Webinar Q&A

Estimating flood peaks and hydrographs for small catchments

29th January 2014. 11:00 - 12:00.

This document covers the Q&A section. The questions were submitted during and after the online session.

Lisa Stewart (Centre for Ecology & Hydrology), Duncan Faulkner (JBA Consulting) and Mark Whitling (Environment Agency) have researched and provided answers to all the questions posed.

We have removed names to protect privacy in this publically available document; Please get in touch with Mark if you have any further questions (mark.whitling@environment-agency.gov.uk).

Mark, Lisa & Duncan.

Q1 Is the urban extension of the ReFH methodology being considered as an appropriate methodology for small urban catchments?

We will be using the urban extension of ReFH within the project for urban catchments (the same methodology is currently being introduced to the ReFH2 software package).

Q2 Will the data collated at the plot scale allow for all of the parameters affecting greenfield runoff to be considered? - Slope, vegetation, soil type and condition etc.

For example the general description of a soil may indicate relatively good infiltration and permeability but soil compaction and grass (or other vegetation) will have a major impact on runoff.

Good points. Yes, we will try to get hold of this data where it is available.

Q3 Lisa referred to suite of tools/products you were hoping to produce as a result of this project. If I recall correctly I don't think there was any mention of climate change. Is it intended to take account of increases due to climate change within the tools/products?

Any tool this project delivers will not take account of projected climate change (as with the current FEH tools), but we can provide links to current guidance.

Can I get more information?

Mark Whitling (mark.whitling@environment-agency.gov.uk) is the Environment Agency's project manager and will answer any questions or queries you may have.

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Q4 Until the results of Phase 2 are published, we are having to apply current methods as best we can. For heavily urban areas, guidance recommends applying a revised ReFH method which considers urban and rural areas separately, adjusting Cmax to achieve a percentage runoff of 70% for the urban portion.

For very small catchments, i.e. ~2km^2, is there much difference between assessing the whole 2km^2 and then applying area-weighted inflows at key points versus splitting the catchment into sub-catchments (representing the key inflow points) and undertaking the assessment for each sub-catchment?

The whole-catchment approach will obviously take less time, but would you expect the results to be much different from the sub-catchment approach?

We are not aware of much, if any, testing of the urban extension of ReFH in conjunction with scaling down to small areas and this makes it difficult to comment before we have carried out the Phase 2 research.

Q5 It was mentioned that Phase 2 of the study will look further at the FEH DDF by studying high intensity, short duration rainfall. Can you tell me if this includes consideration of the spatial variability of such rainfall, areal reduction factors etc.? It seems to me that knowledge of the rainfall that gives rise to a flood event is fundamental to the calibration of any flood estimation method that relates observed runoff to causative rainfall.

The smaller the catchment, the harder it is to know the causative rainfall for a particular flood event. This is almost certainly why the estimation of flood runoff from small catchments is much less reliable than on larger catchments, as stated by Duncan.

The rainfall analysis we are undertaking within phase 2 is a pilot study, so we will be able to make recommendations for future research. I think it's unlikely that we will have time to explore this question properly within the project, but I agree that it is an important consideration. The ever increasing availability of high resolution radar data should help with this question in future.

Q6 Lisa - How does WaND (Water Cycle Management for New development) compare with traditionally used methods, or is it just an interface for one of these?

We are not familiar with WaND. Perhaps you can expand via correspondence?

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Q7 Who is the new method is aimed at and who are the intended end-users

The new methods are aimed at anyone involved with flow estimation in small catchments (i.e. beyond just those using methods from CEH, IoH, ADAS etc). In particular - we have identified the groups listed below. This is a published piece of work; there is nothing stopping someone developing it further or building a user interface specific to a particular audience.

- LLFAs where drainage/SUDS and SABS reviews/design/approvals are undertaken
- Planners (LA Dev Con for example)
- Developers & designers
- WEM Lot 1 and scheme design contractors
- Independent hydrologists and the like
- EA/NRW Hydrologists and modelling staff
- Other utilities/operators dealing with flood risk from small catchments
- SEPA/RA NI etc
- Researchers
- Value added resellers

Q8 I think the questions raised at the end of the session were valid. There are likely to be issues around acceptance and applications of the method and the reliance that can be placed on it considering how limited the background data is.

How will you create a robust system incorporating the data obtained from various gauging networks, not just HiFlows? And if you've got a site that is potentially affected by other sources of flood risk (i.e. not just SW runoff), how will the gauge be incorporated into the new method.

If you are discounting potential sites on this ground then you may lose potentially valuable data from low-lying and flat areas. After all, not all sub 25km2 developments are in upper catchments with steeper topography.

Yes, these are all issues that we will have to deal with as we build up the dataset and decide how to use it. Flow measurement in low-gradient catchments is in particularly short supply, and it can be difficult to incorporate flow data affected by local hydraulic features into generalised methods.

Q9 How is the project considering runoff volumes (as opposed to peak flows)?

The project will apply the urban extension of ReFH2 (Kjeldsen et al., 2013)

Can I get more information?

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Q10 On one of your slides you showed a gully below a fence that captured runoff from a field. Out of interest, how do you ensure that the runoff recorded from that field is comparable to the previous day/week? Surely you are assuming that the system remains pristine, but the reality is that the gully is likely to be broken / damaged / blocked by sediment throughout the recording which will affect the gauge data recorded?

We will need to be aware of the larger potential for errors in plot-scale runoff datasets. However we will not have time or resources to carry out detailed checks of data collection methods, instead relying more on QA carried out by researchers who collected the data and noting any caveats they state.

Q11 The method you are proposing could work well for sites that have similar characteristics across local / regional / national gauging stations, but how will it work for sites that are not well represented? My understanding of the complexities of FEH is that sites are "pooled" to create a larger dataset based on similar characteristics. But if sites are fairly unique and can't be "pooled" then how would your system ensure that the outputs are both accurate and reliable? One of the criticisms of methods like ADAS is that they are based on a limited amount of reference data – will your method suffer from the same criticism?

The first part of the project will construct an extended dataset of flow data from small catchments and data on runoff from small plots. We will use this information to develop a suite of methods which will be more representative of small rural and urban catchments than current methods. We will also provide guidance on the most appropriate method to use in a given situation.

Q12 At what stage in the project will the review of the impact of vegetation on rainfall runoff be completed?

Currently anticipated to be around the end of 2014

Q13 There is an assumption stated in the Phase 1 report that slope does not need to be considered separately because they believe it is inherent in SAAR and SOIL surprised me. Can you explain this assumption please?

This is not an assumption that was made in the analysis in Phase 1 of the project, but refers to a criticism of the ADAS 345 method in Section 5.1.3 of the Phase 1 report.

Can I get more information?

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Q14 As you may be aware, a lot of the development control of surface water is likely to moving over to the new SABs – the Environment Agency will have less input into many developments. You'd need to ask someone who has been involved in the setting up of the SABs as to what experience and level of technical knowledge will be in various groups, but have you thought about how accessible the method might be to the end-user? Will the method only be accessible to experienced consultants or those with access to certain programs? Will there be a way of creating summary sheets to allow technical review of models (similar to WinDes)? What will the final format be – a table of values, a graphical representation?

We had a few LLFA members on the webinar so they are engaged and interested - and we will try get someone to join the Technical Advisory Group.

The aim is to provide guidance and clarification on the most appropriate method to use in any instance. It is quite difficult to comment on the outcome of the research before the analysis has begun - however we are working around a few key principles:

We plan to develop precautionary methods that will use freely available data

We are not going to produce a tool - unless it's the only way to undertake the calculations - instead leaving it open for 3rd party development.

As for final format? The method will be presented as a written guidance enacting the methodology. We can not produce summary sheets for every anticipated use – it will be down to users to present the information in the most suitable format.

Q15 Will the expectation be that we use these interim recommendations as a means to direct development and what is allowed in sites which are part of small catchments? With specific reference to planning responses.

Yes. Flood risk assessments, drainage designs etc that rely on flow estimates for areas defined as small catchments would benefit from using the latest methods and guidance. Environment Agency internal "Computational modelling to assess flood and coastal risk" operational instruction references our "Flood estimation guidelines" operational instruction which is fully up to date with our current thinking on small catchments and describes how we should assess such flows.

These documents are available to Environment Agency staff and our contractors for free. Anyone not working for or on behalf of the Environment Agency that wishes to use these documents may be charged a fee. Please contact your local Environment Agency office to discuss the matter on a case-by-case basis.

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Q16 For sites containing watercourses with catchments less than 25km^2, I currently use the rainfall runoff method and cross-check with the Statistical and ADAS methods for estimating runoff on catchments exhibiting high topographical relief. For urban catchments I use the rational method - ordinarily within WinDes Microdrainage for smaller sites; and I also check this manually using rainfall depth and duration data to establish a volume of runoff. At the plot scale would the estimation of runoff be used to determine the volumetric requirements of a SuDS attenuation pond?

Yes, we will be looking at volumes of runoff at the plot scale for such applications.

Q17 Are plot scale estimates for impermeable sites (e.g hard-standing) outside the scope of this project?

They are within the scope of the project. Both catchment and plot scale; permeable and impermeable. Although we may need to think some more about the interface between the new methods and sewer design techniques.

Q18 With only 75 sites that are sufficiently reliable for QMED estimation, there is very little chance to develop a pooling group of sites that have hydrological parameters that are representative of the target catchment. This problem is compounded for pooling group analysis for flood flow estimation. In this case, what is the recommendation for deriving peak flows for any typical site that will require up to 1000 year return period flows?

We have ideas about this but can't really say precisely what the outcome will be yet. We would tend towards recommending a rainfall-runoff approach for the longest return periods but there are some issues to resolve here.

Q19 When do you plan to publish your findings / methodologies?

We currently expect to publish the outputs around November 2015.

Q20 How important is it to get improved short duration rainfall data (up to 1 hour) and will this be pursued?

This is very important for small catchments and we will be focusing on it at the beginning of the project.

Can I get more information?

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Q21 How does the update of the FEH DDF model fit into this study? And when is the updated FEH DDF model due for publication?

The pilot study of high intensity short duration rainfall will be used to check the extrapolation to very short durations that has been built into the new FEH DDF model. The new FEH DDF model is due for release within a web service to replace the FEH CD-ROM at the end of 2014.

Q22 What consideration has been taken to integrate with the forthcoming National SuDS Standards?

We have a member of the project board who represents the Environment Agenc'y interests - as well as the project team making links with various SUDS related project teams - including the Suds Manual.

Q23 Is it intended that the recommendations of Phase 1 should be implemented in practice now, before the results of Phase 2 are available - or in practice should we continue with IH124?

Please see earlier answer re: accounting the phase 1 interim recommendations being used for planning considerations. We would recommend that phase 1 interim recommendations are used now. Internal and external Environment Agency guidance advises on the use of FEH - for example the Rainfall runoff management for developments guide.

Q24 The NPPF requires us to add 20% to peak flows for development assessment - will the study give any comments upon this requirement and its validity?

Any tools that this project produces would not take account of projected climate change (as with the current FEH tools), but we could provide links to current guidance.

Q25 How will the new methods integrate with the InfoWorks ICM runoff models?

Once we have a set of methods towards the end of the project, we will discuss how to implement them within existing software (as we have done with previous updates to FEH methods).

Can I get more information?

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Q26 **The Phase 1 report found that ADAS 345 consistently underestimated peak flood flows. I regularly run IH124 and ADAS 345 in parallel and compare the two. ADAS 345 rarely predicts lesser runoff rates than IH124, particularly on greater return periods. Only on extremely to very flat ground does IH124 predict higher rates, i.e. slopes on average under 0.2% in most hydrometric regions and under 1% in hydrometric regions 5 and 6/7.**

While inaccuracies on any of the current methods are not surprising, given the datasets they were based on, the fact that they found it consistently predicted much less peak flows that IH124 made me wonder if they used ADAS 345 correctly. Either this or that the catchments used in the phase 1 review were all incredibly flat and therefore not representative of variable catchments.

Would it be possible to send me the catchment characteristics they used? The compilers of the report do seem to have been guessing somewhat about ADAS 345 origins and methods. For information, ADAS 345 is based upon an internal ADAS Report no 5 which is calculative in its methodology – and which is what we use in practice. This method can easily be found on Google in a review carried out by an Irish university (see attached). ADAS 345 cannot be used for urbanised catchments.

We reviewed both ADAS 345 and MAFF/ADAS Report 5, along with the paper by Cawley and Cunnane (which is referenced in the Phase 1 report) and other references. Our interpretation of the ADAS method was based on discussions with several former ADAS staff including Steve Rose of JBA. The paper by Faulkner, Francis and Lamb referred to in the Phase 1 report gives some more details of how the ADAS 345 method was applied in the tests. Yes, we would be happy to send the list of characteristics used in applying the method. Please contact us for further information.

The order and precise wording of some questions has been edited for clarity and consistency.

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