Introductory Lectures on the FSU Methodologies
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04 - Calculation of the Index Flood (QMED)

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Presentation Structure

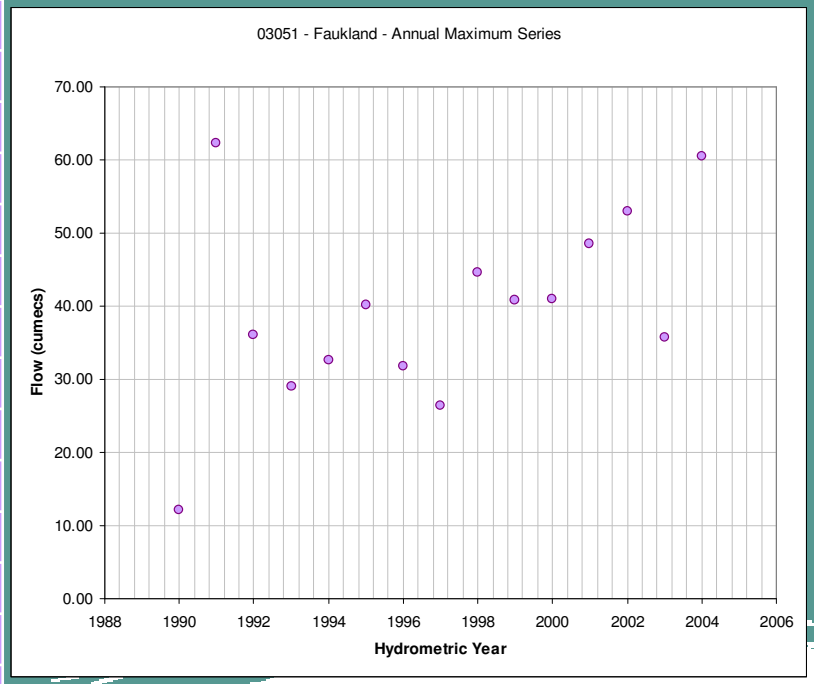
- What is the Index Flood (QMED) ?
- Classification of FSU Stations
- FSU Procedure for Calculating Design Flows for a Specified Return Period

What is the Index Flood (QMED)?

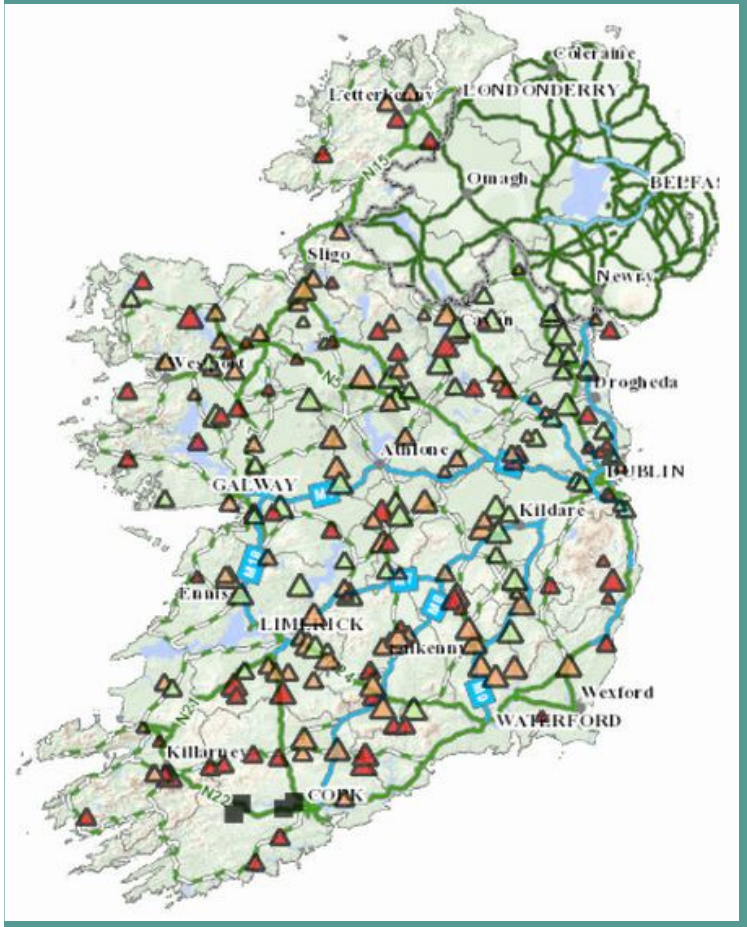
- At a gauged location, it is the median of the Annual Maximum (Amax) series
- QMED is the flood with a return period of 2 years
- As a rule-of-thumb it is approximately equivalent to bankfull flow
- At ungauged locations a methodology using Physical Catchment Descriptors (PCDs) has been developed

QMED from Annual Maxima (Amax) Series

Annual Maximum Series of Recorded Levels and Estimated Flows					
Hydrometric Year	Date		Staff Gauge Reading (m)	Estimated Flow (m^3/s)	FSU Station Class.
1990	28/10/1990		0.88	12.10	B
1991	21/12/1991		2.01	62.30	B
1992	15/01/1993		1.55	36.10	B
1993	26/02/1994		1.40	29.00	B
1994	31/01/1995		1.48	32.70	B
1995	29/11/1995		1.63	40.10	B
1996	19/02/1997		1.46	31.80	B
1997	18/11/1997		1.37	26.40	B
1998	01/10/1998		1.72	44.60	B
1999	03/03/2000		1.64	40.80	B
2000	08/12/2000		1.65	41.00	B
2001	20/02/2002		1.79	48.60	B
2002	22/10/2002		1.86	52.90	B
2003	20/03/2004		1.55	35.80	B
2004	08/01/2005		1.98	60.50	B
			QMED	40.10	



Classification of FSU Stations



Record length indicated by size of triangles

216 FSU Stations

- 54 A1-Stations
  HGF/Qmed > 1.3
- 85 A2 Stations
  1.3> HGF/Qmed > 1.00
- 77 B-Stations
  1 > HGF/Qmed > 0.95
- C and U Stations
  Not Used

FSU Procedure for Calculating Design Flows for a Specified Return Period

- To calculate Q_T (Flood of Return Period T), two items are required:

$$\mathbf{Q_T = QMED \times X_T}$$

Where:

QMED is the Index Flood

X_T is the T-year Return Period Growth Factor

Calculation of QMED at Ungauged Locations

1. Calculate $QMED_{rural}$ at the Subject Site using the FSU 7-variable equation ($QMED_{rural}$ is the QMED value from PCDs without accounting for urbanisation)

2. Choose a gauged location known as a 'Pivotal Site' that will be used to adjust the $QMED_{rural}$ estimate

3. After carrying out the Pivotal Site adjustment apply the urban adjustment factor

1. Calculate QMEDrural at the Subject Site

- $QMEDrural = 1.237 \times 10^{-5} AREA^{0.937} BFIsoil^{-0.922} SAAR^{1.306} FARL^{2.217} DRAIND^{0.341} S1085^{0.185} (1+ARTDRAIN2)^{0.408}$

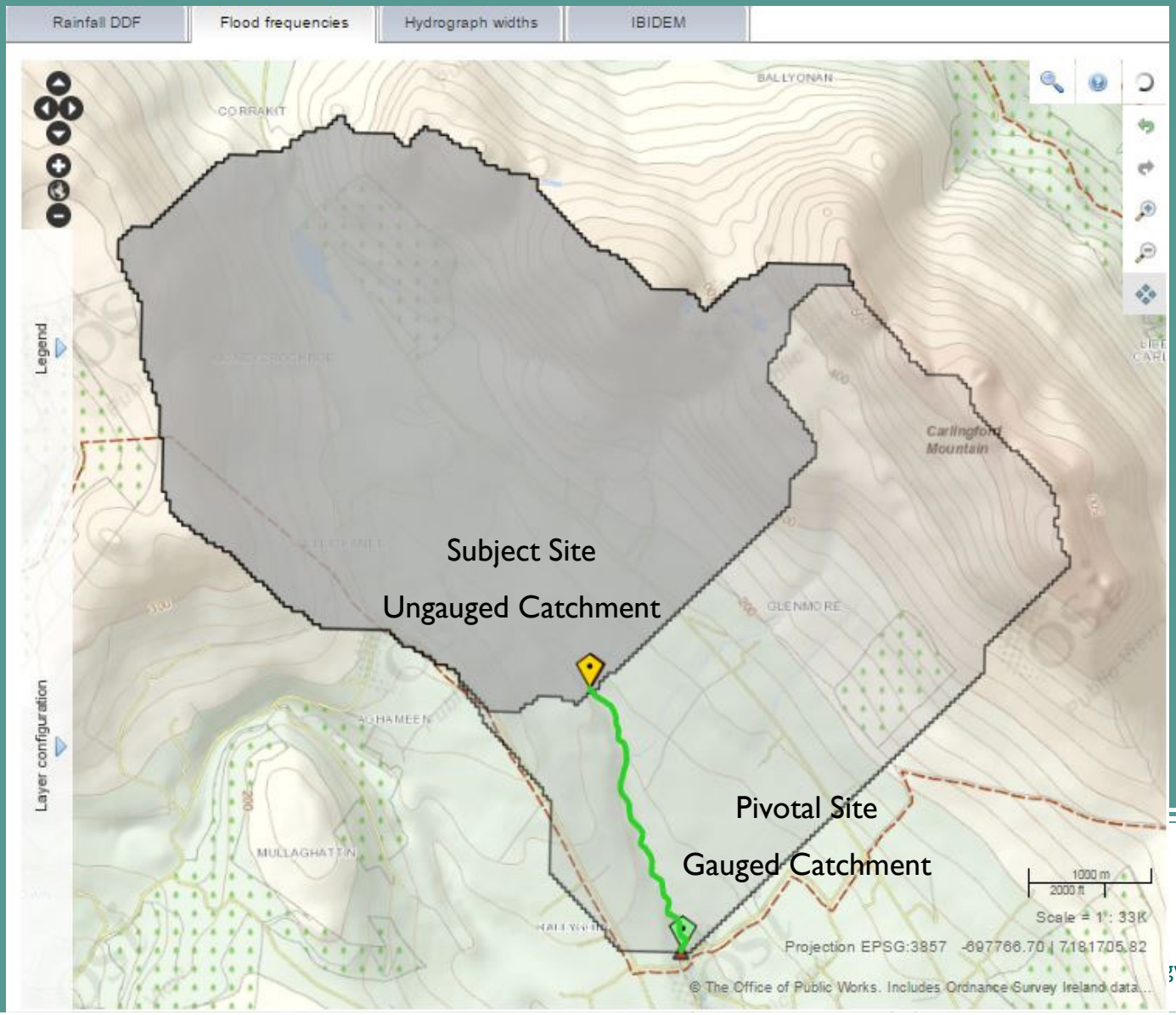
- The QMEDrural equation is equivalent to having only 1-2 years of gauged data at a site

- We must adjust this result by using data from a similar gauged catchment - a **Pivotal Site**

2. Select the Pivotal Site (General Rules)

1. Nearest downstream/upstream gauge on the same river
2. Nearest Gauged Catchment (based on centroids)
3. Selected from the users knowledge of the subject catchment.
4. Selected on the basis of hydrological similarity using *AREA*, *SAAR* and *BFI* values

Pivotal Site Adjustment

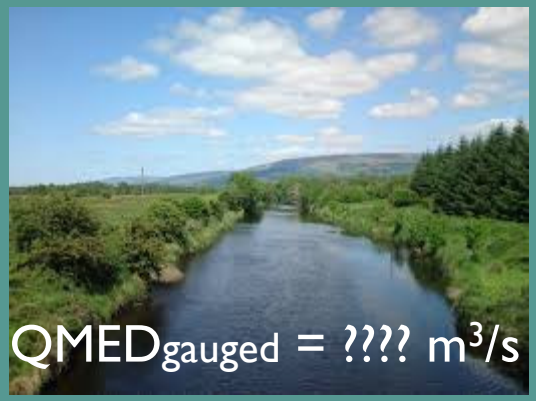


Pivotal Site Adjustment

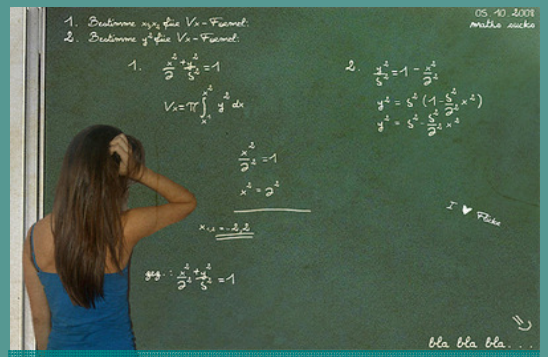
No Gauge

$QMED_{rural}$ = 145 m^3/s

Subject Site



$QMED_{gauged}$ = ???? m^3/s



$QMED_{rural}$ = 170 m^3/s

Pivotal Site

AdjFac = 1.09

$QMED_{gauged}$ = 185 m^3/s

- ADJFAC =$QMED_{gauged}/QMED_{rural}$

Pivotal Site Adjustment

QMEDrural = 145 m^3/s

Subject Site

AdjFac = 1.09

No Gauge

$QMED_{adjusted}$ = 158 m^3/s

- $QMED_{adjusted}$ = QMEDrural x AdjFac

3. Apply the Urban Adjustment Factor

- The value of QMED increases with the degree of urbanisation
- The urban adjustment is as follows:

$$QMED = QMEDadjusted \times (1+URBEXT)^{1.482}$$

- QMED is the final value for QMED at the subject site
- Next step is to calculate the T-year growth factor