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for people and wildlife

Environment Agency

Mr Charles W Green
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Our ref: 304420

Date: 16 May 2023

Dear Mr Charles Green,

RE: Request for information under the Freedom of Information Act 2000 (FOIA)/ Environmental Information Regulations 2004 (EIR)

Thank you for your request (dated 22 March 2023) for information regarding upper Severn rainfall data and flood models.

We respond to requests for information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

Not a request for information:

You have made the below requests which are not for recorded information and therefore the Environmental Information Regulations and the Freedom of Information Act do not apply. However, as we do not wish to be unhelpful, we have provided the following information to assist in answering your enquiry.

1. *When was a model last used to replicate an actual flood event within the Severn/Vyrnwy catchment and which model was it?*

We have provided the below information to help answer your enquiry. Please also view the Overview of Modelling document that we have included with our response:

There are three main hydraulic models that cover the part of the Upper Severn catchment under consideration (it should be noted that the first two models listed have been produced and are owned by Natural Resources Wales) –

- 1D-2D Flood Modeller Pro/TUFLOW hydraulic model covering the Upper Severn in Powys (constructed in 2007).

- 1D-2D Flood Modeller Pro/TUFLOW hydraulic model recently constructed for the Newtown area (constructed in 2021).
- 1D-2D Flood Modeller Pro/TUFLOW hydraulic model for the Severn/Vyrnwy confluence and upper Severn in England (completed in 2020).

It is important to note that these hydraulic models are primarily used to predict future risk, with previous events used to ensure that the performance of the model is reasonable and as would be expected for the geographic area.

As with all hydraulic modelling there are limitations and restrictions with using a computer aided model to represent flood risk in a real-world environment. As such, two methods are used to try and build confidence in predicted model outputs, both of which involve the replication of previous events within the model, utilising actual rainfall data from across the catchment for those events -

- **Verification** – Utilising anecdotal information (E.g. pictures, reports from communities, newspaper outputs) to check flood extents, depths, flow paths etc. are consistent between the model output and what is known to have happened during an event.
- **Calibration** – Using in channel level and flow gauging across the catchment to ensure that the relationship between level and flow is consistent throughout the duration of a known storm event and therefore confirming that conveyance calculations within the model are performing accurately.

For each of the above models, calibration was undertaken using 2-3 of the largest recorded events up to the point of construction of the model. It is acknowledged that a series of significant flood events have taken place since the construction of the models listed above. Future modelling work planned across the Severn catchment (both to support the SVWMS and other flood risk initiatives) will include hydrology updates that will take account of those most recent events to support calibration and verification exercises where appropriate.

2. *Was the last really bad flood of late February 2022 (post storm Franklin) replicated in such a way?*

Calibration exercises within hydraulic models take time and a considerable amount of data input. They also need to be undertaken considering the whole historic record of a catchment/watercourse rather than just a single event in isolation (which may not be representative of the way the catchment would ordinarily react to a given rainfall event).

As outlined above, hydrology reviews will be undertaken as part of the next phase of hydraulic model updates for the Severn to ensure that recent events across the Severn are appropriately considered. Where there are discrepancies between the historic record and the replicated output from the model these will be investigated to understand whether they are hydrological (the way

rainfall runoff is calculated across the system) or hydraulic (the science of fluid mechanics/dynamics within watercourses) with amendments then being made where appropriate.

Information held

I enclose the information requested below regarding your request under question 3**.** Please refer to the Open Government Licence which explains the permitted use of this information.

3. *In each case, what was the total catchment rainfall modelled within the Severn/Vyrnwy confluence catchment area (said variously to be 2,000km^2, or 2,505.7km^2 to Shrewsbury)?*

As modelling and hydrology updates take place (considering the most recent flood events recorded) rainfall data from across the catchment will be utilised to replicate events and ensure that the hydraulic models are performing as would be expected. Much of this data is owned by Natural Resource Wales and would require a separate data request to be made to them in order to access the raw rainfall data held.

In terms of the broad assumptions currently built into the Aggregated Storage Model (outlined with Appendix A), to support some of the early stage optioneering for the SVWMS, a design rainfall breakdown of the following has been utilised.

It should be noted that this is a design event to replicate a hypothetical winter storm and therefore does not directly equate to a recorded event but provides a predicted event against which future flood risk interventions can be tested.

Critical Storm	Area (km2)	SAAR* (mm)	1% AEP *^{2} Event Total Rainfall (mm)	Rainfall Volume (m3)
Vyrnwy	878.1	1279.0	85.22	74,827,634
Severn at Confluence with Vyrnwy	1048.7	1079.0	71.96	75,466,251
Severn Downstream	2505.7	-	-	-

* Standard Average Annual Rainfall
*^{2} Annual Exceedance Probability
(In this instance an event with a 1% chance of happening in any given year – or a "1 in 100 year" event)

Information not held

We are unable to provide you with the following information:

4. Of that total catchment rainfall what was the total rainfall (1) within the Llyn Clywedog catchment (said variously to be 45 ha or 48.92 Ha) and (2) within the Lake Vyrnwy catchment (said to be 74.01 Ha)?

The duty to make information available to you under EIR Regulation 5(1) does not arise because in accordance with EIR Regulation 3(2) we do not hold the information you have requested. Regulation 12(4)(a) also applies – we cannot supply the information because we do not hold it.

Although we do not hold the information requested, we have provided the following commentary to assist with your enquiry. To obtain this information from the Aggregated Storage Model, hydrograph boundaries would need to be amended and altered. Whilst these boundaries currently take full account of the influence of attenuation of the reservoirs; they currently consider a larger sub-catchment than only the reservoir catchments in isolation.

Depending on the location of rainfall gauges, and the data available directly from Natural Resources Wales, actual event data may be better placed to provide a meaningful answer to the above query.

There is no requirement to conduct a public interest test where the refusal relates to information we do not hold.

If you are not satisfied you can contact us within 2 calendar months to ask for our decision to be reviewed. We shall review our response to your request and give you our decision in writing within 40 working days.

If you are not satisfied following this, you can then make an appeal to the Information Commissioner Office (ICO), the statutory regulator for EIR/FOI. The address is: ICO, Wycliffe House, Water Lane, Wilmslow, Cheshire. SK9 5AF. Tel: 0303 123 1113 (local rate) or 01625 545 745 (national rate) | Fax: 01625 524 510 | Email: casework@ico.org.uk | Website: http://www.ico.org.uk

Yours sincerely,
Delyth Evans,
FCRM Specialist, Customer and Engagement Team