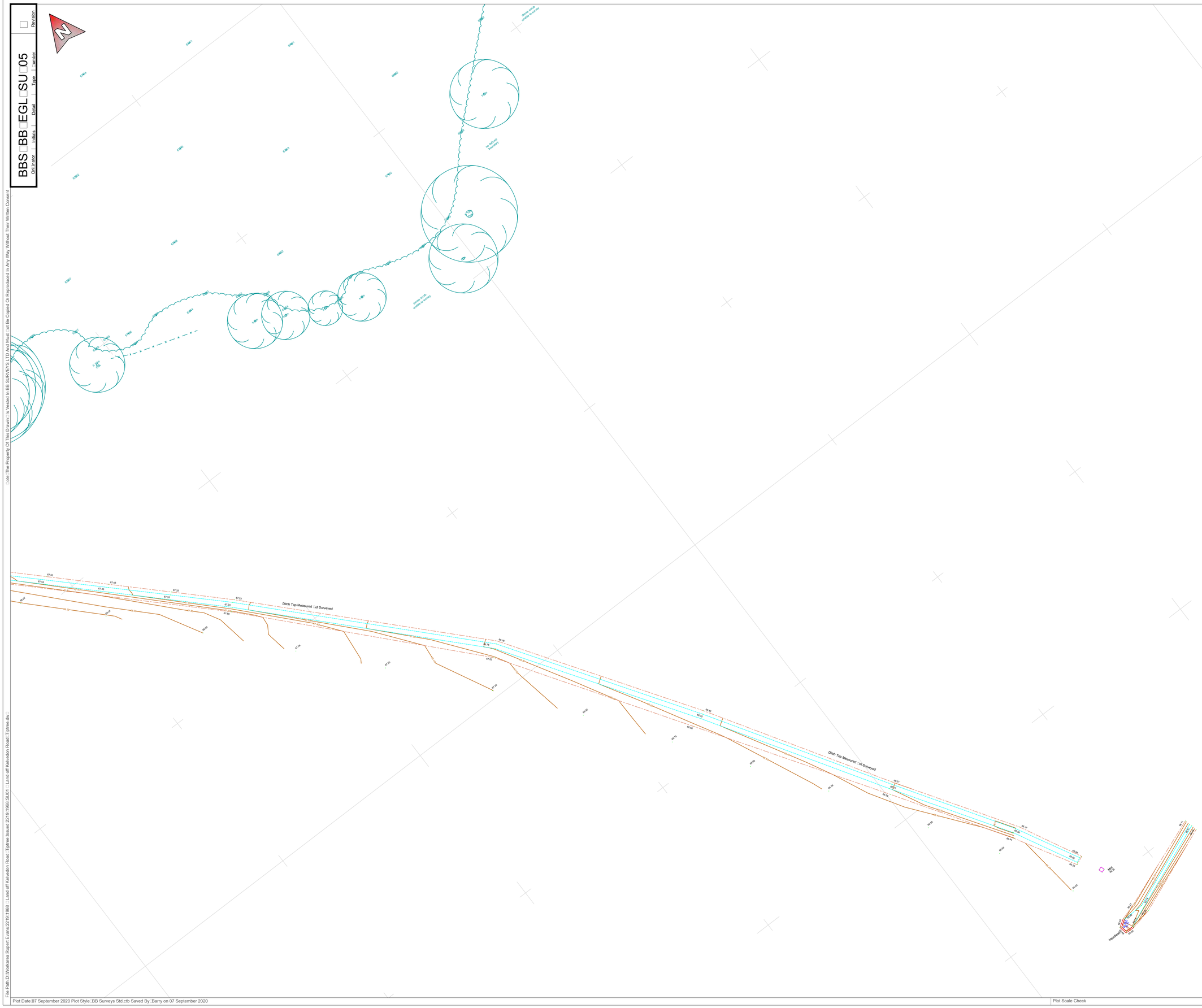
Plot Date:07 September 2020 Plot Style:□BB Surveys Std.ctb Saved By:□Barry on 07 September 2020

Plot Scale Check 100mm

Sheet Si□e A1 841 □594

BBS□BB□EGL□SU□05

Ori□inator	Initials	Detail	Type	□umber	Revision



Scale 1:250 — 0 5 10 15 20 25

□otes□

AV	Air Valve	FH	Fire Hydrant	SP	Si□n Post
BB	Bottom Bank	FP	Footpath	STAY	Stay
BH	Bore Hole	G	Gully Grate	SV	Sluice Valve
BL	Lit Bollard	GV	Gas Valve	TAC	Tactile Pavin□
BOL	Bollard	Hed□e	Hed□e	TB	Top Bank
BI□	Bin	IC	Inspection Cover	TBO□	Telephone Bo□
BS	Bus Stop	IL	Invert Level	TL	Traffic Li□ht
Bushes	Bush	KO	Kerb Outlet	TOK	Top Of Kerb
BT	BT Bo□	LP	Lamp Post	TP	Tele□raph Pole
CAB	Cabinet	MH	Manhole	TRK	Track
CH□L	Channel	MP	Marker Post	TS	Traffic Si□n MH
CL	Centreline	□B	□ame Board	VE□T	Vent
CO□C	Concrete	P□W	Partition Wall	W	Water Cover
COL	Column	PB	Post Bo□	WL	White Line
DB	Ditch Bottom	PM	Parkin□Meter	WO	Wash Out
DCH□L	Draina□e Channel	PO	Post	YL	Yellow Line
Door	Door	RE	Roddin□ Eye		
EEB	Electric MH Cover	Rd□e	Rd□e Level		
EP	Electric Pole	RP	Reflector Post		
ER	Earth Rod	RS	Road Si□n		
ET	EP□Transformer	SETTS	Granite Setts		
Feeder	Feeder Pillar	SF	Safety Fence		

FCB	Close Boarded		Control Station
FCL	Chain Link		Column
FHD	Hoardin□	0.000	Floor to Ceilin□Hei□ht
FHR	Heras Fence	0.000 FFC	Floor to False Ceilin□Hei□ht
FPL	Pallisade		
FPR	Post □ Rail		
FPW	Post □ Wire		
RAIL	Railin□s		

Features

Fences	FCB 1.6h	
Walls	Wall 1.2h	
Hed□es	Hed□e 1.3h	Avera□e root line shown.
Overhead Line	OHL	Indicative position of cables.

Services

Foul Sewers	0.225Ø FW MH	Pipe position and ali□nment is indicative only.
Storm Sewers	0.375Ø SW MH	

Buildin□Hei□hts

SURVEY CARRIED OUT USI□G TRIMBLE S6 TOTAL STATIO□ □ TRIMBLE R10 GPS.

THE SURVEY HAS BEE□ ACCURATELY POSITIO□ED O□ THE ORD□A□CE SURVEY □ATIO□AL GRID SYSTEM USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □DST□15 □SGM15□.

LOCAL SCALE FACTOR HAS BEE□ REMOVED TO TRA□SFORM THE SURVEY TO A FLAT EARTH GRID □SCALE FACTOR 1.00000□.

ALL LEVELS RELATE TO ORD□A□CE SURVEY DATUM □EWLY□□□ VERTICAL CO□TROL HAS BEE□ ESTABLISHED USI□G GPS OBSERVATIO□S TO THE OS ACTIVE □ETWORK A□D A□D THE LATEST ORD□A□CE SURVEY TRA□SFORMATIO□ □DST□15 □SGM15□.

ALL DIME□SIO□S ARE I□ METRES U□LESS OTHERWISE STATED.

A□Y CRITICAL DIME□SIO□S A□D MEASUREME□TS SHOULD BE BASED O□ THE ORIGI□AL DIGITAL DATA A□D CO□FIRMED WITH BB SURVEYS LTD.
A□Y ERRORS SHOULD BE □OTIFIED TO BB SURVEYS LTD.

□O ATTEMPT HAS BEE□ MADE TO E□TER A□Y CO□FI□ED SPACES O□ THIS SITE. WE HAVE MEASURED I□VERT DEPTHS□ESTIMATED PIPE SI□ES A□D SHOW□ THE DIRECTIO□ OF FLOW O□LY WHERE DRAI□ RU□S ARE ACTIVE AT THE TIME OF SURVEY. I□SPECTIO□ COVERS WHICH WE WERE U□ABLE TO LIFT BY MA□UAL METHODS ARE DE□OTED AS MH □TL□ WE DID □OT □UOTE FOR THE USE OF HYDRAULIC LIFTI□G E□UIPME□T.

DRAI□AGE RU□S BETWEE□ I□SPECTIO□ COVERS HAVE □OT BEE□ I□VESTIGATED. A□Y SHOW□ ARE ESTIMATED A□D □OT CO□FIRMED. ALL DRAI□AGE RU□S SHOULD BE PROVED BY DYE TRACI□G A□D IF □ECESSARY BY RADIO DETECTIO□ METHODS PRIOR TO A□Y DESIG□ WORK. ALL PIPE SI□ES A□D CO□□ECTIO□S SHOULD ALSO BE CO□FIRMED WITH YOUR LOCAL DRAI□AGE AUTHORITY PRIOR TO A□Y DESIG□ WORK.

THERE MAY BE I□SPECTIO□ COVERS O□ SITE WHICH WERE □OT VISIBLE AT THE TIME OF SURVEY. THEY MAY HAVE BEE□ BURIED OR COVERED BY VEGETATIO□ YOU SHOULD CO□SULT YOUR LOCAL DRAI□AGE AUTHORITY OR COMMISSIO□ A CCTV DRAI□AGE SURVEY TO E□SURE THAT YOU LOCATE A□Y MISSI□G COVERS OR DRAI□AGE RU□S.

REV	Date	Created By	Comments
□	06.09.20	BB	First Issue

Scale at A1: 1□250

Pro□ect □umber: 2219□1968

Drawin□Status

X	E□istin□ Topo□raphic Survey
	As Built Survey
	For Information

BB SURVEYS LTD
1 Chestnut Place, Cringleford
Norwich, Norfolk NR4 7BD
t: 01603 507917
m: 07786 388175
e: barry@bbsurveys.co.uk

Client

Marden Homes Ltd

Pro□ect

Land off Kelvedon Road
Tiptree

Title

E□istin□ Ground Level Survey
Sheet 5

BBS□BB□EGL□SU□05

Ori□inator	Initials	Detail	Type	□umber	Revision
					□

File Path:D:\Workarea\Rupert Evans\2219\1968 - Land off Kelvedon Road - Tiptree\Issued 2219 1968 SU01 - Land off Kelvedon Road -Tiptree.dwg

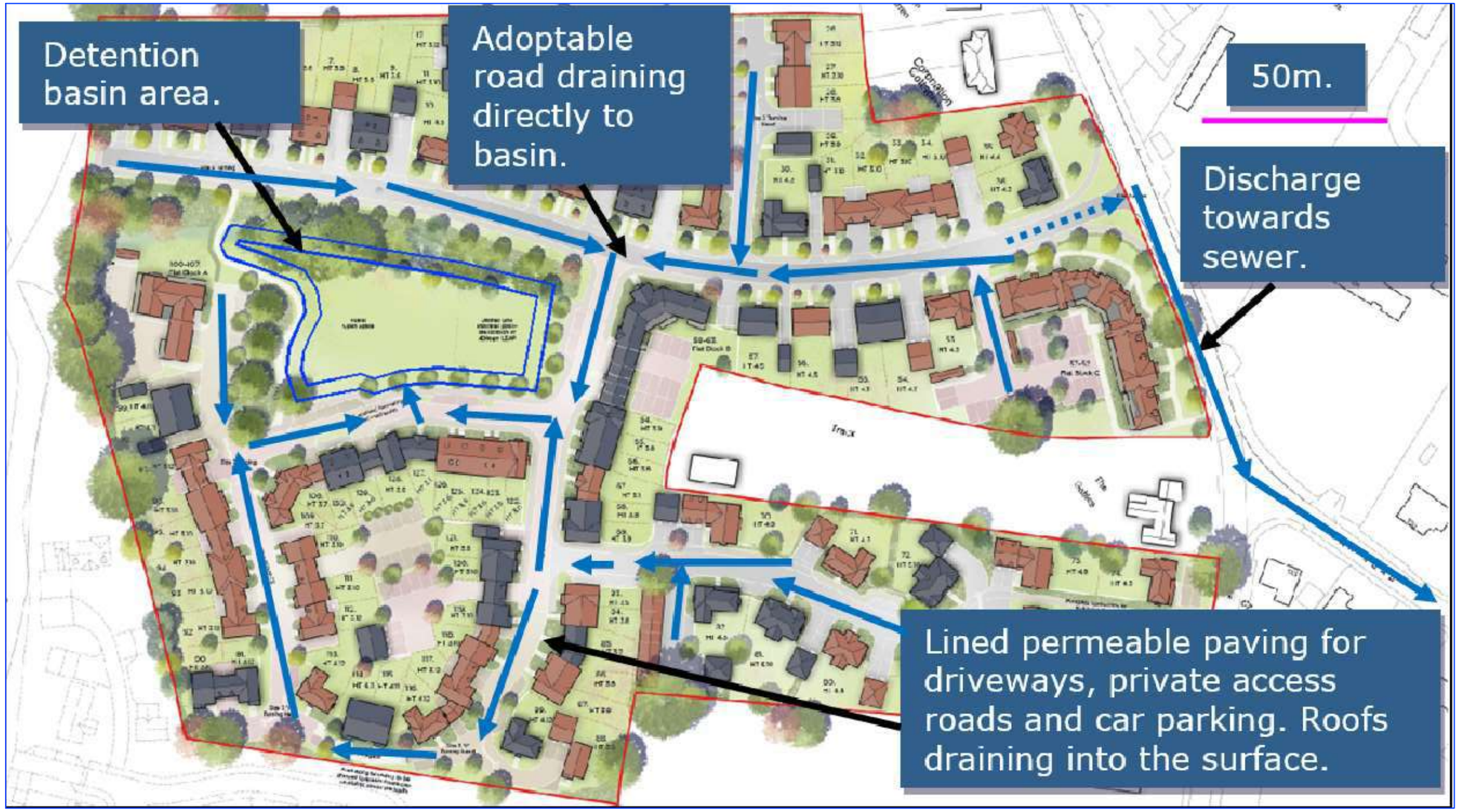
Water Tower
Coal Yard
Golden Warren
Coronation Cottages
Highlands
104
Size 5 Turning Head
Size 3 Turning Head
Site Access
Public Open Space
Dashed Line indicates possible location of 400sqm LEAP
Localised narrowing of road width
Track
The Gables
Stourton
Footpath connection to Kelvedon Road
Size 3 'Y' Turning Head
SHARED SURFACE
Footpath
Area along boundary to be grassed to enable future connection to site to the south
Path (un
OAK ROAD
100
103
67.9m
Colt Farm

2. HT 4.11
3. HT 4.11
4. HT 3.6
5. HT 3.6
6. HT 3.6
7. HT 3.6
8. HT 3.6
9. HT 3.6
10. HT 4.3
11. HT 3.10
12. HT 3.12
13. HT 3.9
14. HT 3.10
15. HT 3.9
16. HT 4.12
17. HT 3.6
18. HT 3.6
19. HT 3.6
20. HT 3.6
21. HT 4.1
22. HT 4.11
23. HT 4.11
24. HT 4.11
25. HT 4.11
26. HT 3.12
27. HT 3.10
28. HT 3.8
29. HT 3.9
30. HT 4.3
31. HT 3.12
32. HT 3.10
33. HT 3.10
34. HT 3.10
35. HT 4.4
36. HT 4.3
37-52. Flat Block C
53. HT 4.3
54. HT 4.11
55. HT 4.11
56. HT 4.5
57. HT 4.5
58-63. Flat Block B
64. HT 3.9
65. HT 3.8
66. HT 3.8
67. HT 3.1
68. HT 3.8
69. HT 3.9
70. HT 4.9
71. HT 4.3
72. HT 5.10
73. HT 4.9
74. HT 4.3
75. HT 4.4
76. HT 4.3
77. HT 4.9
78. HT 4.4
79. HT 5.10
80. HT 4.4
81. HT 5.10
82. HT 4.3
83. HT 3.9
84. HT 3.8
85. HT 3.2
86. HT 3.8
87. HT 3.9
88. HT 3.9
89. HT 4.12
90. HT 3.10
91. HT 3.12
92. HT 3.12
93. HT 3.10
94. HT 3.10
95. HT 3.10
96. HT 3.10
97. HT 3.12
98. HT 4.11
99. HT 4.11
100-107. Flat Block A
108. HT 3.7
109. HT 3.7
110. HT 3.10
111. HT 3.10
112. HT 3.12
113. HT 4.12
114. HT 4.11
115. HT 4.11
116. HT 4.12
117. HT 3.12
118. HT 3.10
119. HT 3.10
120. HT 3.10
121. HT 3.9
122. HT 3.1
123. HT 3.6
124. HT 3.6
125. HT 3.6
126. HT 3.6
127. HT 3.1
128. HT 3.9
129. HT 3.6
130. HT 3.6

1500
0m 5m 15m 30m

AS PROPOSED LAYOUT PLAN

DAP
KELVEDON ROAD
PROPOSED SITE LAYOUT
TIPTREE
COLCHESTER
CO5 0LX
MARDEN HOMES LTD.
23.10.20 1:500@A1 Project#1432
301.01
www.daparchitecture.co.uk



N

LEGEND

DETENTION BASIN DRAINING ROOFS AND HARDSTANDING (2660 SQM X 1M, 1:4 SIDE SLOPES, SIZED TO ACCOMMODATE 100YRCC STORM EVENT.

DISCHARGE INTO EXISTING AW SEWERS AT POST-DEVELOPMENT EQUIVALENT GREENFIELD RATE OF 5.55 L/S DURING ALL MODELLED EVENTS INCLUDING CLIMATE CHANGE 1 IN 100 YEAR EVENT.

NOTES

SITE LAYOUT TAKEN FROM DRAWING NUMBER 1432.301.01.

SUDS STRATEGY IS INDICATIVE AND SUBJECT TO DETAILED DESIGN.

DESIGNED	DRAWN	SCALE	DATE
RE	RE	1:1250	27/07/2021

DRAWING NUMBER	REVISION	DRAWING STATUS
2229/RE/01	A	FINAL

PROJECT
PROPOSALS OFF KELVEDON ROAD, TIPTREE.

DRAWING TITLE
SUDS STRATEGY

CLIENT
MARDEN HOMES

EVANS Rivers and Coastal

EVANS RIVERS AND COASTAL LIMITED
19 ST ANDREWS AVENUE
THORPE ST ANDREW, NORWICH, NR7 0RG
T 01603 304077

E enquires@evansriversandcoastal.co.uk
W www.evansriversandcoastal.co.uk

ORIGINAL SHEET SIZE A3H


EVANS
Rivers and Coastal