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Developing an approach to regulate hydropower in Wales

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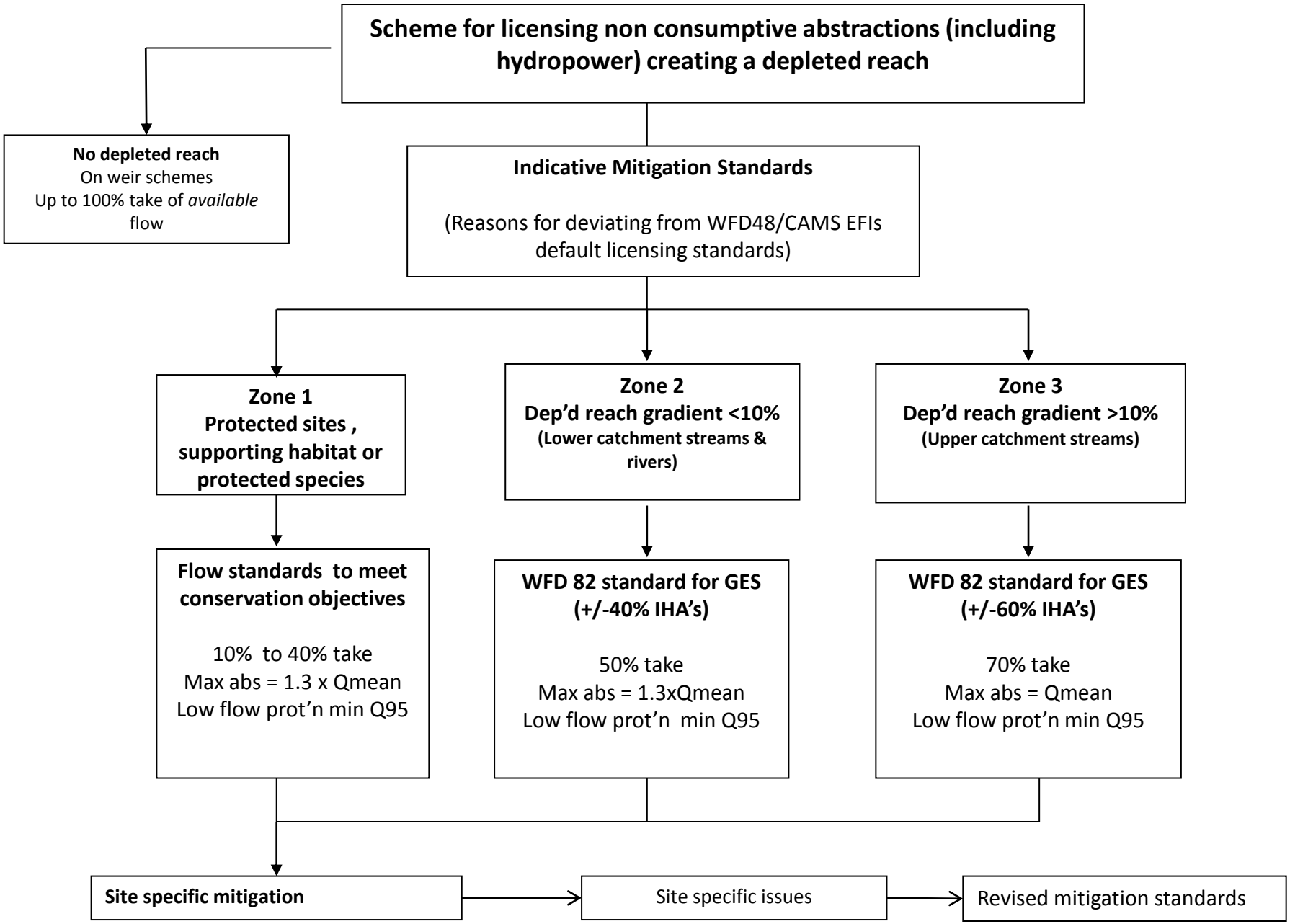
Hydrology & Water Resources Management Team
27 September 2013


Scheme for licensing non consumptive abstractions (including hydropower) creating a depleted reach
No depleted reach
On weir schemes
Up to 100% take of *available* flow
Indicative Mitigation Standards
(Reasons for deviating from WFD48/CAMS EFIs default licensing standards)
Zone 1
Protected sites , supporting habitat or protected species
Zone 2
Dep'd reach gradient <10%
(Lower catchment streams & rivers)
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10% to 40% take
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WFD 82 standard for GES (+/-40% IHA's)
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Site specific mitigation
Site specific issues
Revised mitigation standards

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Ecological Limits to Hydrological Alteration

Uncertainty in quantifying river flow-ecology relationships

BUT

Ecosystems adapted to natural flow regimes

↓

Restrict deviations from the natural flow regime

↓

Ecological Limits to Hydrological Alteration (ELOHA)

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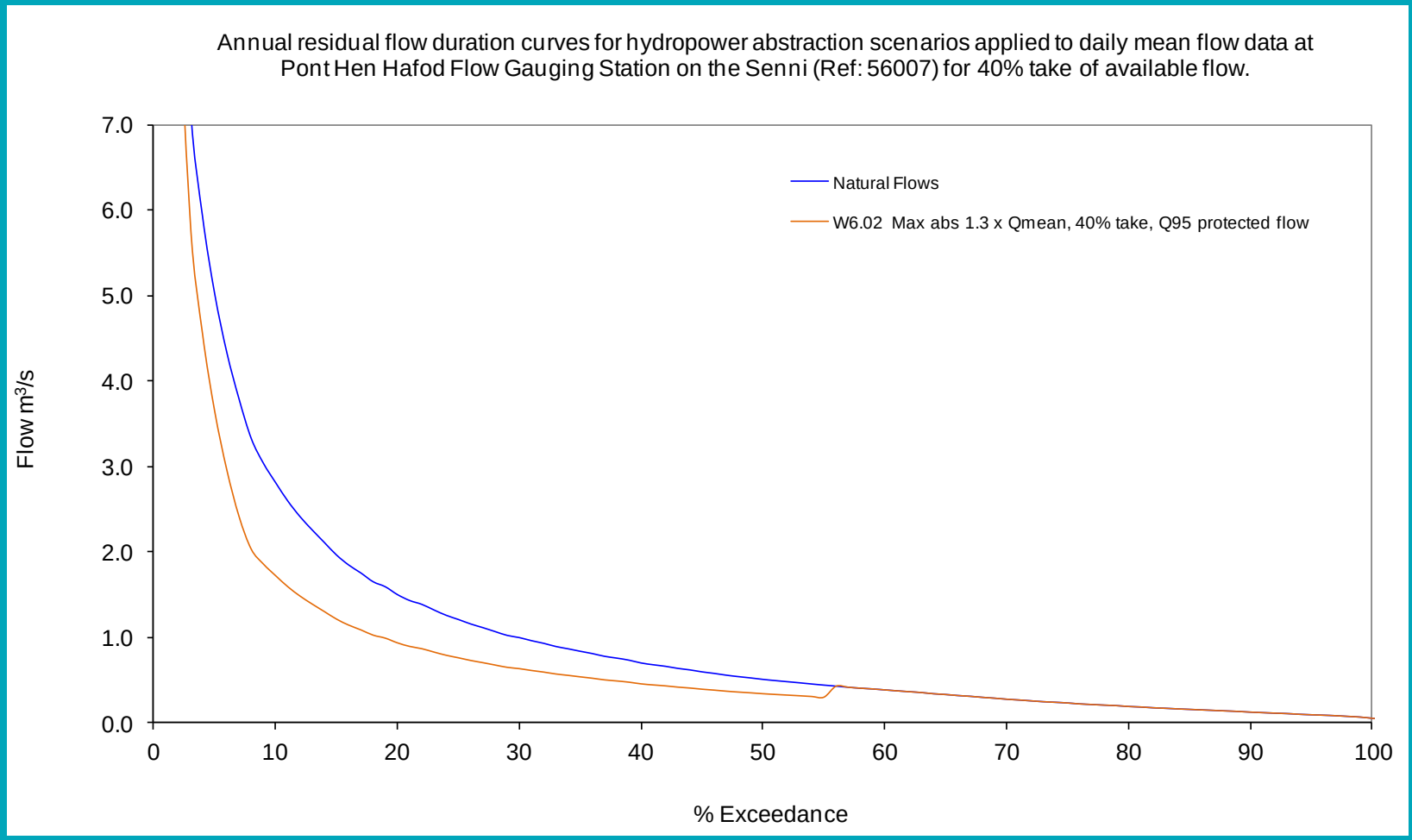
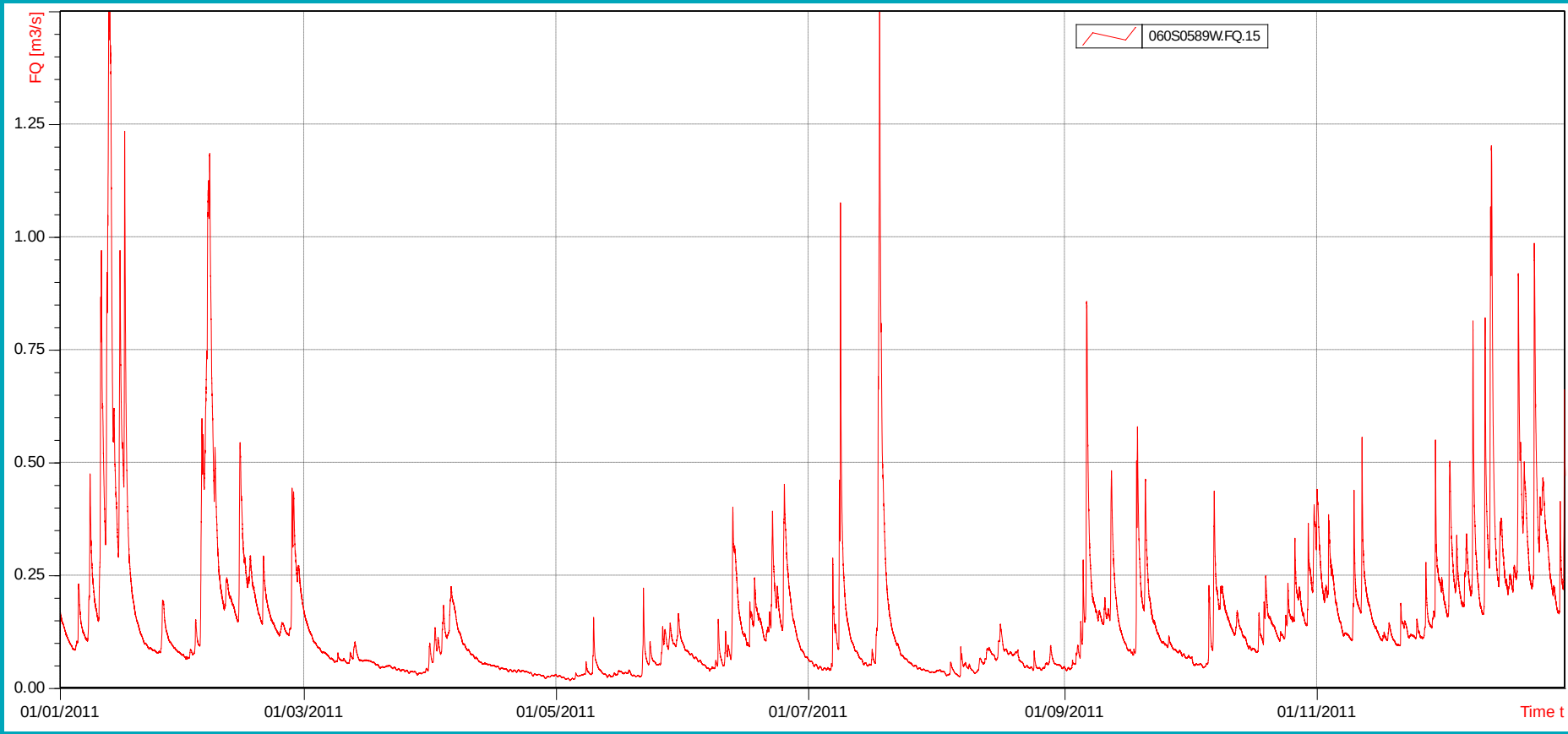
Flows as duration statistics

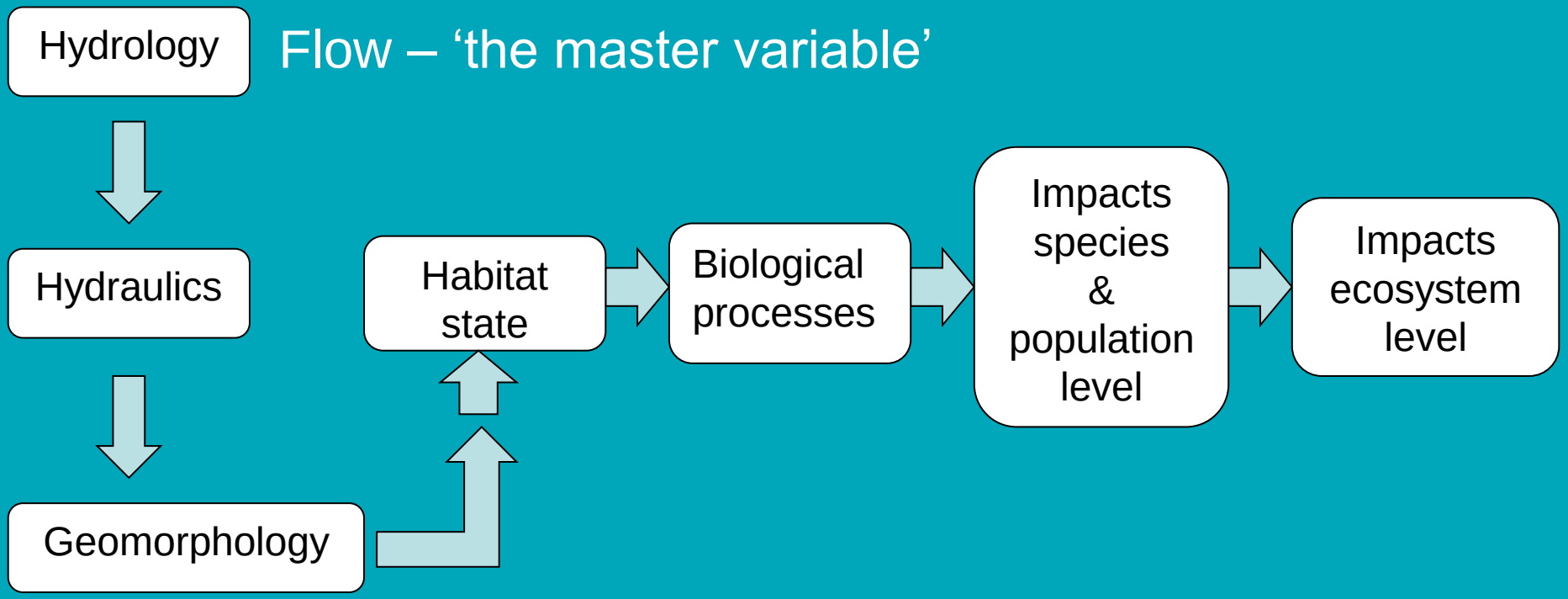


Annual Flow Hydrograph



Source: NRW Hydrometric data base

Impacts of hydrological change - conceptual model



Source: Ecological indicators of the effects of abstraction and flow regulation and optimisation of flow release from water storage reservoirs WFD 21d SNIFFER 2012

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Limits to hydrological alteration - how does this work ?

Richters Indicators of Hydrological Alteration (IHA's)

Assessing deviation

UKTAG Standards (Water Framework Directive Report 82)

0-10% for protected areas and HES.
10-40% low risk of failing to achieve GES
40-80% moderate risk
>80% high risk

Mitigation principles for operational abstraction regimes

- Low flow protection – HoF - %ile
- Flow variability - % take of available flow
- High flow protection - maximum abstraction rate

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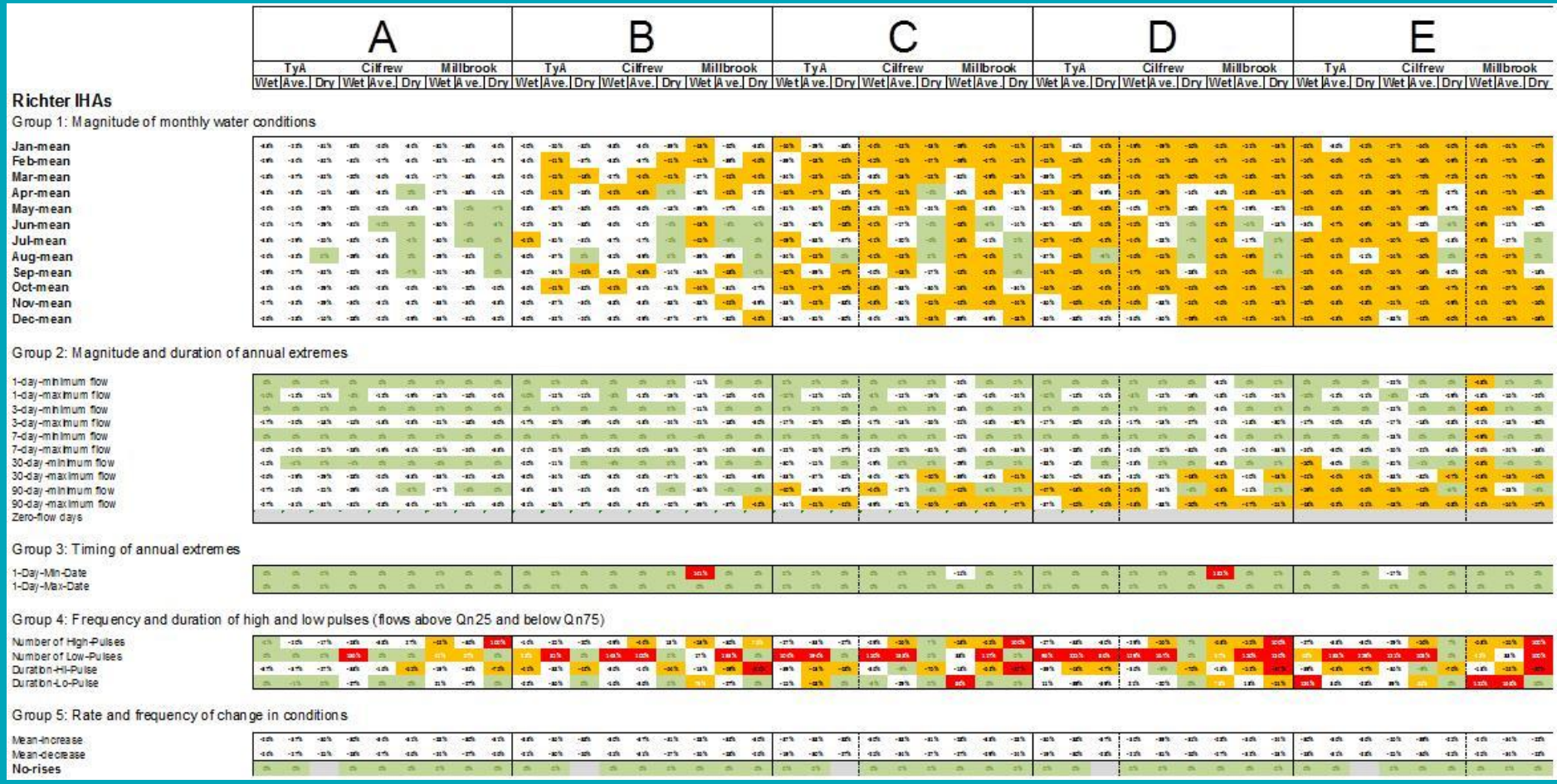
Indicators of Hydrological Alteration



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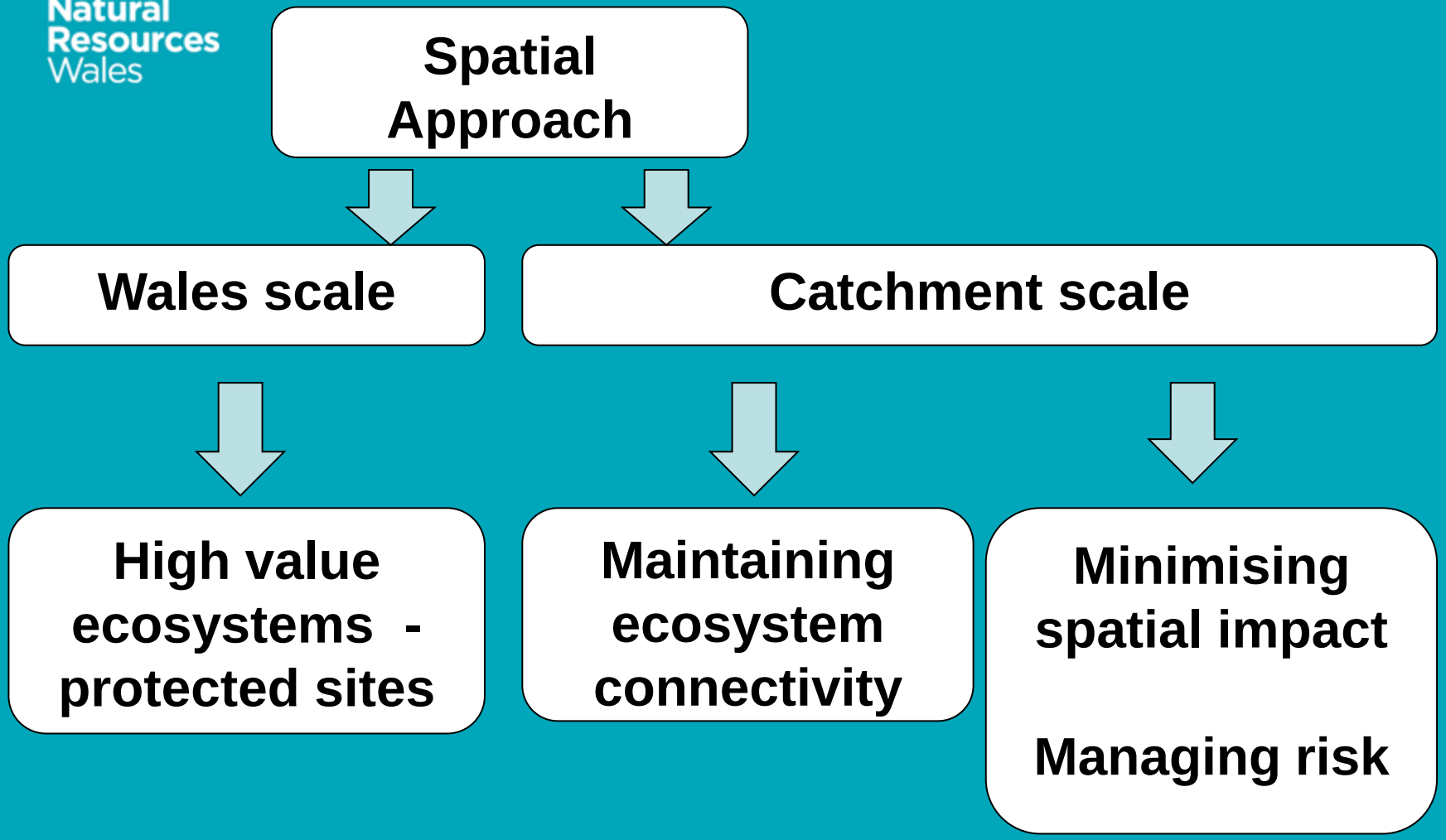
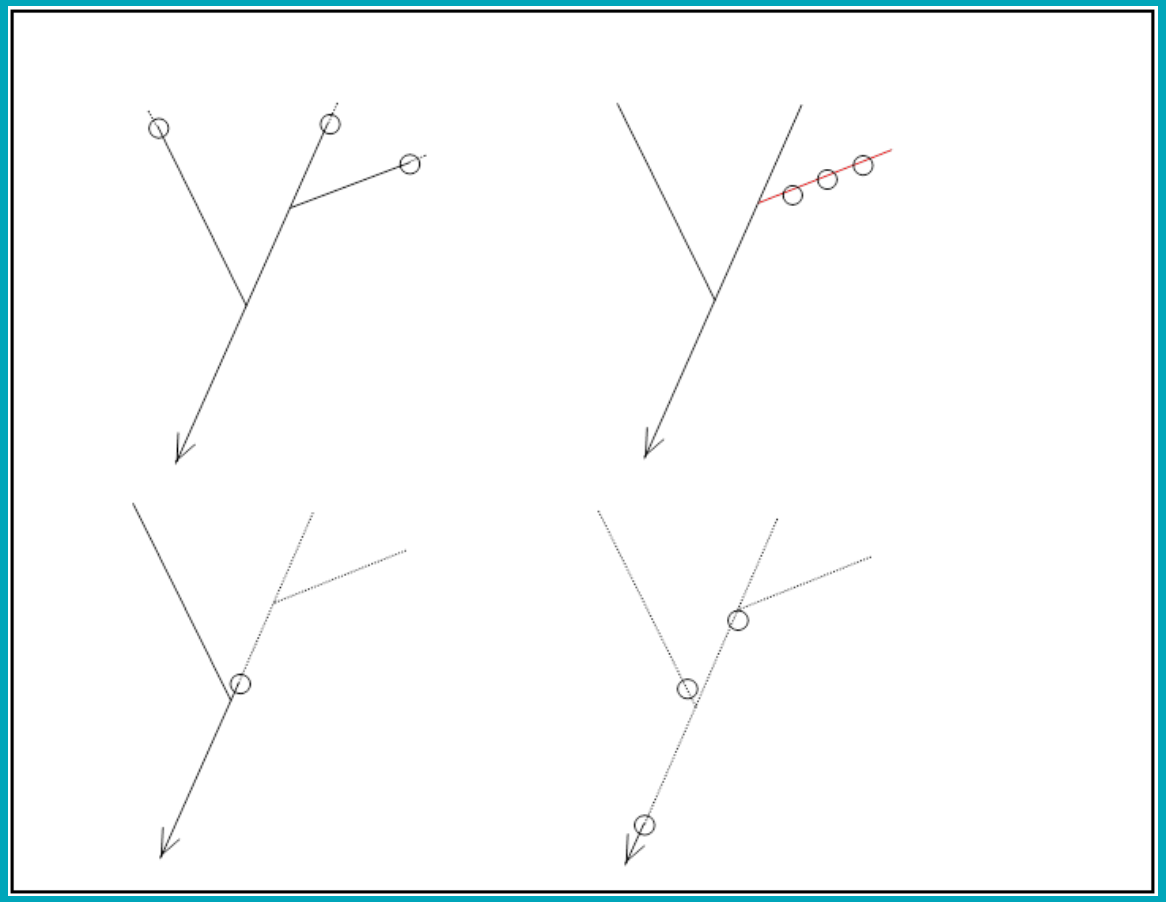


Minimising spatial impact



Sources: CCW Guidance on Small Scale Hydro Electric Power (HEP) Schemes 2011
CCW Science Report No. 932 Landscape Connectivity of Freshwater Ecosystems: Strategic Review and Recommendations

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Zoning: Channel location & typology

- Varying responses to abstraction
- Flashy upland hydrological regimes
- Assessment criteria
- Stream bed gradient
- GIS mapping – digitised river network
- Zoning

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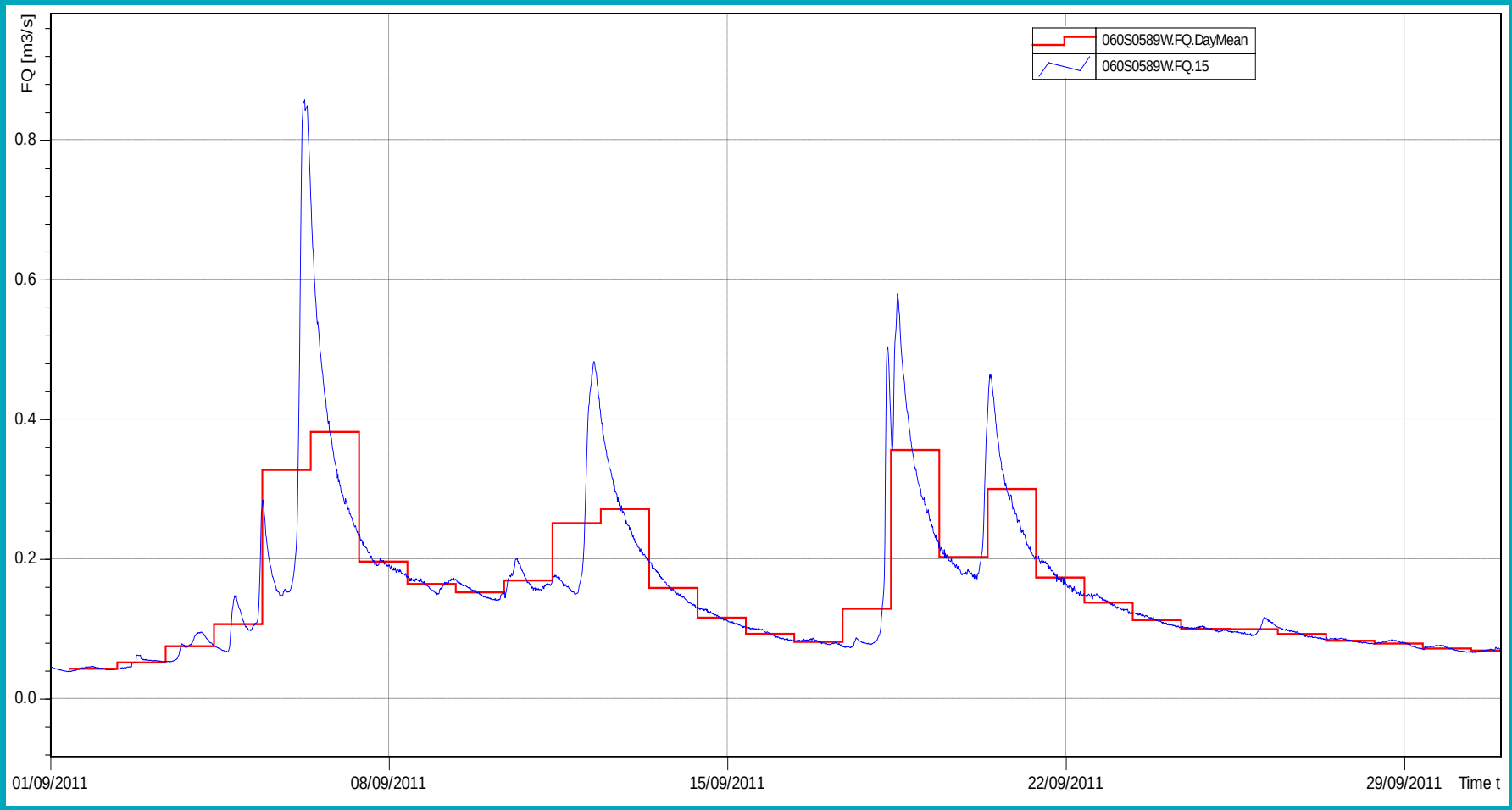
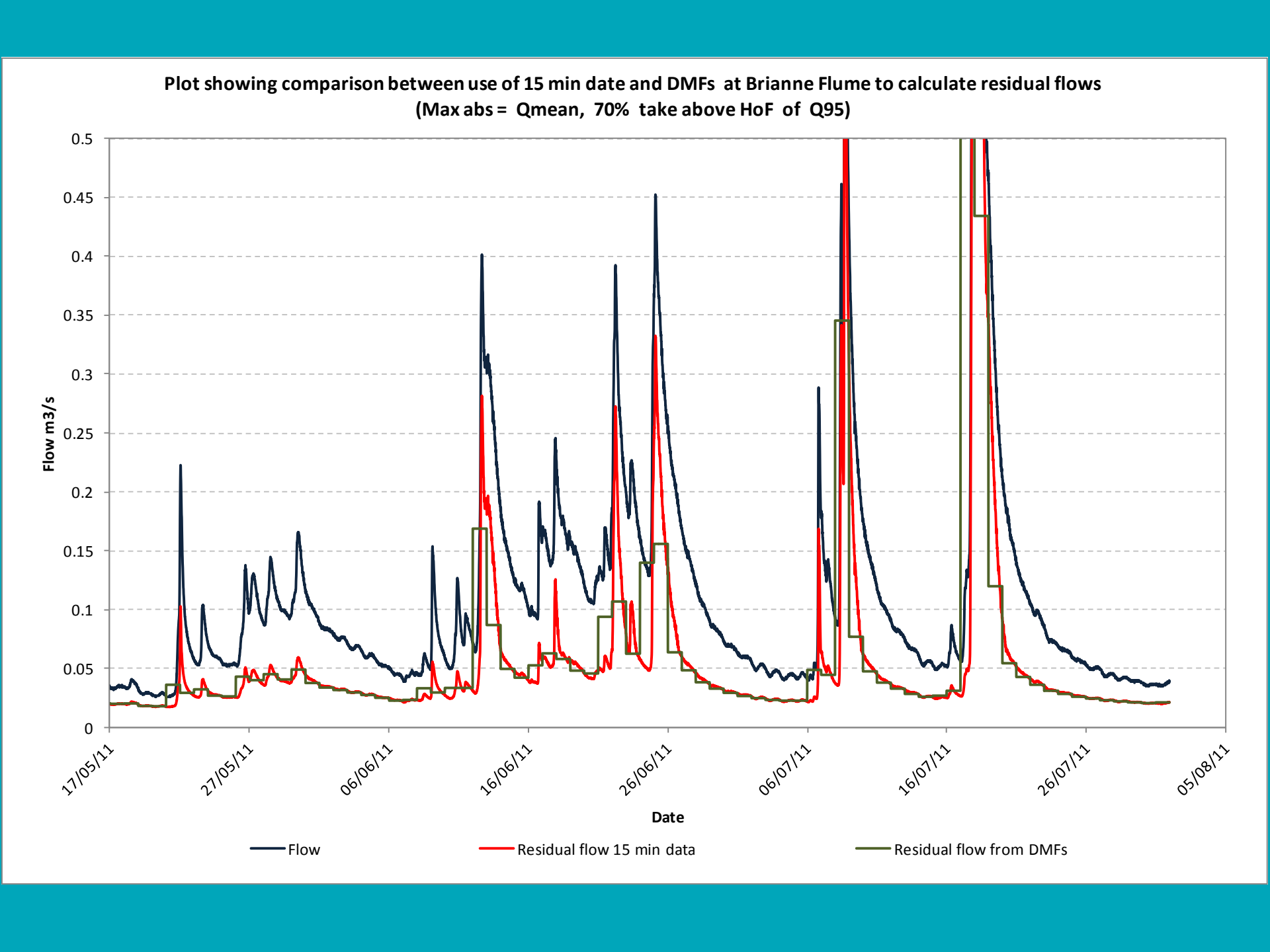
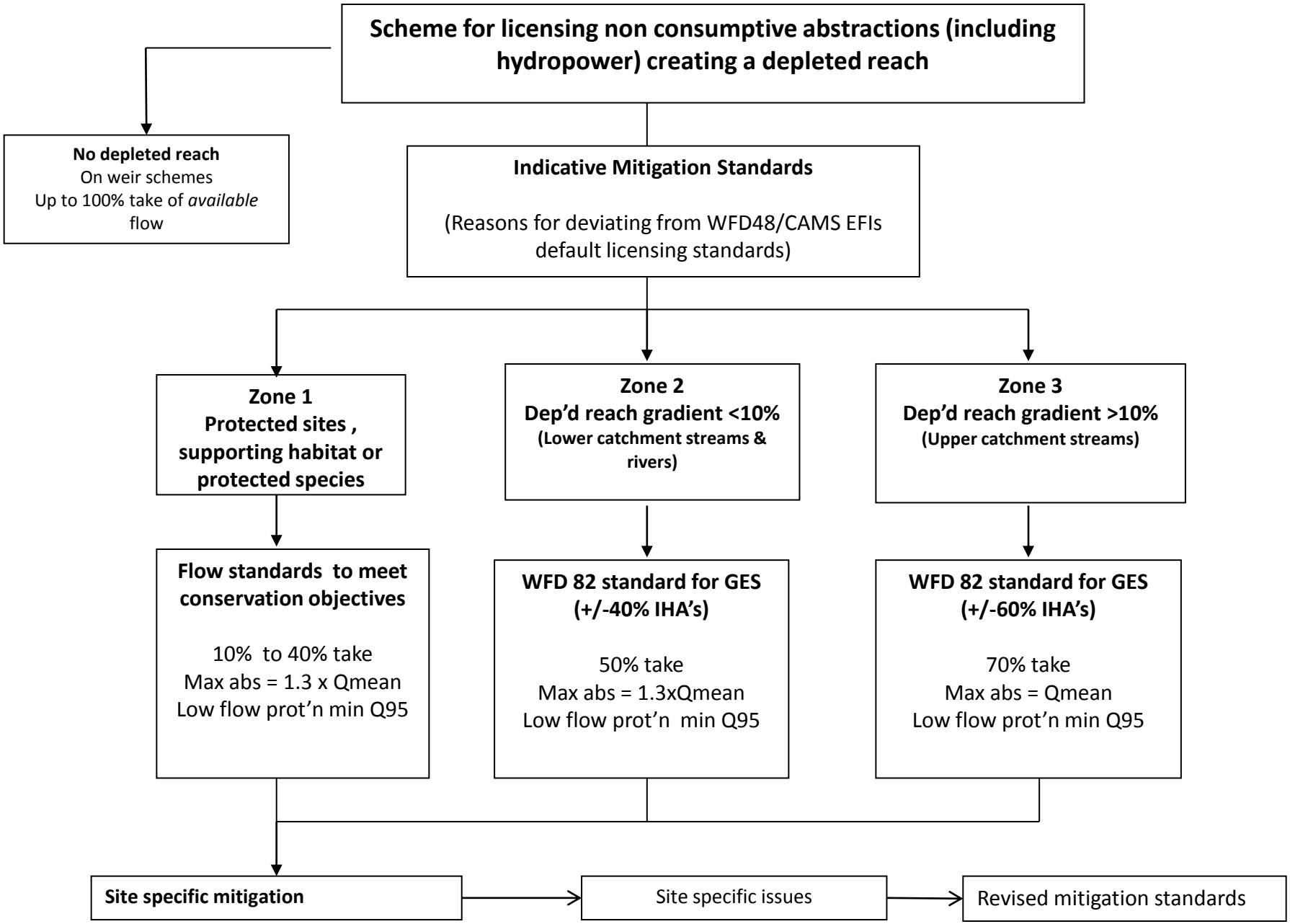
Hydrograph – small catchments data resolution




Plot showing comparison between use of 15 min date and DMFs at Brianne Flume to calculate residual flows
(Max abs = Qmean, 70% take above HoF of Q95)
Flow m3/s
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
17/05/11
27/05/11
06/06/11
16/06/11
26/06/11
06/07/11
16/07/11
26/07/11
05/08/11
Date
Flow
Residual flow 15 min data
Residual flow from DMFs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Finally…

- The start point
- Balance between environment & abstraction
- ELOHA approach - flexibility & adaptive management
- Ecological monitoring required to collect empirical data
- Longer term development of regional flow requirements