

# ReFH Technical Review Sheets



Spreadsheet Version 1.0

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.**



# ReFH 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
<b>PROPWET</b>	0.3	RMED-1D	29.6
ALTBAR	77	RMED-2D	37
ASPBAR	133	URBCONC1990	0.518
ASPVAR	0.55	<b>URBEXT1990</b>	0.0567
<b>BFIHOST</b>	0.565	URBLOC1990	0.646
<b>DPLBAR</b>	1.86	URBCONC2000	0.76
<b>DPSBAR</b>	33.4	URBEXT2000	0.1163
LDP	3.13	URBLOC2000	0.659
<b>SAAR</b>	602	FPEXT	0.0803
SAAR4170	596	FPDBAR	1.12
SPRHOST	33.02	FPLOC	0.785
<b>C</b>	-0.02676	C(1km)	-0.026
<b>D1</b>	0.32863	D1(1km)	0.34
<b>D2</b>	0.2586	D2(1km)	0.265
<b>D3</b>	0.25287	D3(1km)	0.241
<b>E</b>	0.31513	E(1km)	0.315
<b>F</b>	2.52065	F(1km)	2.511

Notes	
Is the catchment small (<0.5 km <sup>2</sup> )?	NO
Is the catchment permeable (SPRHOST < 20)?	NO
Is the catchment urbanised (URBEXT1990 > 0.025)?	YES

**Note: If the answer is 'YES' to the above questions above, FEH Statistical Method is likely to be more appropriate or should be compared with to inform selection of flow estimates.**



# ReFH Technical Review Sheets: Update of URBEXT1990 using UEF



Spreadsheet Version 2.0

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Existing URBEXT Value

URBEXT1990                      0.0567

Year to update to                      2012

UEF    1.0701

**Updated URBEXT1990 =                      0.0607**

Notes:

The UEF (Urban Expansion factor) for revising the URBEXT1990 value is:

$$UEF = 0.8165 + 0.2254 \tan^{-1} \left\{ \frac{Year - 1967.5}{21.25} \right\}$$

As described in Flood Estimation Handbook Volume 5: Catchment Descriptors - Section 6.5.8 (Equation 6.8)

# ReFH Technical Review Sheets: Subject Site Model Parameter Check



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## ReFH Subject Site Parameters

BFIHOST	0.565
PROPWET	0.3
DPLBAR	1.86
DPSBAR	33.4
URBEXT1990	0.0607

### Loss Model

C<sub>max</sub> = 463.12

### Routing Model

T<sub>p</sub> = 2.59

### Baseflow Model

BL = 35.21

BR = 1.31

Notes:

This follows guidance provided in the Flood Estimation Handbook Supplementary Report No. 1 - The revitalised FSR/FEH rainfall-runoff method, Kjeldsen, T.R. 2007.

Loss model equation:

$$C_{\max} = 596.7 \text{ BFIHOST}^{0.95} \text{ PROPWET}^{-0.24}$$

Routing Model Equation:

$$T_p = 1.56 \text{ PROPWET}^{-1.09} \text{ DPLBAR}^{0.6} (1 + \text{URBEXT1990})^{-3.34} \text{ DPSBAR}^{-0.28}$$

Baseflow Model Equations:

$$\text{BL} = 25.5 \text{ BFIHOST}^{0.47} \text{ DPLBAR}^{0.21} \text{ PROPWET}^{-0.53} (1 + \text{URBEXT1990})^{-3.01}$$

where BL is the Baseflow Lag

$$\text{BR} = 3.75 \text{ BFIHOST}^{1.08} \text{ PROPWET}^{0.36}$$

where BR is the Baseflow Recharge

# ReFH Technical Review Sheets: Donor Site Suitability



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	Donor Site	Subject Site	
Station Number	32003		
Station Name	Old Mill Bridge		
Watercourse	Harpers Brook		
Area	70.46	2.65	
Centroid Northing	284601	271512	Distance between centroids
Centroid Easting	491255	494300	
BFIHOST	0.415	0.565	
PROPWET	0.3	0.3	
DPLBAR	12.5	1.86	
DPSBAR	37.7	33.4	
URBEXT1990	0.0081	0.0607	

Notes:

This follows guidance provided in the Flood Estimation Handbook Supplementary Report No. 1 - The revitalised FSR/FEH rainfall-runoff method, Kjeldsen, T.R. 2007.

ReFH stations located close to the subject site can be identified using the FEH CD-ROM v3 and selecting the appropriate tick box within the menu. General caution is advised when estimating ReFH model parameters using donor transfer. No authoritative set of rules exist but these guiding principles should be taken into consideration (based on Houghton Carr, 1999).

- 1) Catchment descriptors should be comparable; in particular catchment area should differ by less than a factor of 5.
- 2) Catchment centroids should normally be separated by a distance of less than 50 km.
- 3) Catchments should be substantially rural. This is a stringent criterion, with the purpose of discouraging transfer of information between mainly rural and substantially urban catchments. In the event that both the subject site and the gauged site are moderately or heavily urbanised, it is important to verify that the location (URBLOC) and concentration (URBCONC) of the urban area, and underlying soil types, are broadly comparable.
- 4) Transfer of information between catchments within the same river basin is preferred, the ideal case being when the gauged site is located just upstream or downstream of the subject site. However, transfer from an otherwise suitable catchment in a neighbouring or nearby river basin is also useful.





# ReFH Technical Review Sheets: Donor Site Model Calculated and Observed Values



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## ReFH Donor Site Parameters - Calculated by ReFH

Station Number	32003
BFIHOST	0.415
PROPWET	0.3
DPLBAR	12.5
DPSBAR	37.7
URBEXT1990	0.0087

### Loss Model

Cmax 345.46

### Routing Model

Tp 9.27

### Baseflow Model

BL 52.87

BR 0.94

## ReFH Donor Site Parameters - Observed

### Loss Model

Cmax 248.80

### Routing Model

Tp 7.05

### Baseflow Model

BL 62.30

BR 0.84

### Notes:

This follows guidance provided in the Flood Estimation Handbook Supplementary Report No. 1 - The revitalised FSR/FEH rainfall-runoff method, Kjeldsen, T.R. 2007.

Donor site calculated values for Cmax, BL, BR and Tp generated using same equations provided on 'Subject Site Model Parameter' review sheet. URBEXT1990 updated by UEF value provided in 'Update of URBEXT1990 Value' sheet.

Donor site observed values for Cmax, BL, BR and Tp from Appendix C, Flood Estimation Handbook Supplementary Report No. 1 - The revitalised FSR/FEH rainfall-runoff method.

# FEH Technical Review Sheets: Adjusted Model Parameters



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	Subject Site	Adjustment Factor	Adjusted Value
<b>Cmax</b>	<b>463.12</b>	<b>0.720</b>	<b>334</b>
<b> Tp</b>	<b>2.59</b>	<b>0.760</b>	<b>1.97</b>
<b>BL</b>	<b>35.21</b>	<b>1.178</b>	<b>41.5</b>
<b>BR</b>	<b>1.31</b>	<b>0.893</b>	<b>1.17</b>

Notes:

This follows guidance provided in the Flood Estimation Handbook Supplementary Report No. 1 - The revitalised FSR/FEH rainfall-runoff method, Kjeldsen, T.R. 2007. See Section 3.4 - Information Transfer from Donor Sites

Adjusted site values calculated for Cmax, BL, BR and Tp using following equation:

$$SS\ Adj = SS\ cds * (DS\ obs/DS\ cds)$$

Where *SS* is the Subject Site, *DS* is the Donor Site, *cds* are model parameters from catchment descriptors, *obs* are observed values and *Adj* are the adjusted value.

