

FEH Technical Review Sheets



Spreadsheet Version 2.0

Project Details	
Project Number	47061228
Project Name	East Northamptonshire Level 2 Strategic Flood Risk Assessment
Catchment Name	Unnamed Watercourse, Irthlingborough
User Name	Dr Rob Sweet, Sarah Littlewood
Technical Reviewer Name	Dr Rob Sweet

Instructions

These forms create audit sheets for the purposes of undertaking flood estimation calculations in line with the Flood Estimation Handbook and supplementary documents. The user needs to fill in the project details above, these are carried through to the other sheets. The user needs to complete the required worksheets (yellow cells require user input, light green are auto populated, light blue are auto calculated). The required sheets should be populated by hand and checked by the author prior to submission for technical review. Once completed can be saved and printed for technical review. Please note that cells have been protected to avoid deletion of text/formulae.

If pasting values into 'yellow' cells, please select 'Paste Special' and check the 'values' box, this will ensure that the format of the cell is not lost.

FEH Technical Review Sheets: Catchment Descriptors



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FEH CD-ROM Version 3

Easting	495550	Northing	270650
Area	2.65		
Catchment Centroid			
Easting	494300	Northing	271512
FARL	1	RMED-1H	12.2
PROPWET	0.3	RMED-1D	29.6
ALTBAR	77	RMED-2D	37
ASPBAR	133	URBCONC1990	0.518
ASPVAR	0.55	URBEXT1990	0.0567
BFIHOST	0.565	URBLOC1990	0.646
DPLBAR	1.86	URBCONC2000	0.76
DPSBAR	33.4	URBEXT2000	0.1163
LDP	3.13	URBLOC2000	0.659
SAAR	602	FPEXT	0.0803
SAAR4170	596	FPDBAR	1.12
SPRHOST	33.02	FPLOC	0.785
C	-0.02676	C(1km)	-0.026
D1	0.32863	D1(1km)	0.34
D2	0.2586	D2(1km)	0.265
D3	0.25287	D3(1km)	0.241
E	0.31513	E(1km)	0.315
F	2.52065	F(1km)	2.511

Notes	
Is the catchment small (< 5 km ²)?	YES
Is the catchment permeable (SPRHOST < 20)?	NO
Is the catchment urbanised (URBEXT > 0.03)?	YES
Is the catchment flat (DPSBAR < 20)?	NO
Is the catchment low lying (ALTBAR < 20)?	NO
Is the catchment affected by lakes and reservoirs (FARL < 0.95)?	NO

FEH Technical Review Sheets: QMED CDs for Subject Site



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AREA	2.65
FARL	1
BFIHOST	0.565
SAAR	602
SPRHOST	33.02
URBEXT2000	0.1163

Calculation of rural QMED

QMED rural = **0.317**

This is the revised Qmed Equation based on Science Report: SC050050 - Improving the FEH statistical procedures for flood frequency estimation. This can be accessed at:

<http://publications.environment-agency.gov.uk/pdf/SCHO0608BOFF-e-e.pdf>

Calculation of urban adjusted QMED applicable if catchment is urban (URBEXT2000 > 0.03).

QMED = UAF x QMED rural

where UAF = $1 + \text{URBEXT2000}^{0.37} \text{PRUAF}^{2.16}$

and PRUAF = $1 + 0.47\text{URBEXT2000}((70/\text{SPRHOST})-1)$

PRUAF = **1.061216**
 UAF = **1.184174**
 QMED = **0.375**

This follows guidance provided in the WINFAP-FEH v3 User Guide and revised equations in Kjeldsen, T.R. 2009. Modelling the Impact of urbanisation on flood frequency relationships in the UK, Hydrology Research 41(5), p391-405.

Note: When a subject catchment is urbanised (i.e. URBEXT2000 > 0.03) the use of Data Transfer Methods to improve the estimate of QMED is not recommended (see page 38 in WINFAP-FEH v3 User Guide).

FEH Technical Review Sheets: QMED CDs for Donor/Analogue Station



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Station Number	32003	Catchment Centroid	
Station Name	Old Mill Bridge	Easting	491255
Watercourse	Harpers Brook	Northing	284601

AREA	70.46
FARL	1
BFIHOST	0.415
SAAR	622
SPRHOST	40.93
URBEXT2000	0.017

Calculation of rural QMED

8.99

This is the revised Qmed Equation based on Science Report: SC050050 - Improving the FEH statistical procedures for flood frequency estimation. This can be accessed at:

<http://publications.environment-agency.gov.uk/pdf/SCHO0608BOFF-e-e.pdf>

Calculation of urban adjusted QMED applicable if catchment is urban (URBEXT2000 > 0.03).

QMED =UAF x QMED rural

where UAF = $1 + \text{URBEXT2000}^{0.37} \text{PRUAF}^{2.16}$

and PRUAF = $1 + 0.47\text{URBEXT2000}((70/\text{SPRHOST})-1)$

PRUAF = N/A
 UAF = N/A
 QMED = N/A

This follows guidance provided in the WINFAP-FEH v3 User Guide and revised equations in Kjeldsen, T.R. 2009. Modelling the Impact of urbanisation on flood frequency relationships in the UK, Hydrology Research 41(5), p391-405.

Note: When a subject catchment is urbanised (i.e. URBEXT2000 >0.03) the use of Data Transfer Methods to improve the estimate of QMED is not recommended (see page 38 in WINFAP-FEH v3 User Guide).

FEH Technical Review Sheets: Adjustment of QMED by Donor/Analogue Station



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Catchment Centroids	Easting	Northing
Subject Site	494300	271512
32003	491255	284601

Distance between centroids = 13.44

Weight where a = rsg 0.35

QMED OBs 10.158

QMED CDs 8.988

Distance 0.352

Adjustment Factor 1.04

Adjusted QMED = 0.39

Notes

$$QMED_{s,adj} = QMED_{s,cds} \left(\frac{QMED_{g,obs}}{QMED_{g,cds}} \right)^{a_{sg}}$$

Where;

$$a_{sg} = 0.4598 \exp(-0.0200d_{sg}) + (1 - 0.4598) \exp(-0.4785d_{sg})$$

Qmed s = Qmed at subject site

Qmed g = Qmed at gauged (donor or analogue site)

Obs = observed

Cds = catchment descriptors

adj = adjusted

FEH Technical Review Sheets:
Initial Pooling Group



Spreadsheet Version 2.0

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User Name	Dr Rob Sweet, Sarah Littlewood
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Station	Distance	Years	QMED	AM	L-CV	L-SKEW	Discordancy
31026 (Eggleton Brook @ Eggleton)	0.281	31	1.081	0.302	0.123	0.611	
31023 (West Glen @ Easton Wood)	0.764	37	1.906	0.404	0.306	0.679	
76011 (Coal Burn @ Coalburn)	1.333	32	1.822	0.178	0.347	2.1	
32029 (Flore @ Experimental Catchment)	1.605	5	2.538	0.374	0.054	2.105	
45817 (Rhb Trib to Haddeo @ Upton (trib))	1.616	16	1.339	0.292	0.304	0.05	
27038 (Costa Beck @ Gatehouses)	1.659	39	1.332	0.379	0.512	1.156	
205999 (Woodburn @ Control)	1.818	11	0.121	0.173	0.076	1.52	
44009 (Wey @ Broadwey)	1.859	32	1.688	0.34	0.241	0.159	
27051 (Crimple @ Burn Bridge)	1.864	37	4.514	0.22	0.133	0.487	
28070 (Burbage Brook @ Burbage)	1.973	56	4.302	0.341	0.51	1.935	
30014 (Pointon Lode @ Pointon)	2	37	2.663	0.404	0.328	1.076	
45816 (Haddeo @ Upton)	2.028	16	3.539	0.331	0.427	0.382	
28033 (Dove @ Hollinsclough)	2.318	30	4.654	0.257	0.403	0.741	
27073 (Brompton Beck @ Snainton Ings)	2.37	29	0.743	0.205	0.011	1.337	
45818 (Withiel Florey Stream @ Bessom Bridge)	2.47	17	4.179	0.352	0.37	1.28	
44801 (Hooke @ Hooke)	2.471	17	1.421	0.238	0.236	1.466	
44006 (Sydling Water @ Sydling st Nicholas)	2.485	35	0.853	0.227	0.087	1.064	
47805 (Wolf @ Germansweek)	2.548	18	13.677	0.394	0.31	0.561	
25019 (Leven @ Easby)	2.596	31	6.088	0.355	0.396	0.29	
Total		526					
Weighted means				0.305	0.283		

Sites Not OK for Pooling	
Sites Not OK for Pooling or Qmed	
Discordant Sites	
Short Record	

Notes:

Select Pooling Group Details within WINFAP-FEH (click on top left to select all, then CTRL + C), then select cell A13 on this sheet and CTRL + V, this will paste in details from WINFAP-FEH. Highlight stations accordingly as per indicators within WINFAP-FEH.

H2 = 2.913 - Pooling Group is Heterogeneous and a review is desirable
All Stations identified as 'Not OK for Pooling' were removed and also 32029 due to the short record length.

FEH Technical Review Sheets:
Revised Pooling Group



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Station	Distance	Years (QMED AM	L-CV	L-SKEW	Discordancy	
76011 (Coal Burn @ Coalburn)	1.333	31	1.805	0.188	0.368	0.85
45817 (Rhb Trib to Haddeo @ Upton (trib))	1.616	15	1.317	0.304	0.313	0.506
44009 (Wey @ Broadwey)	1.859	31	1.679	0.345	0.259	0.885
27051 (Crimple @ Burn Bridge)	1.864	36	4.61	0.219	0.122	0.445
45816 (Haddeo @ Upton)	2.028	14	3.427	0.318	0.449	0.795
28033 (Dove @ Hollinsclough)	2.318	29	4.608	0.262	0.406	0.435
27073 (Brompton Beck @ Snainton Ings)	2.37	28	0.739	0.21	0.017	0.883
44006 (Sydling Water @ Sydling st Nicholas)	2.485	34	0.861	0.231	0.087	0.482
25019 (Leven @ Easby)	2.596	30	5.538	0.361	0.411	0.914
26802 (Gypsey Race @ Kirby Grindalythe)	2.598	9	0.142	0.236	0.134	0.517
54091 (Severn @ Hafren Flume)	2.859	33	5.91	0.188	0.283	2.742
25011 (Langdon Beck @ Langdon)	2.88	22	15.362	0.254	0.405	1.528
54092 (Severn @ Hore Flume)	2.894	33	6.32	0.116	-0.075	2.132
27010 (Hodge Beck @ Bransdale Weir)	3.006	41	9.42	0.224	0.293	0.128
25003 (Trout Beck @ Moor House)	3.037	35	15.09	0.173	0.346	0.95
44008 (Sth Winterbourne @ W'bourne Steeple	3.093	29	0.406	0.39	0.34	1.463
206006 (Annalong @ Recorder 1895)	3.114	48	15.33	0.189	0.052	1.28
91802 (Allt Leachdach @ Intake)	3.156	34	6.35	0.153	0.257	1.066
Total		532				
Weighted means				0.243	0.244	

Notes:

Select Pooling Group Details (once revised from Initial Pooling Group) within WINFAP-FEH (click on top left to select all, then CTRL + C), then select cell A13 on this sheet and CTRL + V, this will paste in details from WINFAP-FEH. Highlight stations accordingly as per indicators within WINFAP-FEH.

H2 = 2.8047, therefore a slight improvement on 'Initial Pooling Group', however it is noted that the SDM measures are greater (upto 3.156), this is likely to be due to the small catchment area and therefore suitable stations are unlikely to be within reasonable tolerances (e.g. 5 * catchment area). Goodness-of-Fit (absolute Z value) - all Z values are outside of the absolute Z value of 1.645, however, th Generalised Logistic provides the lowest Z value (-1.7950) and this distribution typically provides the best fit for use in deriving Growth Curve Factors and Flood Frequency Estimate.

FEH Technical Review Sheets: Growth Curve Factors & Flood Frequency Estimates



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Growth Curve Fitting GL		Flow Derived from Growth Curve GL	
2	1	2	0.375
5	1.368	5	0.514
10	1.654	10	0.621
20	1.977	20	0.742
25	2.092	25	0.786
50	2.49	50	0.935
100	2.963	100	1.113
200	3.528	200	1.325
500	4.448	500	1.67
1000	5.307	1000	1.993

Notes:

Select Growth Curve Factors and Flood Frequency Estimates within WINFAP-FEH (click on top left to select all, then CTRL + C), then paste into this sheet using CTRL + V, this will paste in details from WINFAP-FEH.

Growth Curve was adjusted for Urbanisation within WINFAP-FEH v3, derived Qmed is consistent with urban adjustment of Qmed calculated in 'Subject Site - QMED CDs' worksheet.