



Land Between Lodge Road and Tape Lane, Hurst, Wokingham, RG10 0EG

Proof of Evidence – Flood Risk and Drainage

Robert Walker BEng (Hons) MSc CWEM

On behalf of Mactaggart and Mickel Strategic Land

Section 78 Appeal against refusal of planning permission by Wokingham Borough Council for the:

Outline application for the proposed erection of up to 99 no. dwellings, green infrastructure, open space, pedestrian and cycle links, recreational facilities and other associated infrastructure and access points on Lodge Road and Tape Lane with required improvements. (All matters reserved except for means of access).

Prepared by:

SLR Consulting Limited

Ground Floor Belmont House , Churchill Way, Cardiff,
CF10 2HE

SLR Project No.: 432.010035.00001

PINS Reference: APP/X0360/W/25/3364304

Planning Reference No: 242067

7 August 2025

Revision: 00



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1.0 Introduction

Qualifications and Experience

- 1.1 I am Robert Walker. I am a Chartered Water and Environmental Manager (C.WEM) and a Member of the Chartered Institution of Water and Environmental Management. I hold a Master's degree in Flood Risk Management awarded by University of Glasgow and Heriot Watt University, and a BEng (Hons) in Civil Engineering by Heriot Watt University.
- 1.2 I have over 17 years of post-graduate consulting experience as a Flood Risk Hydraulic Modeller. I joined Halcrow in 2008 and worked as a hydraulic modeller for a period of 9 years' before joining RAB Consultants 2017 where I managed the hydraulic modelling discipline within the company. I joined Atkins in 2019 for a period of 4 years as an Associate and worked on large linear infrastructure and flood defence projects.
- 1.3 I joined SLR Consulting Limited in September 2023 as a Principal Flood Risk Consultant in the Hydrology and Hydrogeology Team.
- 1.4 Over the last 17 years', I have specialised in the field of hydraulic modelling and currently provide technical advice on the quantification and assessment of flood risk, the management of flood risk and the impact of development on the water environment, including from surface water runoff.
- 1.5 I have worked across the Built Environment, Flood Warning and Incident Management, Flood Protection, Industry, and Energy Sectors principally supporting Client's planning and permit applications.
- 1.6 The evidence which I have prepared and provide for this appeal is true and I confirm that the opinions expressed are my true and professional opinions.



2.0 Scope of Evidence

- 2.1 I am instructed by Mactaggart and Mickel Strategic Land (the Appellants) to consider the results of the Environment Agency's second review of the hydraulic model that has been developed to evaluate the flood risk to the Appeal Site.
- 2.1 The results of the review were provided by the Environment Agency under cover of an email on the afternoon 5 August 2025. A copy of the model review spreadsheets and covering email is provided at Annex A.
- 2.2 The covering email from the Environment Agency stated that both the hydraulic model and the hydrological analysis '*are not considered fit for purpose so we will be maintaining our objection*'.
- 2.3 A summary of the reasons why they were not considered fit for purpose is set out below. I have provided a heading for each issue for ease of reference and address these in the following sections of this supplemental proof.

'For the hydraulic modelling, sections that need addressing include:

Modelling Issue 1

- The model is very sensitive to the state of the Culverted sections. These are currently represented with a roughness value of 0.011 n, according to Chow, 1959 this value corresponds to a smooth concrete culvert, which is straight and free of debris. However, survey data of culvert (Hurst Culvert CCTV) shows that the culvert is corrugated with some damaged sections & debris. For closed conduits Chow, 1959 states that corrugated storm drains should have a roughness between 0.021 & 0.03.*

For the hydrology review, the outstanding issues summarised below need to be addressed:

Hydrology Issue 1

- Donor transfer for statistical calculation - Donor site was selected based on proximity following the small catchment procedures. However, the donor selected is extremely permeable ($BFI_{HOST19} = 0.782$) and has unusually small annual maximum flows, the flood estimation guidelines states that such catchments require "Special treatment". How QMED was calculated at this location needs a careful reviewed & comparison to other donor options.*

Hydrology Issue 2

- Calculation of DPLBAR - Catchment shape have changed significantly from FEH webservice, DPLBAR has revised using the equation " $DPLBAR = Revised\ AREA^{LOG(FEH\ DPLBAR, FEH\ AREA)}$ " resulting in a value of 0.727. However, the FEH guidelines & handbook v5 states that DPLBAR should not be updated by area weighting and should either be re-estimated using the equation - $DPLBAR = AREA^{0.548}$ or recalculated from the digital terrain model this may significantly affect the ReFH2 results.*

Hydrology Issue 3

- Storm duration testing – information provided is currently limited, it is currently unclear how storm duration testing was completed and considering the extent the*



culverts impact the hydraulic regime storm duration testing should be undertaken within the hydraulic model for fluvial scenarios.'



3.0 Results of the 2nd Model review

Hydraulic Modelling Report Review

- 3.1 I have summarised the results of the 2nd model review completed by the Environment Agency for the hydraulic model in Table 3-1.

Table 3-1: Hydraulic Modelling Report Review Summary

RAG1	RAG2	Number
Green	OK	4
Amber	OK	22
Amber	Amber	2
Amber	Red	1
Red	OK	4

- 3.2 The 2nd review cleared 26 outstanding issues and the two remaining Amber and one Red issues relate to the roughness value assigned to the culvert in the model (Modelling Issue 1) that I discuss in Section 4.0.

Hydrology Report Review

- 3.3 I have summarised the results of the 2nd model review completed by the Environment Agency for the hydraulic model in Table 3-2.

Table 3-2: Hydrology Report Review Summary

RAG 1	RAG 2	Number
Note 1	Green	3
Green	OK	10
Note 1	Amber	1
Amber	OK	7
Amber	Green	3
Amber	Amber	2
Note 1	Red	2
Red	OK	13
Red	Green	1
Red	Amber	1

Notes

1: Hydrology reviewed for first time as part of RAG2

- 3.4 The 'new' comments have arisen as the method of hydrological analysis was changed in response to the Environment Agency's 1st model review and so has not been previously reviewed.



3.5 The 2nd review cleared 30 outstanding comments, however, there are 4 outstanding Amber comments (1 new) and 2 outstanding Red comment (both new) that these relate to the three issues set out in the Environment Agency's email:

- Hydrology Issue 1: New Red issue raised
- Hydrology Issue 2: Amber issue
- Hydrology Issue 3: Amber issue

3.6 I address these in Section 5.0.



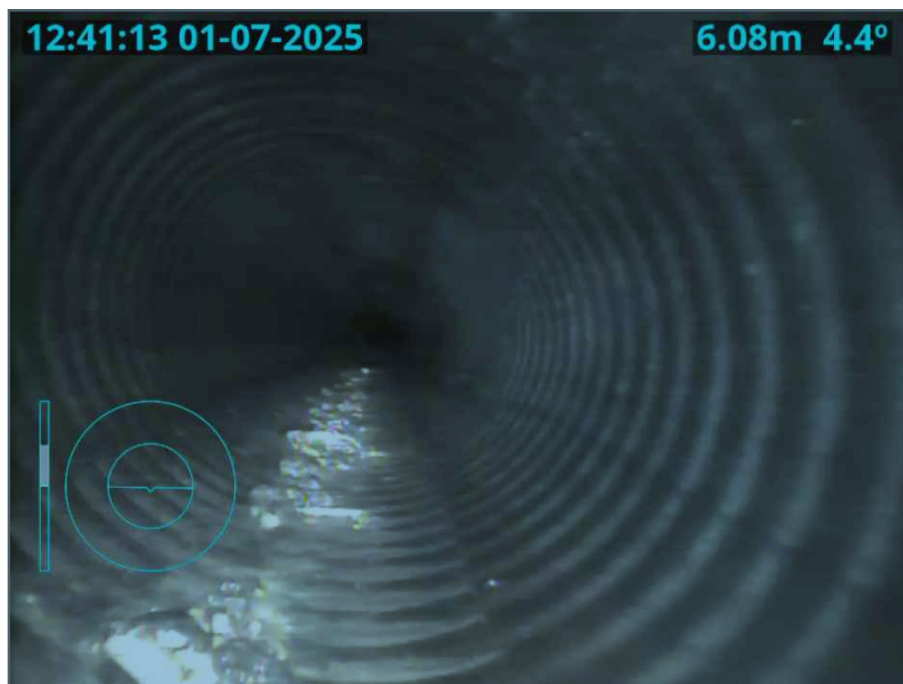
4.0 Hydraulic Modelling

Modelling Issue 1

'The model is very sensitive to the state of the Culverted sections. These are currently represented with a roughness value of 0.011 n, according to Chow, 1959 this value corresponds to a smooth concrete culvert, which is straight and free of debris. However, survey data of culvert (Hurst Culvert CCTV) shows that the culvert is corrugated with some damaged sections & debris. For closed conduits Chow, 1959 states that corrugated storm drains should have a roughness between 0.021 & 0.03.'

- 4.1 The model reviewer has misinterpreted the CCTV survey of the culvert completed by A1 Wokingham Wet Waste Ltd on 1 July 2025. A copy of the survey report is enclosed at Annex B.
- 4.2 Page 2 of the survey describes the pipe material as 'Polythene' and it is clear from the photographic plates in Page 3 of the survey report that that the culvert is a form of 'twinwall' plastic pipe. Twinwall plastic pipes are characterised by a ribbed, or corrugated, exterior profile and smooth bore. An extract from the report is reproduced as Figure 4-1.

Figure 4-1: Photographic Plate from CCTV Survey Report



- 4.3 The reviewer states *'For closed conduits Chow, 1959 states that corrugated storm drains should have a roughness between 0.021 & 0.03.'* However, this refers to a very different type of conduit that is normally fabricated from corrugated steel as shown by Figure 4-2.



Figure 4-2: Typical Corrugated Storm Drain



- 4.4 I have for reference reviewed the details of a typical twinwall pipe¹ of similar manufacture to that used for the culvert and note that a Manning's coefficient (roughness) of **0.012** is quoted for its hydraulic performance. Figure 4-3 shows a typical detail of this manufacture's pipe that is very similar to that shown by the Figure 4-1.

Figure 4-3: Typical Twinwall Pipe (JFC CorriPipe™)



- 4.5 I therefore conclude that the reviewer is mistaken in the characterisation of the outfall pipe and as such the roughness value of **0.011** adopted in the model is an appropriate value to adopt in the model.
- 4.6 Nevertheless, to be robust the model has been re-run to address the Environment Agency's concern about the modelling issues and the roughness value for the culvert has been increased to **0.013** which corresponds to the description in Chow² as '*Culvert with bends, connections and some debris*'

¹ <https://www.jfccivils.com/solid-twinwall-corripipe/>

² Chow, Ven Te, 1959. *Table 5-6, Open Channel Hydraulics*



- 4.7 I therefore conclude that as the culvert has been properly characterised in the model the outstanding 'Red' issue has been addressed and as such the hydraulic model can be considered '**fit for purpose**'



5.0 Hydrology

Hydrology Issue 1

'Donor transfer for statistical calculation - Donor site was selected based on proximity following the small catchment procedures. However, the donor selected is extremely permeable (BFIHOST19 = 0.782) and has unusually small annual maximum flows, the flood estimation guidelines states that such catchments require "Special treatment". How QMED was calculated at this location needs a careful reviewed & comparison to other donor options.'

- 5.1 Donor transfer refers to a method used to improve flood estimation - particularly the estimation of QMED - at ungauged or poorly gauged catchments by transferring information from nearby gauged catchments, known as donor catchments or sites.
- 5.2 The small catchments method is based on proximity which is why the donor site was selected primarily on proximity. It is also of note that the subject site has a BFIHOST19 value of 0.603 and a site is considered 'permeable' where the value is greater than 0.65. For this reason, we considered that the initial donor site selected with a BFIHOST19 of 0.782 was appropriate. Nevertheless, we have completed a review of donor sites based on the BFIHOST19 value as requested by the Environment Agency.
- 5.3 The 2nd review has identified two donor sites in the pooling group generated by WINFAP 5 that have a BFIHOST19 value of <0.65. The two identified sites were ranked in the pooling group as proximity 2 and proximity 10 to the subject site. All other sites in the pooling group had a BFIHOST19 value of >0.65.
- 5.4 Table 5-1 provides a comparison of the QMED estimations for the site considered by the Environment Agency in their 2nd review with the sites with a BFIHOST19 of <0.65. This demonstrates that proximity rank sites 2 and 10 have a similar value for QMED. The closest suitable donor site, 39025, with a BFIHOST19 value of 0.563 has been adopted as the donor for revising the estimate of QMED within the FEH Statistical method.
- 5.5 Details of the analysis are enclosed at Annex C.

Table 5-1: Donor review

Site	Proximity rank	BFIHOST19	QMED (m ³ /s)
39027	1	0.782	0.040
39025	2	0.563	0.055
39018	10	0.621	0.053



Hydrology Issue 2

Calculation of DPLBAR - Catchment shape have changed significantly from FEH webservice, DPLBAR has revised using the equation "DPLBAR = Revised AREA^LOG(FEH DPLBAR, FEH AREA)" resulting in a value of 0.727. However, the FEH guidelines & handbook v5 states that DPLBAR should not be updated by area weighting and should either be re-estimated using the equation - DPLBAR = AREA^0.548 or recalculated from the digital terrain model this may significantly affect the ReFH2 results.

- 5.6 DPLBAR has been updated using the equation $DPLBAR = AREA^{0.548}$ as requested by the Environment Agency. Based on an area of 0.27km², the revised value of DPLBAR is 0.488 compared to 0.727 considered by the Environment Agency in their 2nd review.
- 5.7 This has been repopulated into both the ReFH2 calculations and statistical analysis. It should be noted that no change to the pooling group occurred as a result of changes to the value of DPLBAR and the revised value had little impact on the growth factor for the 1% AEP event, increasing it from 3.210 to 3.214.
- 5.8 Based on the revised calculation of QMED and the updated value of DPLBAR, the updated design flows are summarised in Table 5-2. The results of the statistical and ReFH2 methodologies are in close agreement, with the statistical method being slightly larger. Therefore, the statistical method flows, fitted to a ReFH2 design storm profile, have been used to update the inflows to the hydraulic model.
- 5.9 Details of the analysis are enclosed at Annex C.

Table 5-2: Revised design flow and comparison to previous flows

Event (AEP)	2 nd Model Review		Revised Analysis	
	ReFH2 (m ³ s ⁻¹)	Statistical (m ³ s ⁻¹)	ReFH2 (m ³ s ⁻¹)	Statistical (m ³ s ⁻¹)
50%	-	0.04	0.06	0.06
3.3%	0.10	0.07	0.13	0.13
1%	0.13	0.12	0.17	0.18
0.1%	0.22	0.28	0.28	0.34

Hydrology Issue 3

Storm duration testing – information provided is currently limited, it is currently unclear how storm duration testing was completed and considering the extent the culverts impact the hydraulic regime storm duration testing should be undertaken within the hydraulic model for fluvial scenarios.'

- 5.10 The 6.5hrs storm duration considered by the Environment Agency in their 2nd review was based on the default value generated by the ReFH analysis. This was considered appropriate as flood levels at the Appeal Site are largely controlled by the hydraulic



characteristics of the culvert and therefore would be largely insensitive to variations from the default value adopted.

- 5.11 Nevertheless, storm duration testing was completed using the hydraulic model to determine the critical storm duration that generated the greatest flood levels and extents. The inputs for the storm duration testing were based on the ReFH2 generated hydrograph proportionally scaled to the 1% AEP flood flow derived by the statistical analysis.
- 5.12 As shown by the results of the analysis summarised in Table 5-3, the peak flood level is relatively insensitive to flood level and indicates a critical storm duration of **10.5hrs**. This has been adopted for the revised analysis.

Table 5-3: Storm Duration testing

Storm Duration (hrs)	Flood Level (mAOD)		
	Upstream model boundary	Appeal Site	Inlet to culvert
4.5	37.48	37.47	37.46
5.5	37.49	37.48	37.46
6.5	37.49	37.49	37.46
7.5	37.49	37.49	37.47
8.5	37.49	37.49	37.47
9.5	37.49	37.49	37.47
10.5	37.52	37.51	37.50
11.5	37.51	37.51	37.49
12.5	37.51	37.51	37.49
13.5	37.51	37.50	37.49
14.5	37.50	37.50	37.48

Results

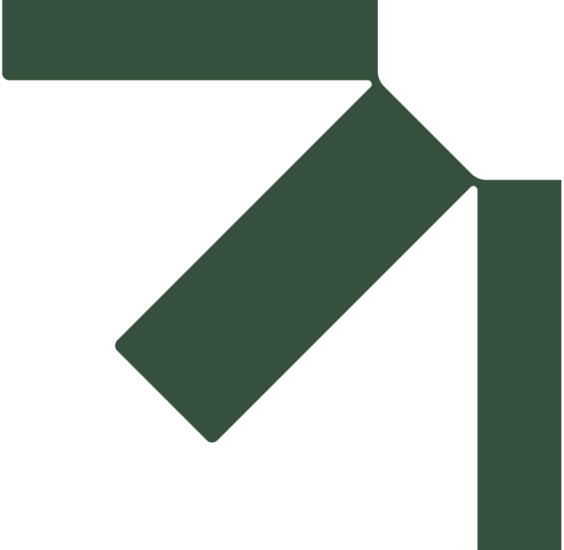
- 5.13 The net effect of the review of the hydrology set out above is that the estimated peak design flow (1% AEP plus 46% Climate Change Allowance) has increased by $0.19\text{m}^3\text{s}^{-1}$ to $0.26\text{m}^3\text{s}^{-1}$ and for the extreme flood (0.1% AEP plus 46% Climate Change Allowance) has increased by $0.32\text{m}^3\text{s}^{-1}$ to $0.5\text{m}^3\text{s}^{-1}$.
- 5.14 The critical storm duration for the design flood had increased from 6.5hrs to 10.5hrs.
- 5.15 The impact of the revised hydrology and hydraulic model on the flood risk to the Appeal Site are discussed by Mr Walton in his Supplemental Proof of Evidence.



6.0 Conclusions

- 6.1 I have reviewed the reasons why, following their 2nd review, the Environment Agency considered that both the hydrology and hydraulic model were still not fit for purpose.
- 6.2 I consider that the Environment Agency has misinterpreted the CCTV survey of the culvert and in particular the material of conduit and as such the suggested increase in roughness coefficient is not justified. Nevertheless, the roughness has been adjusted slightly when the model has been re-run.
- 6.3 This was the single issue raised by the review in respect of the hydraulic model and I therefore consider that the hydraulic model is **'fit for purpose'**.
- 6.4 The three issues raised by the Environment Agency in respect of the hydrological analysis have been addressed and the hydraulic model rerun with revised inflows and critical storm duration. I therefore consider that the hydrological inputs to the hydraulic model are **'fit for purpose'**.





Annex A Environment Agency's 2nd Review (spreadsheets provided digitally)

**Land Between Lodge Road and Tape Lane, Hurst,
Wokingham, RG10 0EG**

Robert Walker BEng (Hons) MSc CWEM

**Section 78 Appeal against refusal of planning permission by Wokingham
Borough Council.**

SLR Project No.: 432.010035.00001

PINS Reference: APP/X0360/W/25/3364304

7 August 2025

Ian Walton

From: Kari Burton <Kari.Burton@macmic.co.uk>
Sent: 05 August 2025 16:37
To: Ian Walton; Robert Walker; Dan Eddon; Stuart Slatter; Lewis Wrench
Cc: Conor Roberts
Subject: FW: Hurst Inquiry - results of 2nd model review
Attachments: Non-real time Hydraulic Model Review Land between Lodge Road and Tape Road_HEreview.xlsx; Flood Estimation Calculation Review Land between Lodge Road and Tape Lane_HEreview.xlsx

Hi all, see below and attached.

Kari Burton MRTPI MRICS
Regional Head of Planning – South East

Mac Mic Group
St. Georges House
15 Hanover Square
Mayfair
London
W1S 1HS

Mobile: 075 8105 8363
Email: kari.burton@macmic.co.uk
www.macmicgroup.co.uk



From: Oliver Murray <Oliver.Murray@environment-agency.gov.uk>
Sent: 05 August 2025 16:35
To: Kari Burton <Kari.Burton@macmic.co.uk>; Dan Eddon <dan.eddon@slrconsulting.com>; Andrew Dannatt <adannatt@slrconsulting.com>; Robert Walker <robertwalker@slrconsulting.com>
Subject: FW: Hurst Inquiry - results of 2nd model review

CAUTION: This email came from an external party. Do not click on a link, or open any attachments unless you recognise the sender, or know that the content is safe.

Hi All,

Please see below the results of the model review and the review sheets attached. If you have any questions please let me know.

Please see the attached the completed hydraulic modelling review and hydrology review spreadsheets. Both are not considered fit for purpose so we will be maintaining our objection. Please also see below for summaries from the model reviewer.

For the hydraulic modelling, sections that need addressing include:

- The model is very sensitive to the state of the Culverted sections. These are currently represented with a roughness value of 0.011 n, according to Chow, 1959 this value corresponds to a smooth concrete culvert, which is straight and free of debris.

However, survey data of culvert (Hurst Culvert CCTV) shows that the culvert is corrugated with some damaged sections & debris. For closed conduits Chow, 1959 states that corrugated storm drains should have a roughness between 0.021 & 0.03.

For the hydrology review, the outstanding issues summarised below need to be addressed:

- Donor transfer for statistical calculation - Donor site was selected based on proximity following the small catchment procedures. However, the donor selected is extremely permeable (BFIHOST19 = 0.782) and has unusually small annual maximum flows, the flood estimation guidelines states that such catchments require "Special treatment". How QMED was calculated at this location needs a careful reviewed & comparison to other donor options.

- Calculation of DPLBAR - Catchment shape have changed significantly from FEH webservice, DPLBAR has revised using the equation " $DPLBAR = \text{Revised AREA}^{\text{LOG}(\text{FEH DPLBAR}, \text{FEH AREA})}$ " resulting in a value of 0.727. However, the FEH guidelines & handbook v5 states that DPLBAR should not be updated by area weighting and should either be re-estimated using the equation - $DPLBAR = \text{AREA}^{0.548}$ or recalculated from the digital terrain model this may significantly affect the ReFH2 results.

- Storm duration testing – information provided is currently limited, it is currently unclear how storm duration testing was completed and considering the extent the culverts impact the hydraulic regime storm duration testing should be undertaken within the hydraulic model for fluvial scenarios.

Many thanks, Olly.

Oliver Murray – Environment Agency

Sustainable Places Planning Advisor | Thames Area

My normal working days are Monday - Friday.



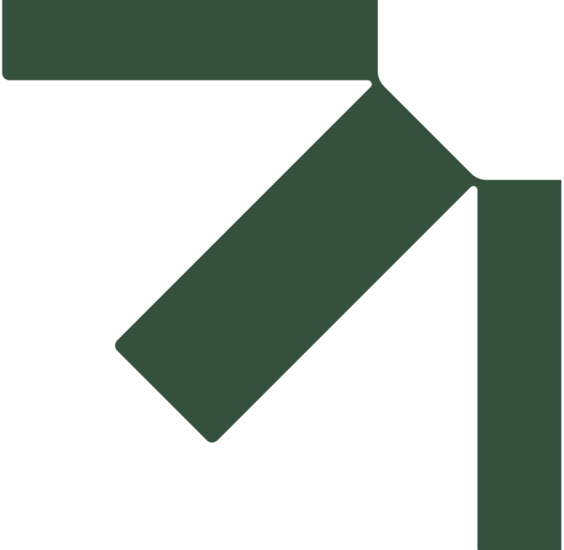
See what the Environment Agency is doing to tackle climate change:

[Environment Agency: reaching net zero by 2030 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/environment-agency-reaching-net-zero-by-2030)



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Annex B A1 Wokingham Wet Waste Ltd CCTV Survey

**Land Between Lodge Road and Tape Lane, Hurst,
Wokingham, RG10 0EG**

Robert Walker BEng (Hons) MSc CWEM

**Section 78 Appeal against refusal of planning permission by Wokingham
Borough Council.**

SLR Project No.: 432.010035.00001

PINS Reference: APP/X0360/W/25/3364304

7 August 2025



Project

Project Name: Hurst Culvert

Project Date: 01/07/2025

Inspection Standard: MSCC5 Sewers & Drainage GB (SRM5 Scoring)





Project Name
Hurst Culvert

Project Number

Project Date
01/07/2025

Project Information

Project Name
Hurst Culvert

Project Number

Project Date
01/07/2025

Client

Company: Mac Mic Group
Contact: Conor Roberts
Street: 5 Merchant Square
Town or City: London
Post Code: W2 1AY



Site

Company: Mac Mic
Street: Lodge Road
Town or City: Hurst
Post Code: RG10

Contractor

Company: A1 Wokingham Wet Waste Ltd
Street: Longacres, Waterloo Road
Town or City: Wokingham
Post Code: RG40 3DS



Project Information

Project Name
Hurst Culvert**Project Number****Project Date**
01/07/2025

Project Notes

Survey abandoned @ 75.08 due to stone which turned the camera over. There are a few minor low points throughout this pipe, these will not affect the flow. There is also minor debris throughout, settled silt / stones. This pipe is also deformed in several locations. There was only access from the field to the south end of the culvert, the survey was abandoned approx. 30m shy of completion.

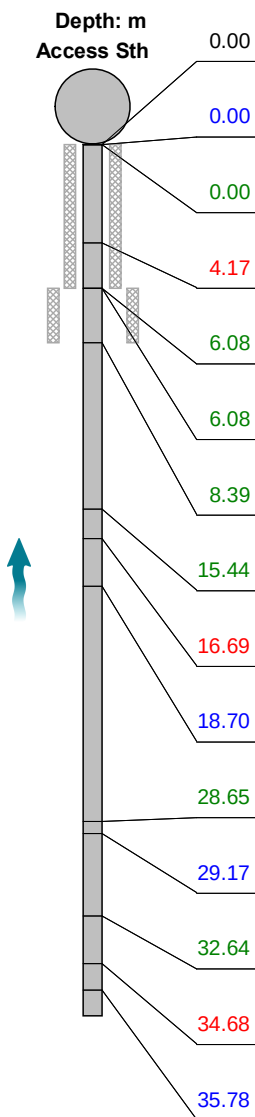
Section Inspection - 01/07/2025 - Access NthX



Item No. 1	Insp. No. 1	Date 01/07/25	Time 14:28	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Unknown	PLR ACCESS NTHX
Operator Joe Howard		Vehicle Not Specified		Camera Crawler	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Hurst	Inspection Direction:	Upstream	Upstream Node:	ACCESS NTH
Road:	Lodge Road	Inspected Length:	75.08 m	Upstream Pipe Depth:	
Location:		Total Length:	75.08 m	Downstream Node:	ACCESS STH
Surface Type:		Joint Length:		Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	300 mm		
Flow Control:	No flow control	Material:	Polyethylene		
Year Constructed:	Not Specified	Lining Type:	No Lining		
Inspection Purpose:	Sample condition survey	Lining Material:	No Lining		

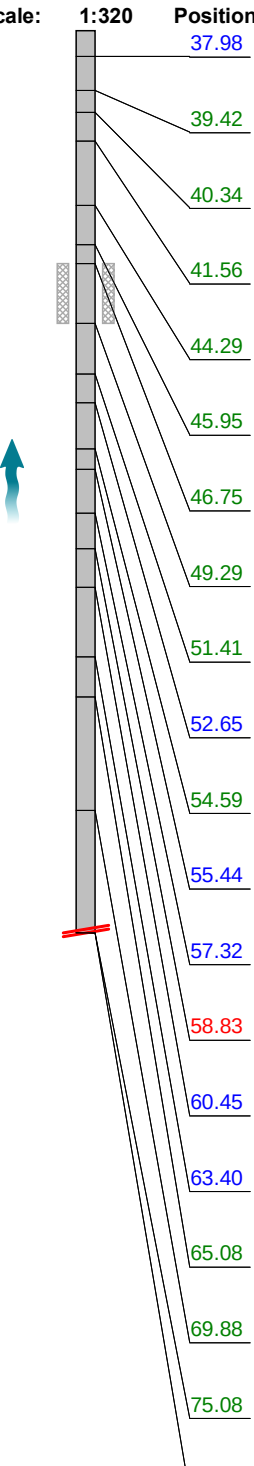
Comments:
Recommendations:

Scale: 1:320	Position [m]	Code	Observation	MPEG	Photo	Grade
	Depth: m Access Sth 0.00	OC	Start node, other special chamber, reference: Access Sth: Open pipe end	00:00:00		
	0.00	WL	Water level, 0% of the vertical dimension	00:00:01		
	0.00	S01	DES Settled deposits, fine, 10% cross-sectional area loss, start	00:00:01	1	
	4.17	D	Deformed sewer or drain, 15%	00:00:43	2	3 / 3
	6.08	F01	DES Settled deposits, fine, 10% cross-sectional area loss, finish	00:00:55		3
	6.08	S02	DES Settled deposits, fine, 5% cross-sectional area loss, start	00:00:55	3	
	8.39	F02	DES Settled deposits, fine, 5% cross-sectional area loss, finish	00:01:08		3
	15.44	DES	Settled deposits, fine, 5% cross-sectional area loss	00:01:43		3
	16.69	D	Deformed sewer or drain, 5%	00:01:50	4	1 / 2
	18.70	WL	Water level, 5% of the vertical dimension: Holding	00:02:01		
	28.65	LR	Line deviates right: Slight	00:03:10	5	
	29.17	WL	Water level, 0% of the vertical dimension	00:03:13		
	32.64	DES	Settled deposits, fine, 5% cross-sectional area loss	00:03:28	6	3
	34.68	D	Deformed sewer or drain, 5%	00:03:36	7	1 / 2
	35.78	WL	Water level, 5% of the vertical dimension: Holding	00:03:42		

Section Inspection - 01/07/2025 - Access NthX



Item No. 1	Insp. No. 1	Date 01/07/25	Time 14:28	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Unknown	PLR ACCESS NTHX
Operator Joe Howard		Vehicle Not Specified		Camera Crawler	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Scale:	1:320	Position [m]	Code	Observation	MPEG	Photo	Grade	
		37.98	WL	Water level, 0% of the vertical dimension	00:03:51			
		39.42	DES	Settled deposits, fine, 5% cross-sectional area loss	00:03:57	8	3	
		40.34	DES	Settled deposits, fine, 5% cross-sectional area loss	00:04:01	9	3	
		41.56	DES	Settled deposits, fine, 5% cross-sectional area loss	00:04:05	10	3	
		44.29	DES	Settled deposits, fine, 5% cross-sectional area loss	00:04:20	11	3	
		45.95	DES	Settled deposits, fine, 5% cross-sectional area loss	00:04:33	12	3	
		46.75	S03	DES	Settled deposits, fine, 5% cross-sectional area loss, start	00:04:36	13	
		49.29	F03	DES	Settled deposits, fine, 5% cross-sectional area loss, finish	00:05:58		3
		51.41	DES	Settled deposits, fine, 10% cross-sectional area loss	00:06:07	14	3	
		52.65	WL	Water level, 10% of the vertical dimension: Holding	00:06:19			
		54.59	DES	Settled deposits, fine, 10% cross-sectional area loss	00:07:33	15	3	
		55.44	WL	Water level, 15% of the vertical dimension: Holding	00:07:46			
		57.32	WL	Water level, 10% of the vertical dimension: Holding	00:09:23			
		58.83	D	Deformed sewer or drain, 5%	00:09:44	16	1 / 2	
		60.45	WL	Water level, 0% of the vertical dimension	00:10:05			
		63.40	WL	Water level, 5% of the vertical dimension: Holding	00:11:51			
		65.08	DES	Settled deposits, fine, 5% cross-sectional area loss	00:12:33	17	3	
		69.88	DES	Settled deposits, fine, 5% cross-sectional area loss	00:13:36	18	3	
		75.08	DER	Settled deposits, coarse, 15% cross-sectional area loss: Stone.	00:17:40		3	
		75.08	SA	Survey abandoned: Camera turned over on stone.	00:17:40			

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
4	40.0	0.5	40.0	3.0	19	4.0	0.7	55.0	3.0

Section Pictures - 01/07/2025 - Access NthX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Upstream	ACCESS NTHX		



1, 00:00:01, 0.00 m
Settled deposits, fine, 10% cross-sectional area loss, start



2, 00:00:43, 4.17 m
Deformed sewer or drain, 15%



3, 00:00:55, 6.08 m
Settled deposits, fine, 5% cross-sectional area loss, start



4, 00:01:50, 16.69 m
Deformed sewer or drain, 5%

Section Pictures - 01/07/2025 - Access NthX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Upstream	ACCESS NTHX		



5, 00:03:10, 28.65 m
Line deviates right, Slight



6, 00:03:28, 32.64 m
Settled deposits, fine, 5% cross-sectional area loss



7, 00:03:36, 34.68 m
Deformed sewer or drain, 5%



8, 00:03:57, 39.42 m
Settled deposits, fine, 5% cross-sectional area loss

Section Pictures - 01/07/2025 - Access NthX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Upstream	ACCESS NTHX		



9, 00:04:01, 40.34 m
Settled deposits, fine, 5% cross-sectional area loss



10, 00:04:05, 41.56 m
Settled deposits, fine, 5% cross-sectional area loss



11, 00:04:20, 44.29 m
Settled deposits, fine, 5% cross-sectional area loss



12, 00:04:33, 45.95 m
Settled deposits, fine, 5% cross-sectional area loss

Section Pictures - 01/07/2025 - Access NthX

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Upstream	ACCESS NTHX		



13, 00:04:36, 46.75 m
Settled deposits, fine, 5% cross-sectional area loss, start



14, 00:06:07, 51.41 m
Settled deposits, fine, 10% cross-sectional area loss



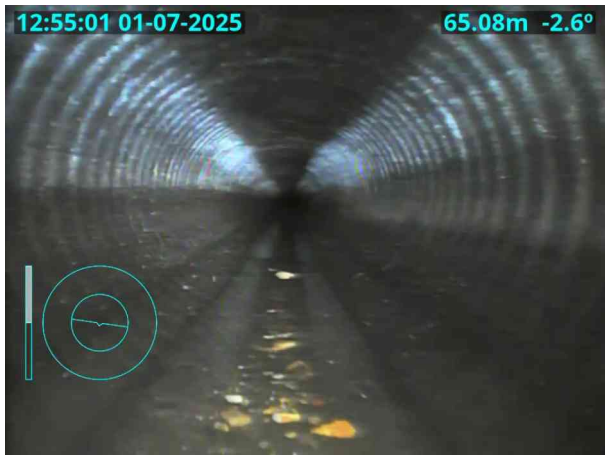
15, 00:07:33, 54.59 m
Settled deposits, fine, 10% cross-sectional area loss



16, 00:09:44, 58.83 m
Deformed sewer or drain, 5%

Section Pictures - 01/07/2025 - Access NthX

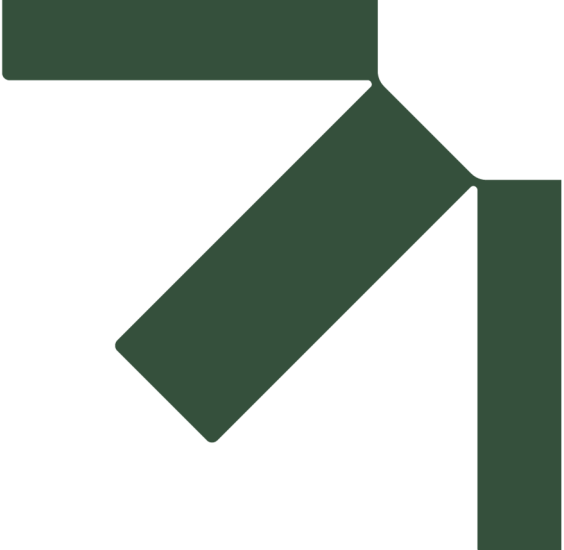
Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Upstream	ACCESS NTHX		



17, 00:12:33, 65.08 m
Settled deposits, fine, 5% cross-sectional area loss



18, 00:13:36, 69.88 m
Settled deposits, fine, 5% cross-sectional area loss



Annex C Hydrological Analysis

**Land Between Lodge Road and Tape Lane, Hurst,
Wokingham, RG10 0EG**

Robert Walker BEng (Hons) MSc CWEM

**Section 78 Appeal against refusal of planning permission by Wokingham
Borough Council.**

SLR Project No.: 432.010035.00001

PINS Reference: APP/X0360/W/25/3364304

7 August 2025

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Date of creation: 06-08-2025 15:57:50
Software: WINFAP Version: 5.2.9046 (26106)
Peak Flow dataset: Peak Flow Dataset 13.0.3
Supplementary data used: No

Site details

Site number: 3257216875
Site name: FBH_Catchment_Descriptors_479750_174550_v5_0_1
Site location: SU 79750 74550
Easting: 479750
Northing: 174550
Catchment area: 0.27 km²
SAAR: 641 mm
BFIHOST19: 0.603
FPEXT: 0.414
FARL: 1.000
URBEXT2000: 0.1160

Site data

At-site data

At-site data present: No

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Analysis settings

Urbanisation settings

User defined: No
Urban area: 0.05 km²
PRimp: 70.00%
Impervious Factor: 0.300
UAF: 1.17469

Growth curve settings

Distance Measure Method: Small catchment
Pooling group URBEXT2000 Threshold: 0.030
Deurbanise Pooling Group L-moments: Yes

QMED settings

Use at-site data: No
Method: Donor Station(s)

Growth curve data and results

Pooling group AM data

Station	Distance	Years of data	QMED AM	L-CV Observed	L-CV Deurbanised	L-SKEW Observed	L-SKEW Deurbanised
76011 (Coal Bum @ Coalburn)	2.094	46	1.826	0.170	0.170	0.296	0.296
27051 (Crimple @ Burn Bridge)	2.821	51	4.564	0.217	0.217	0.142	0.141
45816 (Haddeo @ Upton)	3.136	30	3.352	0.288	0.289	0.408	0.407
25019 (Leven @ Easby)	3.268	45	5.090	0.341	0.342	0.373	0.372
28033 (Dove @ Hollinsclough)	3.415	48	4.138	0.235	0.235	0.367	0.367
49005 (Bolingey Stream @ Bolingey Cocks Bridge)	3.522	13	4.072	0.274	0.275	0.295	0.294
27010 (Hodge Beck @ Bransdale Weir)	3.578	41	9.420	0.224	0.224	0.293	0.293
36010 (Bumpstead Brook @ Broad Green)	3.668	56	7.855	0.348	0.350	0.107	0.106
7009 (Mosset Burn @ Wardend Bridge)	3.737	25	7.053	0.365	0.365	0.329	0.329
25011 (Langdon Beck @ Langdon)	3.861	37	15.647	0.225	0.225	0.321	0.321
41020 (Bevern Stream @ Clappers Bridge)	3.969	54	13.780	0.199	0.200	0.164	0.162
24007 (Browney @ Lanchester)	4.090	15	10.981	0.222	0.222	0.212	0.211
73015 (Keer @ High Keer Weir)	4.095	33	12.421	0.204	0.205	0.189	0.189
36004 (Chad Brook @ Long Melford)	4.143	56	4.799	0.301	0.302	0.181	0.180
Total		550					

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Pooling group suitability

Station	Suitability for QMED	Suitability for pooling	Years	Non-flood years	Percentage non-flood years	Mann Kendall (MK)	MK significance (%)	Discordancy	Comments
76011 (Coal Bum @ Coalburn)	Yes	Yes	46	0	0.00			1.008	
27051 (Crimple @ Burn Bridge)	Yes	Yes	51	3	5.88	1.34	None	0.792	
45816 (Haddeo @ Upton)	Yes	Yes	30	1	3.33	-0.45	None	0.885	
25019 (Leven @ Easby)	Yes	Yes	45	3	6.67			1.069	
28033 (Dove @ Hollinslough)	Yes	Yes	48	1	2.08			0.867	
49005 (Bolingey Stream @ Bolingey Cocks Bridge)	Yes	Yes	13	0	0.00			2.438	
27010 (Hodge Beck @ Bransdale Weir)	Yes	Yes	41	1	2.44	-2.10	5	0.257	
36010 (Bumpstead Brook @ Broad Green)	Yes	Yes	56	12	21.43	0.10	None	2.083	
7009 (Mosset Burn @ Wardend Bridge)	Yes	Yes	25	3	12.00			1.158	
25011 (Langdon Beck @ Langdon)	Yes	Yes	37	0	0.00			0.466	
41020 (Bevern Stream @ Clappers Bridge)	Yes	Yes	54	3	5.56	1.19	None	0.832	
24007 (Browney @ Lanchester)	Yes	Yes	15	0	0.00			0.803	
73015 (Keer @ High Keer Weir)	Yes	Yes	33	1	3.03	3.30	5	0.468	
36004 (Chad Brook @ Long Melford)	Yes	Yes	56	7	12.50	-1.61	None	0.873	

Pooling group catchment descriptors

Station	Area	SAAR	FPEXT	FARL	URBEXT2000	BFIHOST19
76011 (Coal Bum @ Coalburn)	1.630	1096	0.074	1.000	0.000	0.274
27051 (Crimple @ Burn Bridge)	8.172	855	0.013	1.000	0.006	0.329
45816 (Haddeo @ Upton)	6.808	1210	0.011	1.000	0.005	0.535
25019 (Leven @ Easby)	15.088	830	0.019	1.000	0.004	0.495
28033 (Dove @ Hollinslough)	7.915	1346	0.007	1.000	0.000	0.347
49005 (Bolingey Stream @ Bolingey Cocks Bridge)	16.080	1044	0.023	0.991	0.006	0.562
27010 (Hodge Beck @ Bransdale Weir)	18.820	987	0.009	1.000	0.001	0.303
36010 (Bumpstead Brook @ Broad Green)	27.547	588	0.045	0.999	0.007	0.367
7009 (Mosset Burn @ Wardend Bridge)	28.295	803	0.060	0.998	0.000	0.606
25011 (Langdon Beck @ Langdon)	12.787	1463	0.012	1.000	0.001	0.264
41020 (Bevern Stream @ Clappers Bridge)	35.480	886	0.076	0.993	0.013	0.362
24007 (Browney @ Lanchester)	44.670	797	0.015	1.000	0.001	0.353
73015 (Keer @ High Keer Weir)	30.043	1158	0.074	0.976	0.003	0.455
36004 (Chad Brook @ Long Melford)	50.328	589	0.065	1.000	0.006	0.456

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Pooling Group Rejected Stations

Station	Distance	Years of data	QMED AM	L-CV Observed	L-CV Deurbanised	L-SKEW Observed	L-SKEW Deurbanised	Comments
27073 (Brompton Beck @ Snainton Ings)	2.708	43	0.812	0.212	0.213	0.033	0.032	
26016 (Gypsy Race @ Kirby Grindalythe)	3.257	26	0.100	0.318	0.318	0.253	0.253	
44008 (South Winterbourne @ Winterbourne Steepleton)	3.655	32	0.572	0.405	0.406	0.254	0.254	
26014 (Water Forlomes @ Driffeld)	3.803	25	0.424	0.318	0.319	0.205	0.204	
47022 (Tory Brook @ Newnham Park)	3.820	28	6.134	0.243	0.245	0.163	0.160	
7012 (Lossie @ Ballachraggan)	3.925	9	7.262	0.488	0.488	0.670	0.670	
7011 (Black Burn @ Pluscarden Abbey)	3.935	11	4.298	0.495	0.495	0.581	0.580	
44013 (Piddle @ Little Puddle)	4.036	31	0.933	0.483	0.484	0.256	0.256	
28058 (Henmore Brook @ Ashbourne)	4.039	13	10.600	0.145	0.147	-0.046	-0.049	
39033 (Winterbourne Stream @ Bagnor)	4.066	61	0.399	0.337	0.337	0.378	0.377	
72014 (Conder @ Galgate)	4.095	56	16.971	0.228	0.229	0.133	0.132	
33054 (Babingley @ Castle Rising)	4.112	47	1.129	0.227	0.228	0.195	0.194	
26015 (Driffeld Canal @ Wansford Bridge)	4.129	13	2.490	0.170	0.173	0.092	0.088	

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Growth curve L-moments

Rural L-CV:	0.257	Urban L-CV:	0.240
Rural L-Skewness:	0.259	Urban L-Skewness:	0.280

Rural fitted parameters

Distribution	Location	Scale	Shape	H	Bound
GL	1.000	0.257	-0.259		0.009
GEV	0.863	0.364	-0.134		-1.846
KAP3	0.930	0.304	-0.203	-0.400	-0.566

Goodness of fit

GL:	0.4547 *
GEV:	-0.9887 *
P3:	-2.8898
GP:	-4.5625
KAP3:	-0.0311 *

* Distribution gives an acceptable fit (absolute Z value < 1.645)

Heterogeneity

Standardised test value H2: 1.8388

The pooling group is possibly heterogeneous and a review of the pooling group is optional.

Standardised growth curves

Rural

Return period	GL	GEV	KAP3
2	1.000	1.000	1.000
5	1.429	1.468	1.445
10	1.761	1.820	1.788
20	2.135	2.192	2.165
25	2.268	2.318	2.296
30	2.382	2.423	2.407
50	2.727	2.730	2.738
75	3.034	2.989	3.026
100	3.271	3.180	3.244
200	3.918	3.673	3.823
500	4.970	4.397	4.724
1000	5.949	5.007	5.525

Urban

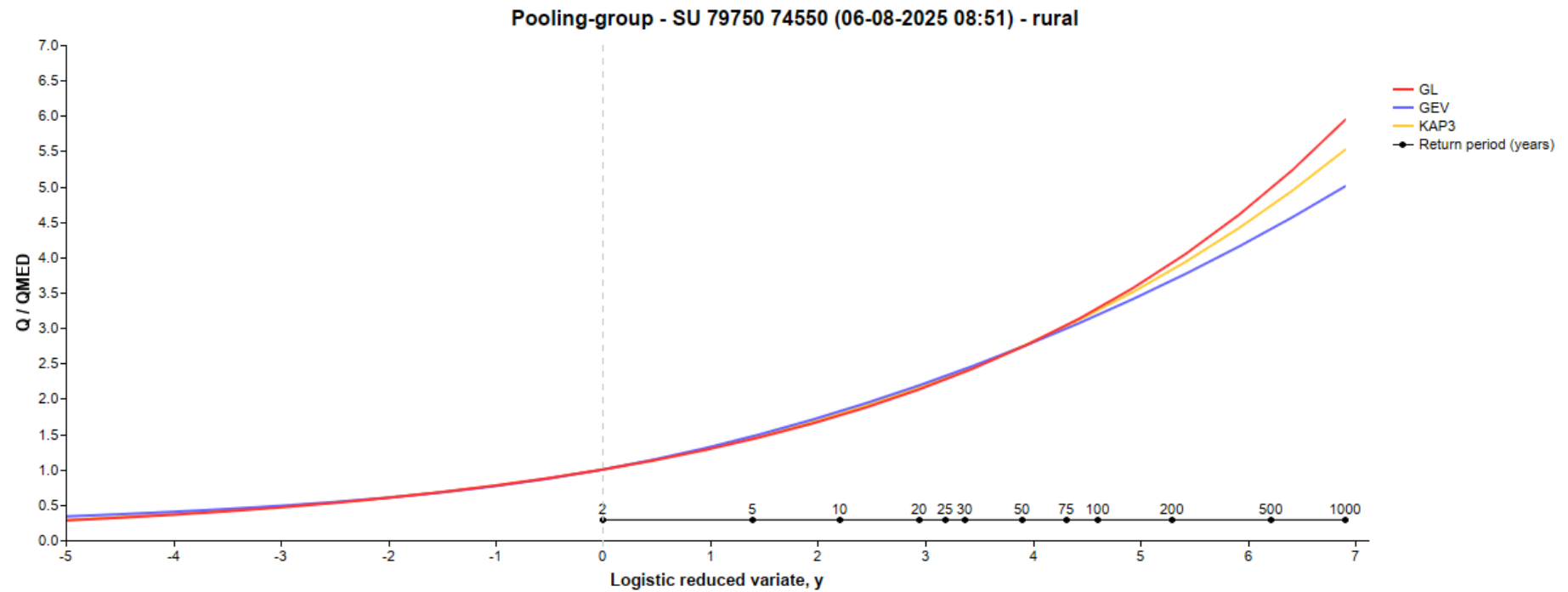
Return period	GL	GEV	KAP3
2	1.000	1.000	1.000
5	1.399	1.434	1.413
10	1.715	1.769	1.739
20	2.077	2.132	2.105
25	2.207	2.256	2.233
30	2.319	2.361	2.343
50	2.661	2.670	2.674
75	2.967	2.934	2.963
100	3.206	3.131	3.185
200	3.864	3.647	3.782
500	4.953	4.424	4.730
1000	5.983	5.095	5.591

Urban fitted parameters

Distribution	Location	Scale	Shape	H	Bound
GL	1.000	0.235	-0.280		0.160
GEV	0.876	0.328	-0.165		-1.110
KAP3	0.936	0.276	-0.229	-0.400	-0.270

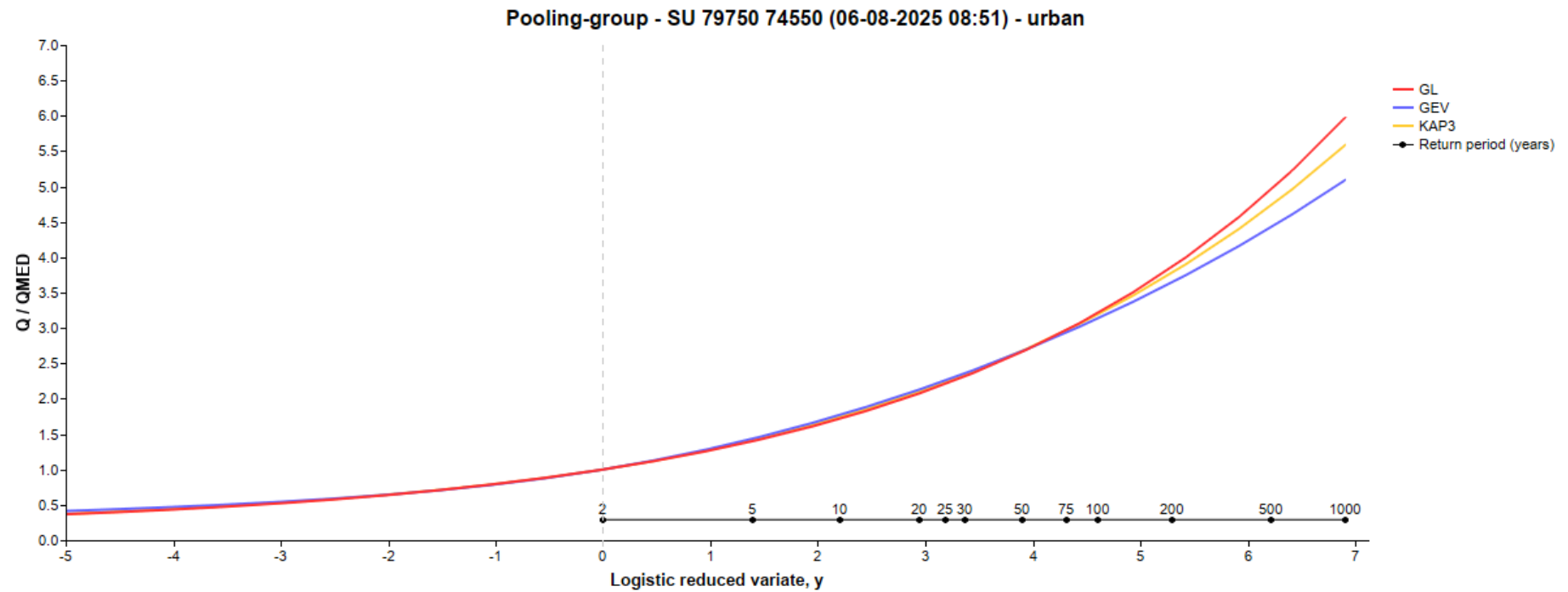
UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

QMED data and results

Donor selection criteria

Only sites suitable for QMED: Yes
URBEXT2000: <0.030
Donor adjusted FSE: 1.417
No. of donors: 1

Donor stations

Station	Distance	Use QMED obs deurbanised	QMED obs	QMED deurbanised	QMED CDs urban	QMED CDs rural
39025 (Enborne @ Brimpton)	33.64	Yes	16.700	16.271	18.310	18.310

Donor suitability

Station	Suitability for QMED	Suitability for pooling	Years	Non-flood years	Percentage non-flood years	Mann Kendall (MKZ)	MKZ significance (%)	Comments
39025 (Enborne @ Brimpton)	Yes	Yes	56	0	0.00	-1.11	None	

Donor catchment descriptors

Station	Area	Centroid X	Centroid Y	SAAR	FPEXT	FARL	URBEXT2000	BFIHOST19
*FEH_Catchment_Descriptors_479750_174550_v5_0_1 @SU 79750 74550)	0.270	479825	173754	641	0.414	1.000	0.116	0.603
39025 (Enborne @ Brimpton)	142.010	448695	160991	789	0.075	0.978	0.020	0.563

Unused Donor stations

Station	Distance	URBEXT	Use QMED obs deurbanised	QMED obs	QMED deurbanised	QMED CDs urban	QMED CDs rural	Centroid X	Centroid Y	Area	SAAR	BFIHOST19	FARL	Years of data	QMED suitability	Pooling suitability
39027 (Pang @ Pangbourne)	26.36	0.012	Yes	2.140	2.081	6.817	6.817	453633	176722	175.683	694	0.782	0.996	55	Yes	No
39033 (Winterbourne Stream @ Bagnor)	34.85	0.001	Yes	0.399	0.398	2.053	2.053	445079	176491	45.312	717	0.812	1.000	61	Yes	Yes
42009 (Candover Stream @ Borough Bridge)	37.55	0.011	Yes	1.065	1.011	1.806	1.806	460964	141288	72.062	819	0.924	0.930	53	Yes	Yes
39029 (Tilling Boume @ Shalford)	39.36	0.022	Yes	1.994	1.905	3.072	3.072	508055	146327	58.775	810	0.744	0.879	55	Yes	No
39036 (Law Brook @ Albury)	39.87	0.008	Yes	0.459	0.452	1.729	1.729	507365	144918	16.062	819	0.699	0.960	53	Yes	No
39019 (Lambourn @ Shaw)	42.46	0.005	Yes	3.545	3.484	6.345	6.345	437608	178282	235.430	736	0.864	0.979	56	Yes	Yes
42007 (Alre @ Drove Lane Alresford)	43.65	0.016	Yes	2.491	2.292	1.215	1.215	462212	133819	57.447	857	0.933	0.864	44	Yes	Yes
39018 (Ock @ Abingdon)	46.24	0.020	Yes	10.450	10.150	13.911	13.911	437750	192941	248.215	637	0.621	0.986	16	Yes	No
39016 (Kennet @ Theale)	46.27	0.017	Yes	38.197	36.443	28.704	28.704	433674	170432	1037.392	758	0.821	0.965	52	Yes	Yes

QMED

Rural: 0.047 m³/s
Urban: 0.055 m³/s

UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

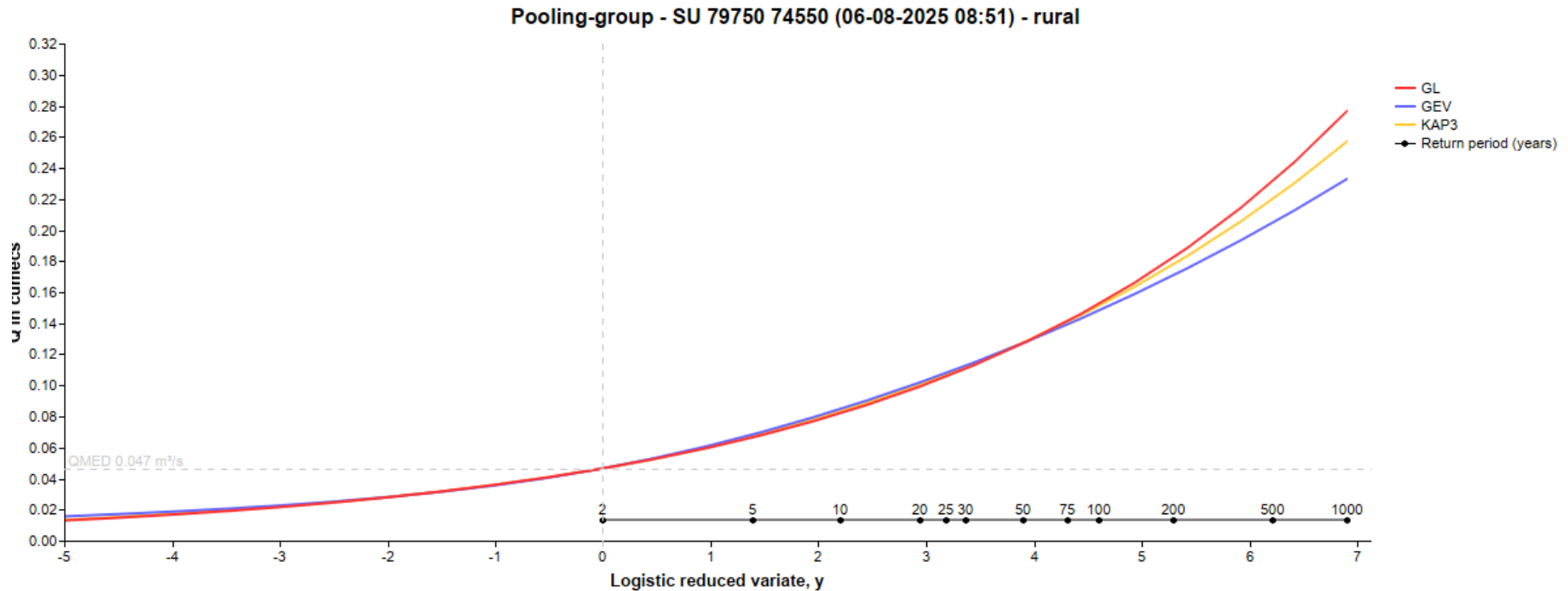
Flood Frequency Curve

Rural Flood Frequency Curve

Return period	GL (m³/s)	GEV (m³/s)	KAP3 (m³/s)
2	0.047	0.047	0.047
5	0.067	0.068	0.067
10	0.082	0.085	0.083
20	0.099	0.102	0.101
25	0.106	0.108	0.107
30	0.111	0.113	0.112
50	0.127	0.127	0.127
75	0.141	0.139	0.141
100	0.152	0.148	0.151
200	0.182	0.171	0.178
500	0.231	0.205	0.220
1000	0.277	0.233	0.257

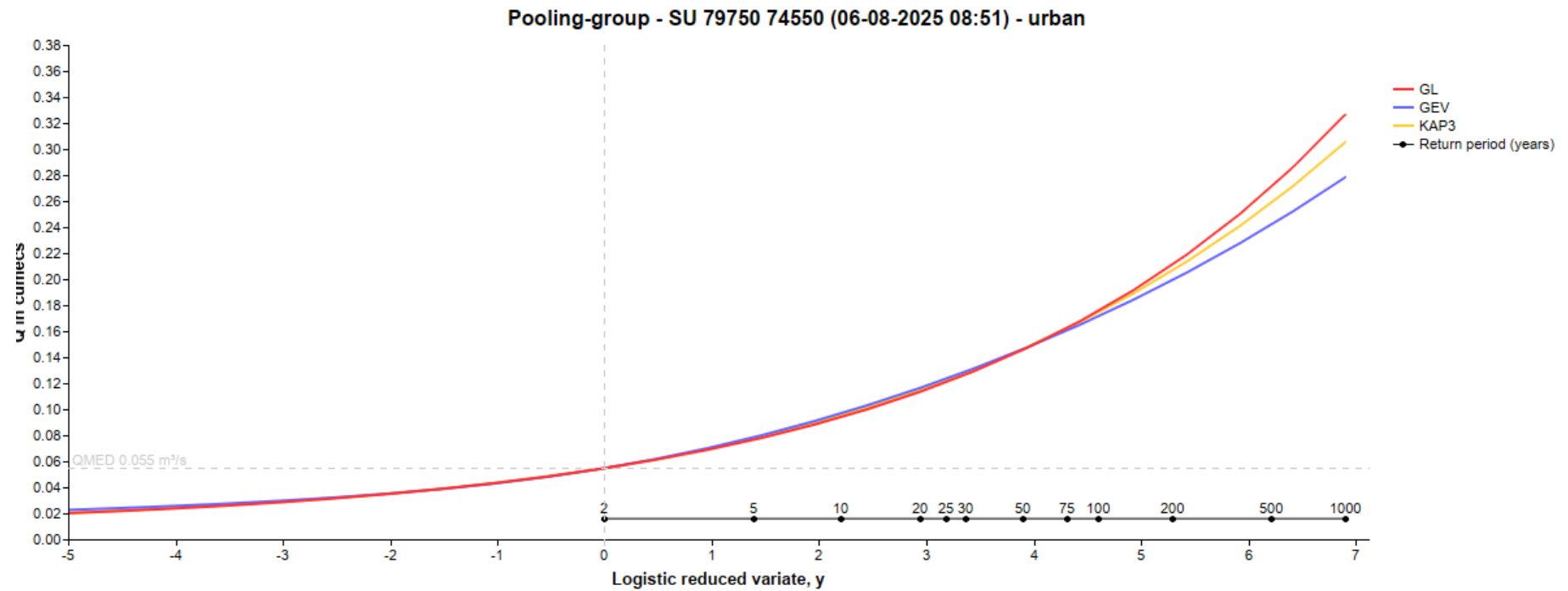
Urban Flood Frequency Curve

Return period	GL (m³/s)	GEV (m³/s)	KAP3 (m³/s)
2	0.055	0.055	0.055
5	0.076	0.078	0.077
10	0.094	0.097	0.095
20	0.114	0.117	0.115
25	0.121	0.123	0.122
30	0.127	0.129	0.128
50	0.146	0.146	0.146
75	0.162	0.160	0.162
100	0.175	0.171	0.174
200	0.211	0.199	0.207
500	0.271	0.242	0.259
1000	0.327	0.279	0.306



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method



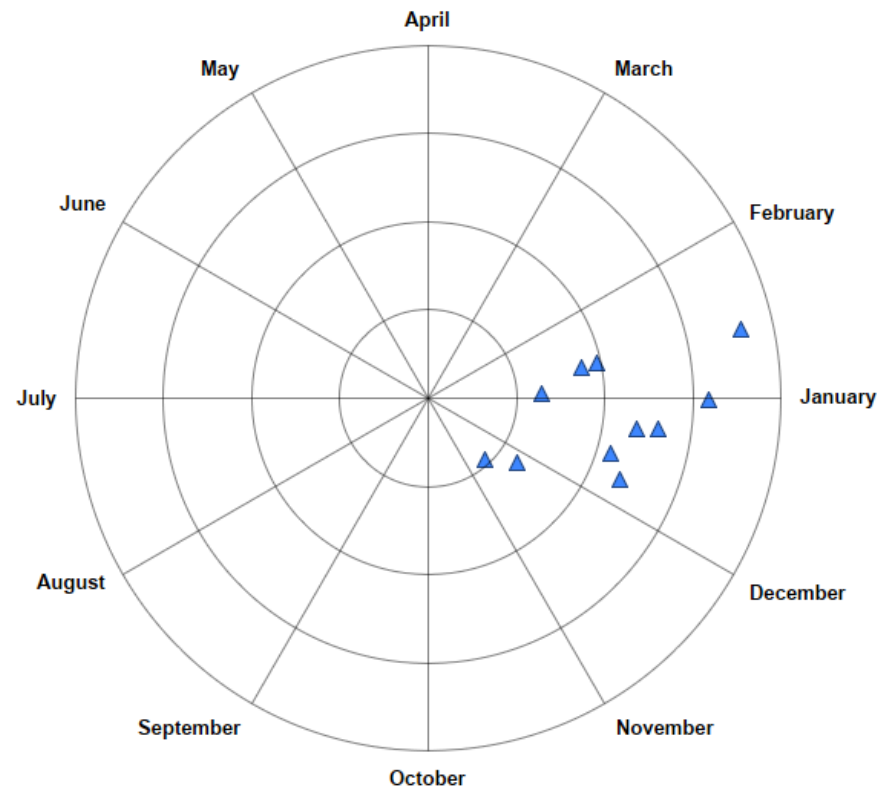
UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Appendix

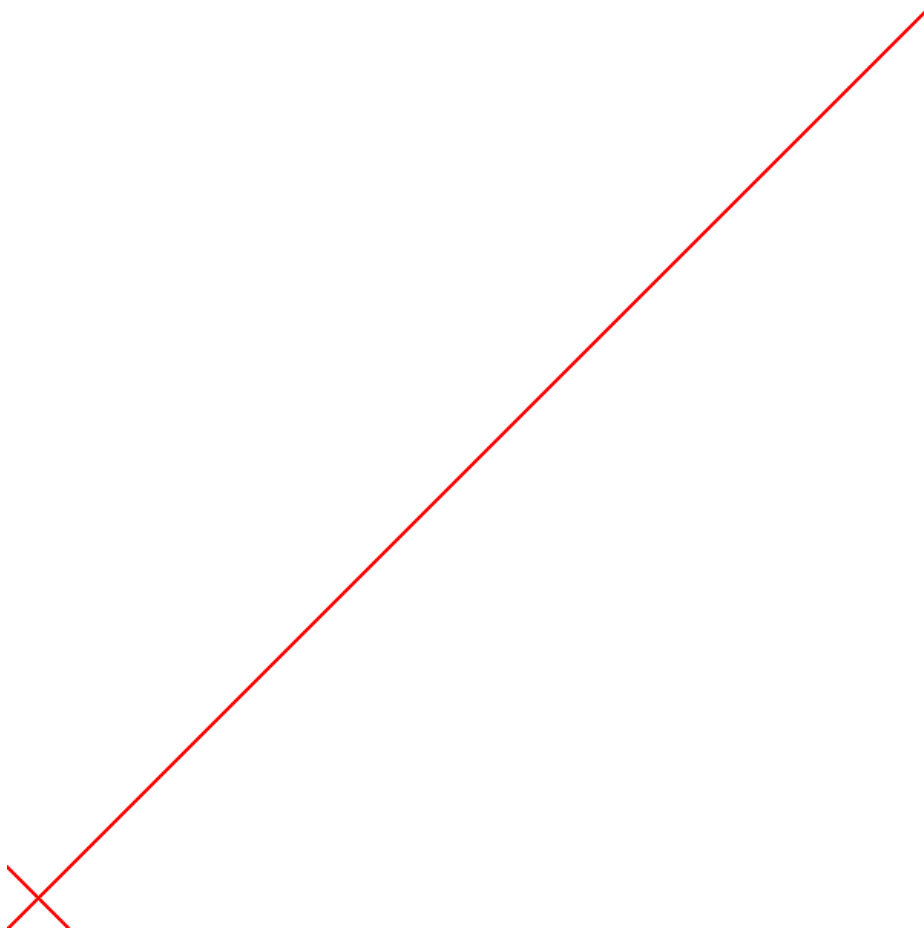
Station record parameters

Flood seasonality: SU 79750 74550 (06-08-2025 08:51) - urban



UK Design Flood Estimation

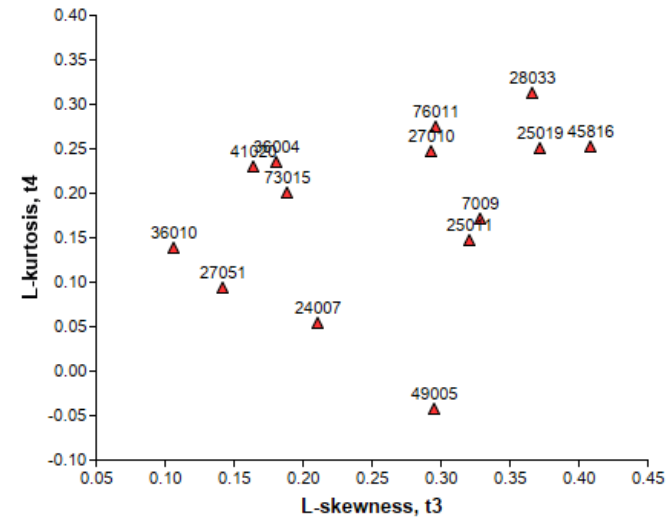
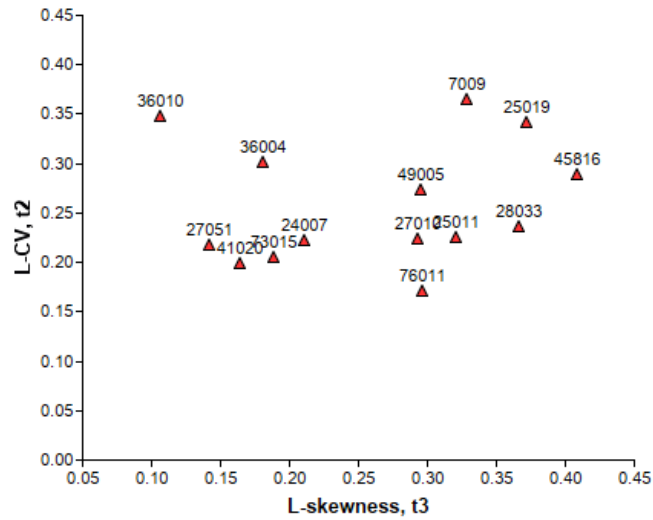
Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

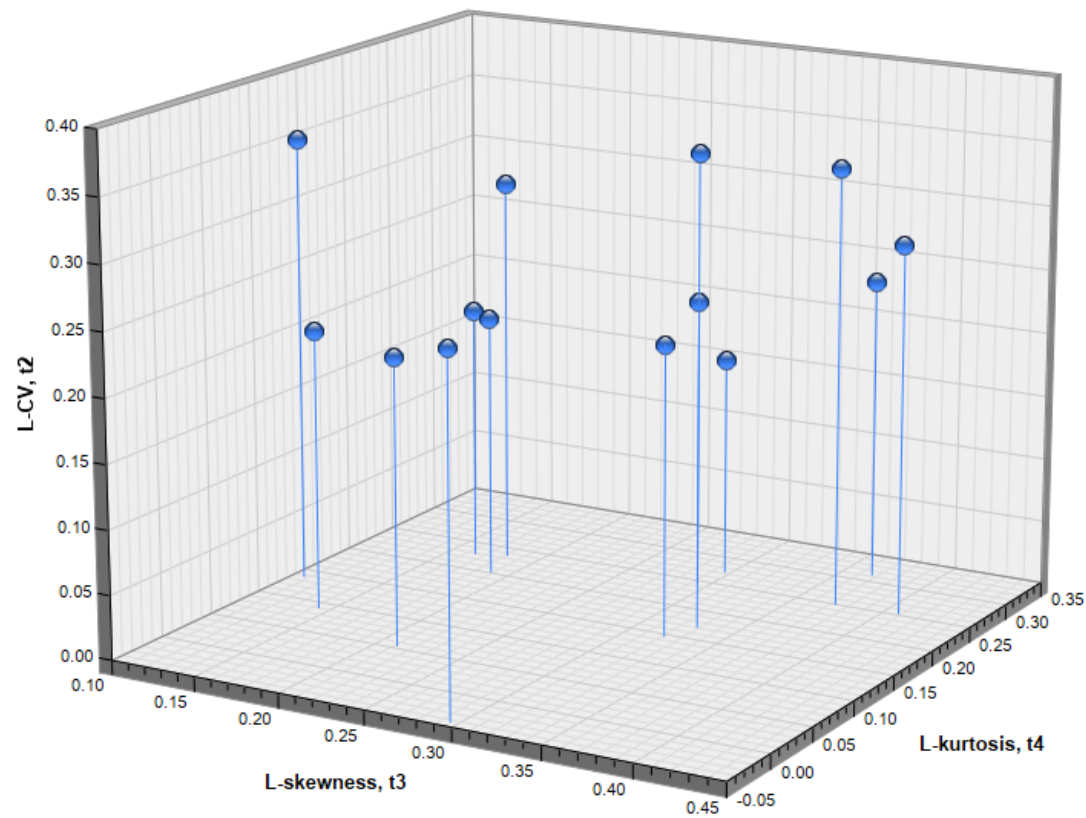
L-moment ratios - SU 79750 74550 (06-08-2025 08:51) - urban



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

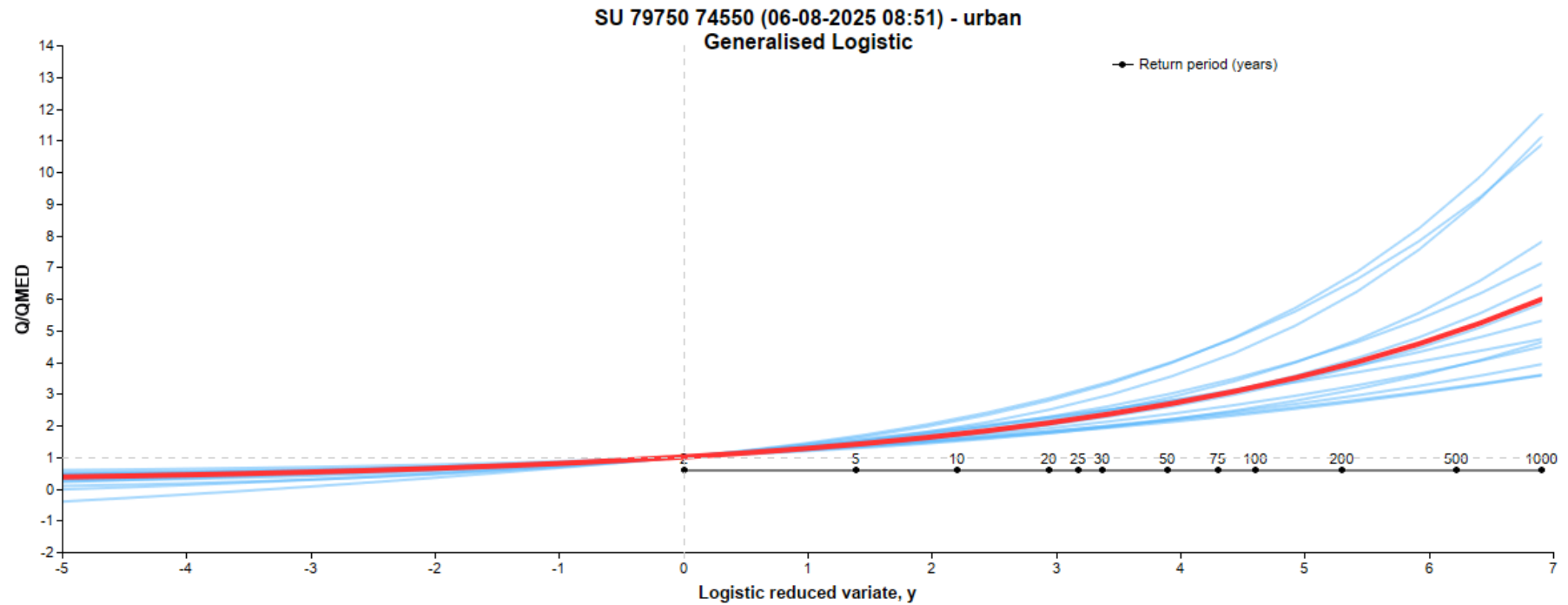
L-moment ratios - SU 79750 74550 (06-08-2025 08:51) - urban



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

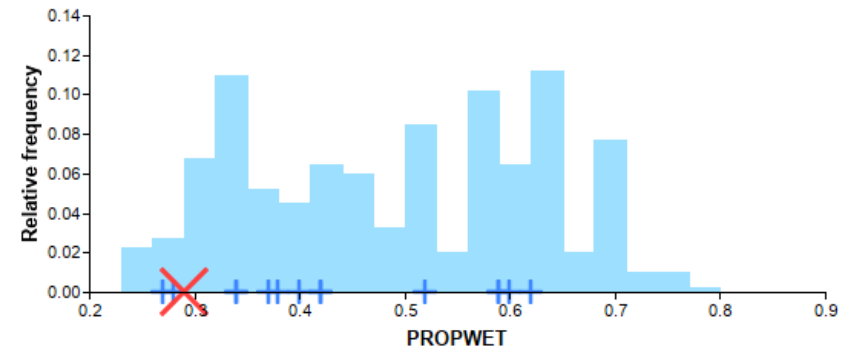
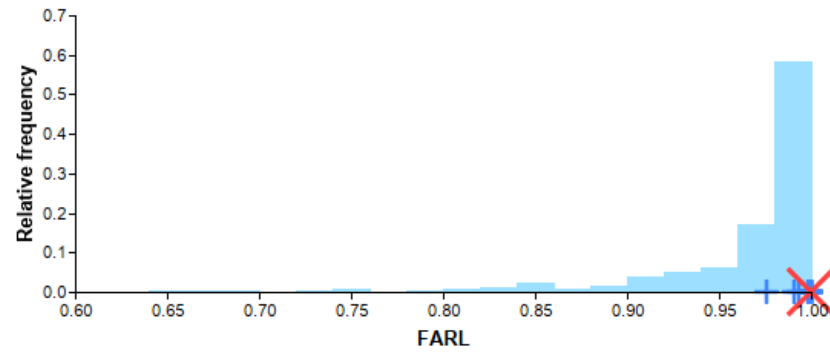
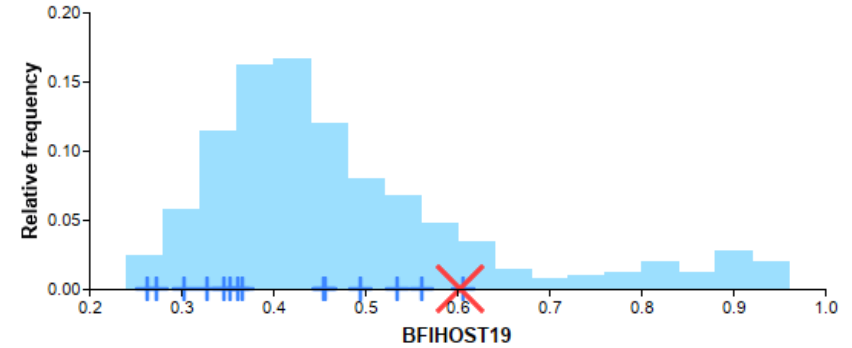
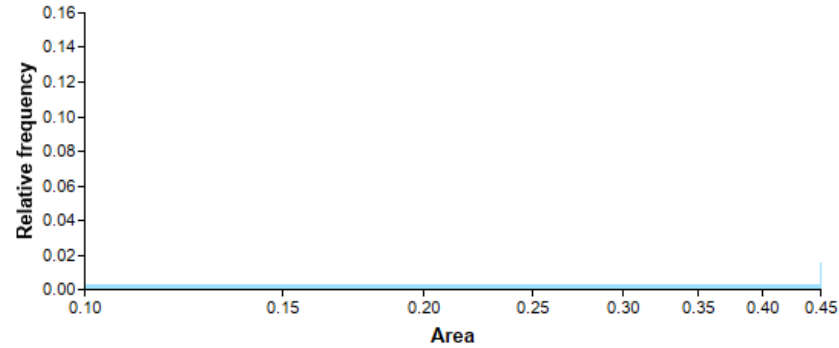
Pooling group growth curves



UK Design Flood Estimation

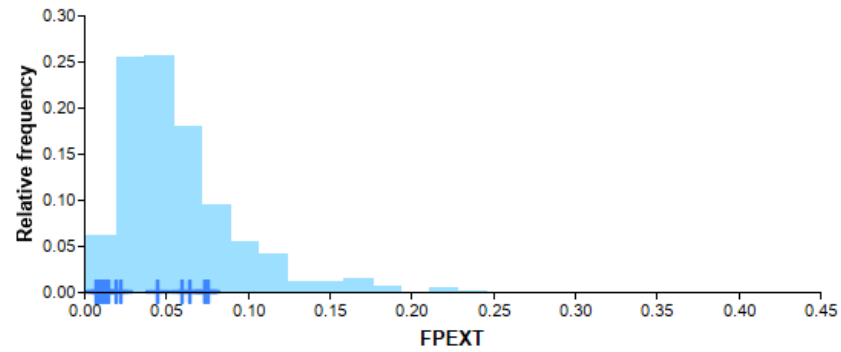
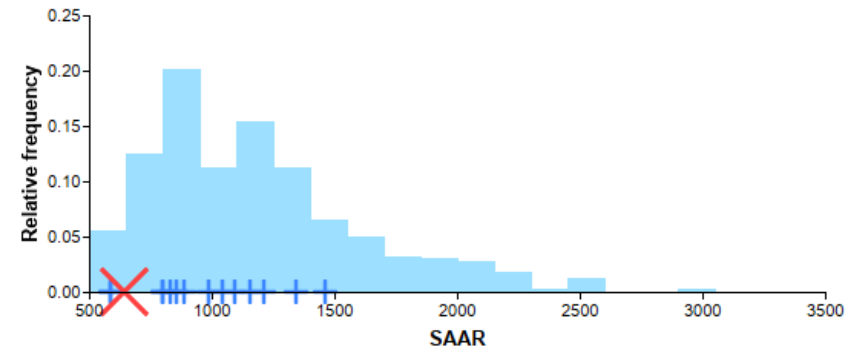
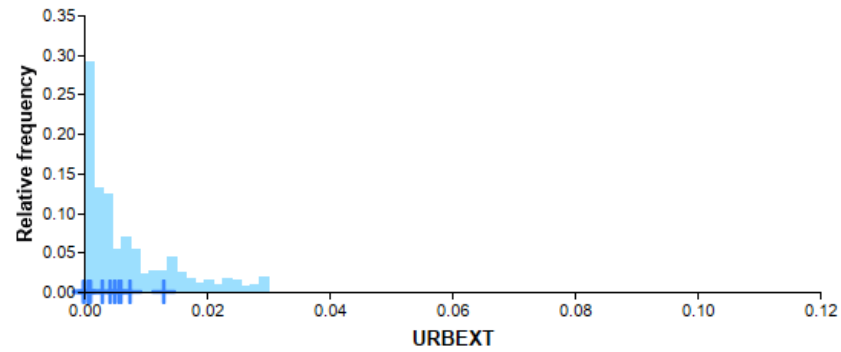
Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method

Catchment descriptors



UK Design Flood Estimation

Summary of ESS/Pooled Estimation Analysis using the Flood Estimation Handbook Statistical Method



UK Design Flood Estimation

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Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

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

Site detailsChecksum: 56E2-EBF5

Site name: FEH_Catchment_Descriptors_479750_174550_v5_0_1

Easting: 479750

Northing: 174550

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.28 [1.17]*

Using plot scale calculations: No

Model: 2.3

Site description:None

Model run: 100 year

Summary of results

Rainfall - FEH22 (mm):	65.54	Total runoff (ML):	2.89
Total Rainfall (mm):	42.24	Total flow (ML):	7.55
Peak Rainfall (mm):	11.49	Peak flow (m³/s):	0.17

Parameters

Where the user has overridden 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 - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	04:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	85.31	No
Cmax (mm)	551.97	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.01	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	34.35	No
BR	2.23	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0.07	No
Effective URBEXT2000	0.16	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	1.207	0.000	0.257	0.000	0.003	0.003
00:30:00	2.265	0.000	0.492	0.000	0.003	0.004
01:00:00	4.211	0.000	0.938	0.002	0.003	0.005
01:30:00	7.693	0.000	1.792	0.007	0.003	0.010
02:00:00	11.488	0.000	2.861	0.016	0.003	0.020
02:30:00	7.693	0.000	2.040	0.034	0.004	0.038
03:00:00	4.211	0.000	1.159	0.060	0.004	0.064
03:30:00	2.265	0.000	0.636	0.089	0.006	0.095
04:00:00	1.207	0.000	0.342	0.118	0.007	0.125
04:30:00	0.000	0.000	0.000	0.141	0.010	0.150
05:00:00	0.000	0.000	0.000	0.152	0.013	0.165
05:30:00	0.000	0.000	0.000	0.152	0.016	0.167
06:00:00	0.000	0.000	0.000	0.142	0.019	0.161
06:30:00	0.000	0.000	0.000	0.127	0.022	0.148
07:00:00	0.000	0.000	0.000	0.110	0.024	0.134
07:30:00	0.000	0.000	0.000	0.094	0.026	0.120
08:00:00	0.000	0.000	0.000	0.079	0.028	0.107
08:30:00	0.000	0.000	0.000	0.065	0.030	0.095
09:00:00	0.000	0.000	0.000	0.054	0.031	0.085
09:30:00	0.000	0.000	0.000	0.043	0.032	0.075
10:00:00	0.000	0.000	0.000	0.034	0.033	0.067
10:30:00	0.000	0.000	0.000	0.027	0.033	0.060
11:00:00	0.000	0.000	0.000	0.020	0.034	0.054
11:30:00	0.000	0.000	0.000	0.015	0.034	0.049
12:00:00	0.000	0.000	0.000	0.011	0.034	0.045
12:30:00	0.000	0.000	0.000	0.007	0.034	0.041
13:00:00	0.000	0.000	0.000	0.004	0.033	0.037
13:30:00	0.000	0.000	0.000	0.002	0.033	0.035
14:00:00	0.000	0.000	0.000	0.001	0.033	0.033
14:30:00	0.000	0.000	0.000	0.000	0.032	0.032
15:00:00	0.000	0.000	0.000	0.000	0.032	0.032
15:30:00	0.000	0.000	0.000	0.000	0.031	0.031
16:00:00	0.000	0.000	0.000	0.000	0.031	0.031
16:30:00	0.000	0.000	0.000	0.000	0.030	0.030

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.000	0.000	0.000	0.000	0.030	0.030
17:30:00	0.000	0.000	0.000	0.000	0.029	0.029
18:00:00	0.000	0.000	0.000	0.000	0.029	0.029
18:30:00	0.000	0.000	0.000	0.000	0.029	0.029
19:00:00	0.000	0.000	0.000	0.000	0.028	0.028
19:30:00	0.000	0.000	0.000	0.000	0.028	0.028
20:00:00	0.000	0.000	0.000	0.000	0.027	0.027
20:30:00	0.000	0.000	0.000	0.000	0.027	0.027
21:00:00	0.000	0.000	0.000	0.000	0.027	0.027
21:30:00	0.000	0.000	0.000	0.000	0.026	0.026
22:00:00	0.000	0.000	0.000	0.000	0.026	0.026
22:30:00	0.000	0.000	0.000	0.000	0.025	0.025
23:00:00	0.000	0.000	0.000	0.000	0.025	0.025
23:30:00	0.000	0.000	0.000	0.000	0.025	0.025
24:00:00	0.000	0.000	0.000	0.000	0.024	0.024
24:30:00	0.000	0.000	0.000	0.000	0.024	0.024
25:00:00	0.000	0.000	0.000	0.000	0.024	0.024
25:30:00	0.000	0.000	0.000	0.000	0.023	0.023
26:00:00	0.000	0.000	0.000	0.000	0.023	0.023
26:30:00	0.000	0.000	0.000	0.000	0.023	0.023
27:00:00	0.000	0.000	0.000	0.000	0.022	0.022
27:30:00	0.000	0.000	0.000	0.000	0.022	0.022
28:00:00	0.000	0.000	0.000	0.000	0.022	0.022
28:30:00	0.000	0.000	0.000	0.000	0.021	0.021
29:00:00	0.000	0.000	0.000	0.000	0.021	0.021
29:30:00	0.000	0.000	0.000	0.000	0.021	0.021
30:00:00	0.000	0.000	0.000	0.000	0.020	0.020
30:30:00	0.000	0.000	0.000	0.000	0.020	0.020
31:00:00	0.000	0.000	0.000	0.000	0.020	0.020
31:30:00	0.000	0.000	0.000	0.000	0.020	0.020
32:00:00	0.000	0.000	0.000	0.000	0.019	0.019
32:30:00	0.000	0.000	0.000	0.000	0.019	0.019
33:00:00	0.000	0.000	0.000	0.000	0.019	0.019
33:30:00	0.000	0.000	0.000	0.000	0.018	0.018
34:00:00	0.000	0.000	0.000	0.000	0.018	0.018

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.000	0.000	0.000	0.000	0.018	0.018
35:00:00	0.000	0.000	0.000	0.000	0.018	0.018
35:30:00	0.000	0.000	0.000	0.000	0.017	0.017
36:00:00	0.000	0.000	0.000	0.000	0.017	0.017
36:30:00	0.000	0.000	0.000	0.000	0.017	0.017
37:00:00	0.000	0.000	0.000	0.000	0.017	0.017
37:30:00	0.000	0.000	0.000	0.000	0.016	0.016
38:00:00	0.000	0.000	0.000	0.000	0.016	0.016
38:30:00	0.000	0.000	0.000	0.000	0.016	0.016
39:00:00	0.000	0.000	0.000	0.000	0.016	0.016
39:30:00	0.000	0.000	0.000	0.000	0.015	0.015
40:00:00	0.000	0.000	0.000	0.000	0.015	0.015
40:30:00	0.000	0.000	0.000	0.000	0.015	0.015
41:00:00	0.000	0.000	0.000	0.000	0.015	0.015
41:30:00	0.000	0.000	0.000	0.000	0.015	0.015
42:00:00	0.000	0.000	0.000	0.000	0.014	0.014
42:30:00	0.000	0.000	0.000	0.000	0.014	0.014
43:00:00	0.000	0.000	0.000	0.000	0.014	0.014
43:30:00	0.000	0.000	0.000	0.000	0.014	0.014
44:00:00	0.000	0.000	0.000	0.000	0.014	0.014
44:30:00	0.000	0.000	0.000	0.000	0.013	0.013
45:00:00	0.000	0.000	0.000	0.000	0.013	0.013
45:30:00	0.000	0.000	0.000	0.000	0.013	0.013
46:00:00	0.000	0.000	0.000	0.000	0.013	0.013
46:30:00	0.000	0.000	0.000	0.000	0.013	0.013
47:00:00	0.000	0.000	0.000	0.000	0.012	0.012
47:30:00	0.000	0.000	0.000	0.000	0.012	0.012
48:00:00	0.000	0.000	0.000	0.000	0.012	0.012
48:30:00	0.000	0.000	0.000	0.000	0.012	0.012
49:00:00	0.000	0.000	0.000	0.000	0.012	0.012
49:30:00	0.000	0.000	0.000	0.000	0.012	0.012
50:00:00	0.000	0.000	0.000	0.000	0.011	0.011
50:30:00	0.000	0.000	0.000	0.000	0.011	0.011
51:00:00	0.000	0.000	0.000	0.000	0.011	0.011
51:30:00	0.000	0.000	0.000	0.000	0.011	0.011

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.000	0.000	0.000	0.000	0.011	0.011
52:30:00	0.000	0.000	0.000	0.000	0.011	0.011
53:00:00	0.000	0.000	0.000	0.000	0.010	0.010
53:30:00	0.000	0.000	0.000	0.000	0.010	0.010
54:00:00	0.000	0.000	0.000	0.000	0.010	0.010
54:30:00	0.000	0.000	0.000	0.000	0.010	0.010
55:00:00	0.000	0.000	0.000	0.000	0.010	0.010
55:30:00	0.000	0.000	0.000	0.000	0.010	0.010
56:00:00	0.000	0.000	0.000	0.000	0.010	0.010
56:30:00	0.000	0.000	0.000	0.000	0.009	0.009
57:00:00	0.000	0.000	0.000	0.000	0.009	0.009
57:30:00	0.000	0.000	0.000	0.000	0.009	0.009
58:00:00	0.000	0.000	0.000	0.000	0.009	0.009
58:30:00	0.000	0.000	0.000	0.000	0.009	0.009
59:00:00	0.000	0.000	0.000	0.000	0.009	0.009
59:30:00	0.000	0.000	0.000	0.000	0.009	0.009
60:00:00	0.000	0.000	0.000	0.000	0.009	0.009
60:30:00	0.000	0.000	0.000	0.000	0.008	0.008
61:00:00	0.000	0.000	0.000	0.000	0.008	0.008
61:30:00	0.000	0.000	0.000	0.000	0.008	0.008
62:00:00	0.000	0.000	0.000	0.000	0.008	0.008
62:30:00	0.000	0.000	0.000	0.000	0.008	0.008
63:00:00	0.000	0.000	0.000	0.000	0.008	0.008
63:30:00	0.000	0.000	0.000	0.000	0.008	0.008
64:00:00	0.000	0.000	0.000	0.000	0.008	0.008
64:30:00	0.000	0.000	0.000	0.000	0.007	0.007
65:00:00	0.000	0.000	0.000	0.000	0.007	0.007
65:30:00	0.000	0.000	0.000	0.000	0.007	0.007
66:00:00	0.000	0.000	0.000	0.000	0.007	0.007
66:30:00	0.000	0.000	0.000	0.000	0.007	0.007
67:00:00	0.000	0.000	0.000	0.000	0.007	0.007
67:30:00	0.000	0.000	0.000	0.000	0.007	0.007
68:00:00	0.000	0.000	0.000	0.000	0.007	0.007
68:30:00	0.000	0.000	0.000	0.000	0.007	0.007
69:00:00	0.000	0.000	0.000	0.000	0.007	0.007

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
69:30:00	0.000	0.000	0.000	0.000	0.006	0.006
70:00:00	0.000	0.000	0.000	0.000	0.006	0.006
70:30:00	0.000	0.000	0.000	0.000	0.006	0.006
71:00:00	0.000	0.000	0.000	0.000	0.006	0.006
71:30:00	0.000	0.000	0.000	0.000	0.006	0.006
72:00:00	0.000	0.000	0.000	0.000	0.006	0.006
72:30:00	0.000	0.000	0.000	0.000	0.006	0.006
73:00:00	0.000	0.000	0.000	0.000	0.006	0.006
73:30:00	0.000	0.000	0.000	0.000	0.006	0.006
74:00:00	0.000	0.000	0.000	0.000	0.006	0.006
74:30:00	0.000	0.000	0.000	0.000	0.006	0.006
75:00:00	0.000	0.000	0.000	0.000	0.006	0.006
75:30:00	0.000	0.000	0.000	0.000	0.005	0.005
76:00:00	0.000	0.000	0.000	0.000	0.005	0.005
76:30:00	0.000	0.000	0.000	0.000	0.005	0.005
77:00:00	0.000	0.000	0.000	0.000	0.005	0.005
77:30:00	0.000	0.000	0.000	0.000	0.005	0.005
78:00:00	0.000	0.000	0.000	0.000	0.005	0.005
78:30:00	0.000	0.000	0.000	0.000	0.005	0.005
79:00:00	0.000	0.000	0.000	0.000	0.005	0.005
79:30:00	0.000	0.000	0.000	0.000	0.005	0.005
80:00:00	0.000	0.000	0.000	0.000	0.005	0.005
80:30:00	0.000	0.000	0.000	0.000	0.005	0.005
81:00:00	0.000	0.000	0.000	0.000	0.005	0.005
81:30:00	0.000	0.000	0.000	0.000	0.005	0.005
82:00:00	0.000	0.000	0.000	0.000	0.004	0.004
82:30:00	0.000	0.000	0.000	0.000	0.004	0.004
83:00:00	0.000	0.000	0.000	0.000	0.004	0.004
83:30:00	0.000	0.000	0.000	0.000	0.004	0.004
84:00:00	0.000	0.000	0.000	0.000	0.004	0.004
84:30:00	0.000	0.000	0.000	0.000	0.004	0.004
85:00:00	0.000	0.000	0.000	0.000	0.004	0.004
85:30:00	0.000	0.000	0.000	0.000	0.004	0.004
86:00:00	0.000	0.000	0.000	0.000	0.004	0.004
86:30:00	0.000	0.000	0.000	0.000	0.004	0.004

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
87:00:00	0.000	0.000	0.000	0.000	0.004	0.004
87:30:00	0.000	0.000	0.000	0.000	0.004	0.004
88:00:00	0.000	0.000	0.000	0.000	0.004	0.004
88:30:00	0.000	0.000	0.000	0.000	0.004	0.004
89:00:00	0.000	0.000	0.000	0.000	0.004	0.004
89:30:00	0.000	0.000	0.000	0.000	0.004	0.004
90:00:00	0.000	0.000	0.000	0.000	0.004	0.004
90:30:00	0.000	0.000	0.000	0.000	0.004	0.004
91:00:00	0.000	0.000	0.000	0.000	0.003	0.003
91:30:00	0.000	0.000	0.000	0.000	0.003	0.003
92:00:00	0.000	0.000	0.000	0.000	0.003	0.003
92:30:00	0.000	0.000	0.000	0.000	0.003	0.003
93:00:00	0.000	0.000	0.000	0.000	0.003	0.003
93:30:00	0.000	0.000	0.000	0.000	0.003	0.003

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.28 [1.17]	Yes
ALTBAR	38	No
ASPBAR	5	No
ASPVAR	0.68	No
BFIHOST	0.53 [0.42]	Yes
BFIHOST19	0.6 [0.49]	Yes
DPLBAR (km)	0.49 [1.04]	Yes
DPSBAR (mkm ⁻¹)	5.6	No
FARL	1	No
LDP	2.01	No
PROPWET	0.29	No
RMED1H	11.9	No
RMED1D	31.5	No
RMED2D	43.2	No
SAAR (mm)	641	No
SAAR4170 (mm)	649	No
SPRHOST	37.21	No
URBEXT2000	0.16	No
URBEXT1990	0.06	No
URBCONC	0.75	No
URBLOC	1.03	No
DDF parameter C	-0.03	No
DDF parameter D1	0.26	No
DDF parameter D2	0.32	No
DDF parameter D3	0.26	No
DDF parameter E	0.3	No
DDF parameter F	2.69	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.26	No
DDF parameter D2 (1km grid value)	0.31	No
DDF parameter D3 (1km grid value)	0.26	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.69	No

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

UK Design Flood Estimation

Generated on 07 August 2025 14:14:51 by chloenelson
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

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

Site detailsChecksum: 56E2-EBF5

Site name: FEH_Catchment_Descriptors_479750_174550_v5_0_1

Easting: 479750

Northing: 174550

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.28 [1.17]*

Using plot scale calculations: No

Model: 2.3

Site description:None

Model run: 1000 year

Summary of results

Rainfall - FEH22 (mm):	100.80	Total runoff (ML):	4.79
Total Rainfall (mm):	64.96	Total flow (ML):	12.50
Peak Rainfall (mm):	17.67	Peak flow (m³/s):	0.28

Parameters

Where the user has overridden 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 - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	04:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	85.31	No
Cmax (mm)	551.97	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	3.01	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	34.35	No
BR	2.22	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0.07	No
Effective URBEXT2000	0.16	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	1.856	0.000	0.397	0.000	0.003	0.003
00:30:00	3.483	0.000	0.765	0.001	0.003	0.004
01:00:00	6.477	0.000	1.476	0.004	0.003	0.007
01:30:00	11.831	0.000	2.879	0.011	0.003	0.014
02:00:00	17.668	0.000	4.738	0.026	0.003	0.029
02:30:00	11.831	0.000	3.467	0.054	0.004	0.058
03:00:00	6.477	0.000	1.998	0.096	0.005	0.101
03:30:00	3.483	0.000	1.104	0.144	0.007	0.152
04:00:00	1.856	0.000	0.597	0.191	0.010	0.202
04:30:00	0.000	0.000	0.000	0.230	0.014	0.244
05:00:00	0.000	0.000	0.000	0.250	0.019	0.269
05:30:00	0.000	0.000	0.000	0.251	0.024	0.275
06:00:00	0.000	0.000	0.000	0.236	0.029	0.266
06:30:00	0.000	0.000	0.000	0.212	0.034	0.246
07:00:00	0.000	0.000	0.000	0.184	0.039	0.223
07:30:00	0.000	0.000	0.000	0.157	0.043	0.200
08:00:00	0.000	0.000	0.000	0.132	0.046	0.178
08:30:00	0.000	0.000	0.000	0.110	0.048	0.158
09:00:00	0.000	0.000	0.000	0.091	0.050	0.141
09:30:00	0.000	0.000	0.000	0.074	0.052	0.126
10:00:00	0.000	0.000	0.000	0.059	0.053	0.112
10:30:00	0.000	0.000	0.000	0.046	0.054	0.100
11:00:00	0.000	0.000	0.000	0.035	0.055	0.090
11:30:00	0.000	0.000	0.000	0.027	0.055	0.082
12:00:00	0.000	0.000	0.000	0.019	0.055	0.074
12:30:00	0.000	0.000	0.000	0.012	0.055	0.067
13:00:00	0.000	0.000	0.000	0.007	0.055	0.062
13:30:00	0.000	0.000	0.000	0.003	0.054	0.058
14:00:00	0.000	0.000	0.000	0.001	0.054	0.055
14:30:00	0.000	0.000	0.000	0.000	0.053	0.053
15:00:00	0.000	0.000	0.000	0.000	0.052	0.052
15:30:00	0.000	0.000	0.000	0.000	0.051	0.051
16:00:00	0.000	0.000	0.000	0.000	0.051	0.051
16:30:00	0.000	0.000	0.000	0.000	0.050	0.050

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.000	0.000	0.000	0.000	0.049	0.049
17:30:00	0.000	0.000	0.000	0.000	0.048	0.048
18:00:00	0.000	0.000	0.000	0.000	0.048	0.048
18:30:00	0.000	0.000	0.000	0.000	0.047	0.047
19:00:00	0.000	0.000	0.000	0.000	0.046	0.046
19:30:00	0.000	0.000	0.000	0.000	0.046	0.046
20:00:00	0.000	0.000	0.000	0.000	0.045	0.045
20:30:00	0.000	0.000	0.000	0.000	0.044	0.044
21:00:00	0.000	0.000	0.000	0.000	0.044	0.044
21:30:00	0.000	0.000	0.000	0.000	0.043	0.043
22:00:00	0.000	0.000	0.000	0.000	0.042	0.042
22:30:00	0.000	0.000	0.000	0.000	0.042	0.042
23:00:00	0.000	0.000	0.000	0.000	0.041	0.041
23:30:00	0.000	0.000	0.000	0.000	0.041	0.041
24:00:00	0.000	0.000	0.000	0.000	0.040	0.040
24:30:00	0.000	0.000	0.000	0.000	0.039	0.039
25:00:00	0.000	0.000	0.000	0.000	0.039	0.039
25:30:00	0.000	0.000	0.000	0.000	0.038	0.038
26:00:00	0.000	0.000	0.000	0.000	0.038	0.038
26:30:00	0.000	0.000	0.000	0.000	0.037	0.037
27:00:00	0.000	0.000	0.000	0.000	0.037	0.037
27:30:00	0.000	0.000	0.000	0.000	0.036	0.036
28:00:00	0.000	0.000	0.000	0.000	0.036	0.036
28:30:00	0.000	0.000	0.000	0.000	0.035	0.035
29:00:00	0.000	0.000	0.000	0.000	0.035	0.035
29:30:00	0.000	0.000	0.000	0.000	0.034	0.034
30:00:00	0.000	0.000	0.000	0.000	0.034	0.034
30:30:00	0.000	0.000	0.000	0.000	0.033	0.033
31:00:00	0.000	0.000	0.000	0.000	0.033	0.033
31:30:00	0.000	0.000	0.000	0.000	0.032	0.032
32:00:00	0.000	0.000	0.000	0.000	0.032	0.032
32:30:00	0.000	0.000	0.000	0.000	0.031	0.031
33:00:00	0.000	0.000	0.000	0.000	0.031	0.031
33:30:00	0.000	0.000	0.000	0.000	0.030	0.030
34:00:00	0.000	0.000	0.000	0.000	0.030	0.030

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.000	0.000	0.000	0.000	0.030	0.030
35:00:00	0.000	0.000	0.000	0.000	0.029	0.029
35:30:00	0.000	0.000	0.000	0.000	0.029	0.029
36:00:00	0.000	0.000	0.000	0.000	0.028	0.028
36:30:00	0.000	0.000	0.000	0.000	0.028	0.028
37:00:00	0.000	0.000	0.000	0.000	0.027	0.027
37:30:00	0.000	0.000	0.000	0.000	0.027	0.027
38:00:00	0.000	0.000	0.000	0.000	0.027	0.027
38:30:00	0.000	0.000	0.000	0.000	0.026	0.026
39:00:00	0.000	0.000	0.000	0.000	0.026	0.026
39:30:00	0.000	0.000	0.000	0.000	0.026	0.026
40:00:00	0.000	0.000	0.000	0.000	0.025	0.025
40:30:00	0.000	0.000	0.000	0.000	0.025	0.025
41:00:00	0.000	0.000	0.000	0.000	0.024	0.024
41:30:00	0.000	0.000	0.000	0.000	0.024	0.024
42:00:00	0.000	0.000	0.000	0.000	0.024	0.024
42:30:00	0.000	0.000	0.000	0.000	0.023	0.023
43:00:00	0.000	0.000	0.000	0.000	0.023	0.023
43:30:00	0.000	0.000	0.000	0.000	0.023	0.023
44:00:00	0.000	0.000	0.000	0.000	0.022	0.022
44:30:00	0.000	0.000	0.000	0.000	0.022	0.022
45:00:00	0.000	0.000	0.000	0.000	0.022	0.022
45:30:00	0.000	0.000	0.000	0.000	0.021	0.021
46:00:00	0.000	0.000	0.000	0.000	0.021	0.021
46:30:00	0.000	0.000	0.000	0.000	0.021	0.021
47:00:00	0.000	0.000	0.000	0.000	0.021	0.021
47:30:00	0.000	0.000	0.000	0.000	0.020	0.020
48:00:00	0.000	0.000	0.000	0.000	0.020	0.020
48:30:00	0.000	0.000	0.000	0.000	0.020	0.020
49:00:00	0.000	0.000	0.000	0.000	0.019	0.019
49:30:00	0.000	0.000	0.000	0.000	0.019	0.019
50:00:00	0.000	0.000	0.000	0.000	0.019	0.019
50:30:00	0.000	0.000	0.000	0.000	0.019	0.019
51:00:00	0.000	0.000	0.000	0.000	0.018	0.018
51:30:00	0.000	0.000	0.000	0.000	0.018	0.018

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.000	0.000	0.000	0.000	0.018	0.018
52:30:00	0.000	0.000	0.000	0.000	0.017	0.017
53:00:00	0.000	0.000	0.000	0.000	0.017	0.017
53:30:00	0.000	0.000	0.000	0.000	0.017	0.017
54:00:00	0.000	0.000	0.000	0.000	0.017	0.017
54:30:00	0.000	0.000	0.000	0.000	0.016	0.016
55:00:00	0.000	0.000	0.000	0.000	0.016	0.016
55:30:00	0.000	0.000	0.000	0.000	0.016	0.016
56:00:00	0.000	0.000	0.000	0.000	0.016	0.016
56:30:00	0.000	0.000	0.000	0.000	0.016	0.016
57:00:00	0.000	0.000	0.000	0.000	0.015	0.015
57:30:00	0.000	0.000	0.000	0.000	0.015	0.015
58:00:00	0.000	0.000	0.000	0.000	0.015	0.015
58:30:00	0.000	0.000	0.000	0.000	0.015	0.015
59:00:00	0.000	0.000	0.000	0.000	0.014	0.014
59:30:00	0.000	0.000	0.000	0.000	0.014	0.014
60:00:00	0.000	0.000	0.000	0.000	0.014	0.014
60:30:00	0.000	0.000	0.000	0.000	0.014	0.014
61:00:00	0.000	0.000	0.000	0.000	0.014	0.014
61:30:00	0.000	0.000	0.000	0.000	0.013	0.013
62:00:00	0.000	0.000	0.000	0.000	0.013	0.013
62:30:00	0.000	0.000	0.000	0.000	0.013	0.013
63:00:00	0.000	0.000	0.000	0.000	0.013	0.013
63:30:00	0.000	0.000	0.000	0.000	0.013	0.013
64:00:00	0.000	0.000	0.000	0.000	0.013	0.013
64:30:00	0.000	0.000	0.000	0.000	0.012	0.012
65:00:00	0.000	0.000	0.000	0.000	0.012	0.012
65:30:00	0.000	0.000	0.000	0.000	0.012	0.012
66:00:00	0.000	0.000	0.000	0.000	0.012	0.012
66:30:00	0.000	0.000	0.000	0.000	0.012	0.012
67:00:00	0.000	0.000	0.000	0.000	0.011	0.011
67:30:00	0.000	0.000	0.000	0.000	0.011	0.011
68:00:00	0.000	0.000	0.000	0.000	0.011	0.011
68:30:00	0.000	0.000	0.000	0.000	0.011	0.011
69:00:00	0.000	0.000	0.000	0.000	0.011	0.011

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
69:30:00	0.000	0.000	0.000	0.000	0.011	0.011
70:00:00	0.000	0.000	0.000	0.000	0.011	0.011
70:30:00	0.000	0.000	0.000	0.000	0.010	0.010
71:00:00	0.000	0.000	0.000	0.000	0.010	0.010
71:30:00	0.000	0.000	0.000	0.000	0.010	0.010
72:00:00	0.000	0.000	0.000	0.000	0.010	0.010
72:30:00	0.000	0.000	0.000	0.000	0.010	0.010
73:00:00	0.000	0.000	0.000	0.000	0.010	0.010
73:30:00	0.000	0.000	0.000	0.000	0.009	0.009
74:00:00	0.000	0.000	0.000	0.000	0.009	0.009
74:30:00	0.000	0.000	0.000	0.000	0.009	0.009
75:00:00	0.000	0.000	0.000	0.000	0.009	0.009
75:30:00	0.000	0.000	0.000	0.000	0.009	0.009
76:00:00	0.000	0.000	0.000	0.000	0.009	0.009
76:30:00	0.000	0.000	0.000	0.000	0.009	0.009
77:00:00	0.000	0.000	0.000	0.000	0.009	0.009
77:30:00	0.000	0.000	0.000	0.000	0.008	0.008
78:00:00	0.000	0.000	0.000	0.000	0.008	0.008
78:30:00	0.000	0.000	0.000	0.000	0.008	0.008
79:00:00	0.000	0.000	0.000	0.000	0.008	0.008
79:30:00	0.000	0.000	0.000	0.000	0.008	0.008
80:00:00	0.000	0.000	0.000	0.000	0.008	0.008
80:30:00	0.000	0.000	0.000	0.000	0.008	0.008
81:00:00	0.000	0.000	0.000	0.000	0.008	0.008
81:30:00	0.000	0.000	0.000	0.000	0.008	0.008
82:00:00	0.000	0.000	0.000	0.000	0.007	0.007
82:30:00	0.000	0.000	0.000	0.000	0.007	0.007
83:00:00	0.000	0.000	0.000	0.000	0.007	0.007
83:30:00	0.000	0.000	0.000	0.000	0.007	0.007
84:00:00	0.000	0.000	0.000	0.000	0.007	0.007
84:30:00	0.000	0.000	0.000	0.000	0.007	0.007
85:00:00	0.000	0.000	0.000	0.000	0.007	0.007
85:30:00	0.000	0.000	0.000	0.000	0.007	0.007
86:00:00	0.000	0.000	0.000	0.000	0.007	0.007
86:30:00	0.000	0.000	0.000	0.000	0.006	0.006

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
87:00:00	0.000	0.000	0.000	0.000	0.006	0.006
87:30:00	0.000	0.000	0.000	0.000	0.006	0.006
88:00:00	0.000	0.000	0.000	0.000	0.006	0.006
88:30:00	0.000	0.000	0.000	0.000	0.006	0.006
89:00:00	0.000	0.000	0.000	0.000	0.006	0.006
89:30:00	0.000	0.000	0.000	0.000	0.006	0.006
90:00:00	0.000	0.000	0.000	0.000	0.006	0.006
90:30:00	0.000	0.000	0.000	0.000	0.006	0.006
91:00:00	0.000	0.000	0.000	0.000	0.006	0.006
91:30:00	0.000	0.000	0.000	0.000	0.006	0.006
92:00:00	0.000	0.000	0.000	0.000	0.006	0.006
92:30:00	0.000	0.000	0.000	0.000	0.005	0.005
93:00:00	0.000	0.000	0.000	0.000	0.005	0.005
93:30:00	0.000	0.000	0.000	0.000	0.005	0.005
94:00:00	0.000	0.000	0.000	0.000	0.005	0.005
94:30:00	0.000	0.000	0.000	0.000	0.005	0.005
95:00:00	0.000	0.000	0.000	0.000	0.005	0.005
95:30:00	0.000	0.000	0.000	0.000	0.005	0.005
96:00:00	0.000	0.000	0.000	0.000	0.005	0.005
96:30:00	0.000	0.000	0.000	0.000	0.005	0.005
97:00:00	0.000	0.000	0.000	0.000	0.005	0.005
97:30:00	0.000	0.000	0.000	0.000	0.005	0.005
98:00:00	0.000	0.000	0.000	0.000	0.005	0.005
98:30:00	0.000	0.000	0.000	0.000	0.005	0.005
99:00:00	0.000	0.000	0.000	0.000	0.005	0.005

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.28 [1.17]	Yes
ALTBAR	38	No
ASPBAR	5	No
ASPVAR	0.68	No
BFIHOST	0.53 [0.42]	Yes
BFIHOST19	0.6 [0.49]	Yes
DPLBAR (km)	0.49 [1.04]	Yes
DPSBAR (mkm ⁻¹)	5.6	No
FARL	1	No
LDP	2.01	No
PROPWET	0.29	No
RMED1H	11.9	No
RMED1D	31.5	No
RMED2D	43.2	No
SAAR (mm)	641	No
SAAR4170 (mm)	649	No
SPRHOST	37.21	No
URBEXT2000	0.16	No
URBEXT1990	0.06	No
URBCONC	0.75	No
URBLOC	1.03	No
DDF parameter C	-0.03	No
DDF parameter D1	0.26	No
DDF parameter D2	0.32	No
DDF parameter D3	0.26	No
DDF parameter E	0.3	No
DDF parameter F	2.69	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.26	No
DDF parameter D2 (1km grid value)	0.31	No
DDF parameter D3 (1km grid value)	0.26	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.69	No

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

WHS Non-Flood Years Spreadsheet



Project / Site Name Hurst
PeakFlow Dataset Location C:\Users\chloenelson\Downloads\NRFAPeakFlow_v13-0-2\suitable-for-pooling

Pooling Group

Station	Distance	Years of data	QMED AM	L-CV Observed	L-CV Deurbanised	L-SKEW Observed	L-SKEW Deurbanised	Station No	URBEXT2000	L-CVAdj	L-CVAdj (Deurban)	L-SKEWadj	L-SKEWadj (Deurban)	k (Shape)	Beta (Scale)	Notes and Warnings.
76011 (Coal Burn @ Coalburn)	2.094	46	1.826	0.17	0.17	0.296	0.296	76011	0.0000	0.170	0.170	0.296	0.296	-0.296	0.159	
27051 (Crimple @ Burn Bridge)	2.821	51	4.564	0.217	0.217	0.142	0.141	27051	0.0058	0.208	0.209	0.159	0.158	-0.158	0.211	
45816 (Haddoe @ Upton)	3.136	30	3.352	0.288	0.289	0.408	0.407	45816	0.0050	0.283	0.284	0.422	0.421	-0.421	0.253	
25019 (Leven @ Easby)	3.268	45	5.09	0.341	0.342	0.373	0.372	25019	0.0043	0.326	0.327	0.405	0.404	-0.404	0.308	
28033 (Dove @ Hollinsclough)	3.415	48	4.138	0.235	0.235	0.367	0.367	28033	0.0000	0.228	0.228	0.397	0.397	-0.397	0.201	
49005 (Bolingey Stream @ Bolingey Cocks Bridge)	3.522	13	4.072	0.274	0.275	0.295	0.294	49005	0.0060	0.274	0.275	0.295	0.294	-0.294	0.272	
27010 (Hodge Beck @ Bransdale Weir)	3.578	41	9.42	0.224	0.224	0.293	0.293	27010	0.0007	0.220	0.220	0.306	0.306	-0.306	0.210	
36010 (Bumpstead Brook @ Broad Green)	3.668	56	7.855	0.348	0.35	0.107	0.106	36010	0.0075	0.285	0.287	0.175	0.174	-0.174	0.296	SAAR <= 800mm. Non-Flood Yrs over 15% of record, station review recommended.
7009 (Mosset Burn @ Wardend Bridge)	3.737	25	7.053	0.365	0.365	0.329	0.329	7009	0.0000	0.353	0.353	0.335	0.335	-0.335	0.357	
25011 (Langdon Beck @ Langdon)	3.861	37	15.647	0.225	0.225	0.321	0.321	25011	0.0010	0.225	0.225	0.321	0.321	-0.321	0.213	
41020 (Bevern Stream @ Clappers Bridge)	3.969	54	13.78	0.199	0.2	0.164	0.162	41020	0.0129	0.186	0.187	0.210	0.208	-0.208	0.186	
24007 (Brownney @ Lanchester)	4.09	15	10.981	0.222	0.222	0.212	0.211	24007	0.0009	0.222	0.222	0.212	0.211	-0.211	0.223	SAAR <= 800mm.
73015 (Keer @ High Keer Weir)	4.095	33	12.421	0.204	0.205	0.189	0.189	73015	0.0029	0.198	0.198	0.214	0.213	-0.213	0.197	
36004 (Chad Brook @ Long Melford)	4.143	56	4.799	0.301	0.302	0.181	0.18	36004	0.0057	0.254	0.255	0.293	0.292	-0.292	0.250	SAAR <= 800mm.
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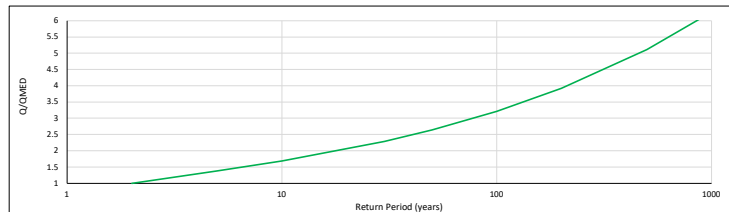
URBAN	0.18
URBEXT2000	0.116

Deurbanise pooling group L-moments	Yes
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SPECIFY TARGET RETURN PERIODS	2	5	10	30	50	100	200	500	1000
	1.000	1.377	1.686	2.292	2.644	3.214	3.918	5.108	6.261

Final Non-Flood Yr Adjusted Growth Curve

Pooled L-CV	0.228
Pooled L-Skew	0.309





Making Sustainability Happen