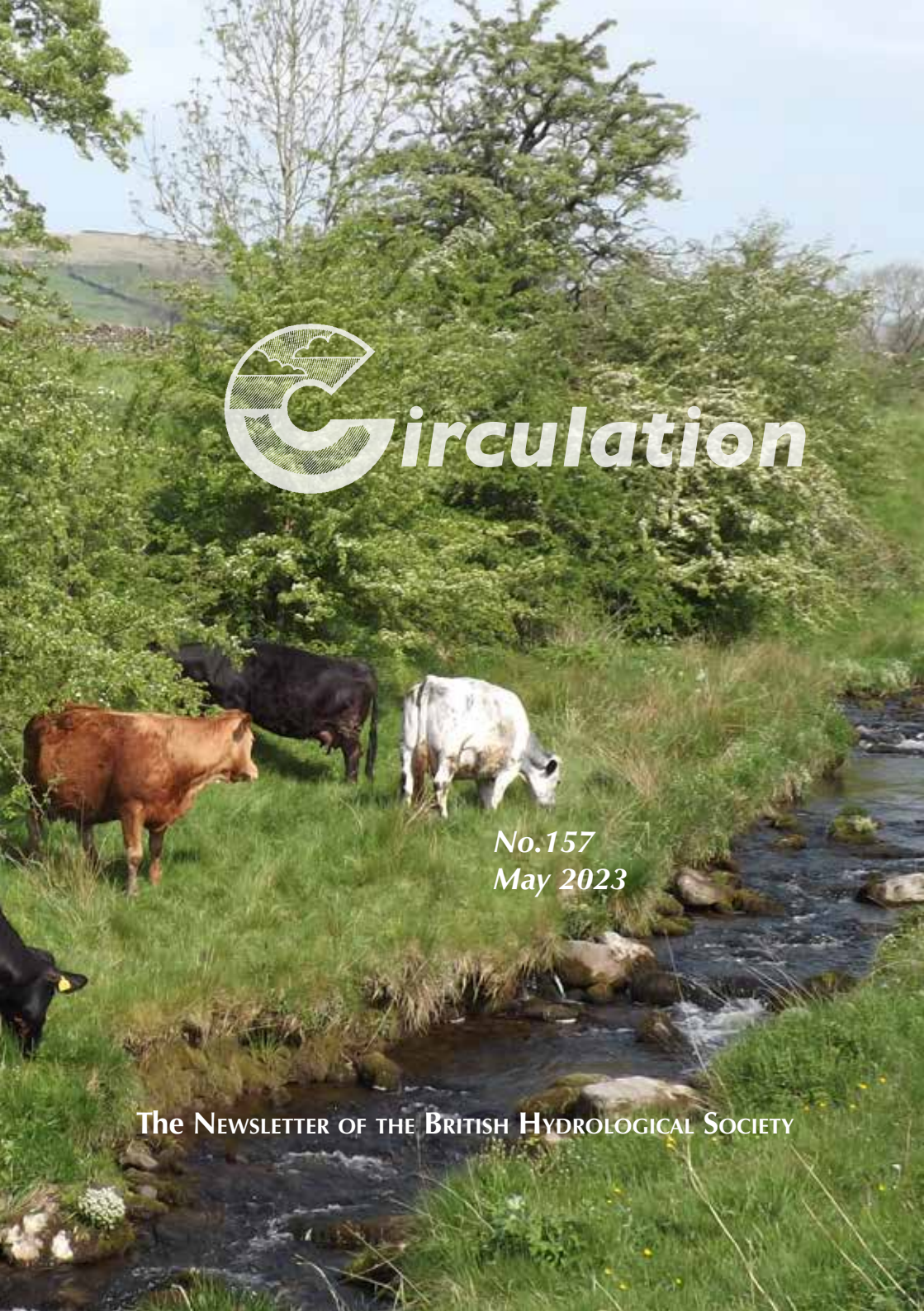


Circulation

No.157
May 2023

The Newsletter of the British Hydrological Society

Contents

BHS 40th Anniversary

Walls of water

Review of extreme rainfall within England for FEH2

2023 UK skills and satisfaction survey

Enhanced Hydrology Data Explorer

FEH22 rainfall depth-duration-frequency model

Obituaries

Laura Baird

David Marshall

Hydrological Bulletin: February – April 2023

Copy deadline for Circulation No. 158 28th July 2023

Access to BHS membership

There is a link to the membership form on our website which is important information if you are busy (as we hope!) persuading collegues to join us

https://forms.office.com/r/FwxUQiALpz

Circulation **is published quarterly. It is free to members of the British Hydrological Society and costs £25 to nonmembers on annual subscription. Articles published reflect the views of the authors and do not represent official BHS policy.**

- **Membership enquiries: Moira Doherty, BHS Secretary, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA. Tel: 0207 665 2234 Email: bhs@ice.org.uk**
- **Editor: Celia Kirby Tel: 01544 230053 Email celia.kirby@btinternet.com**
- **Web pages: http://www.hydrology.org.uk/**

Circulation **is indexed in** *Geosystems' Hydrotitles* **&** *GeoArchive* **and** *NISC HydroROM*.

Hydrology learning between the generations: 40 years of the BHS

Monday 6 November 2023
Institution of Civil Engineers, London

This in-person meeting will be a celebration of the 40th anniversary of the British Hydrological Society. A multi-generational lineup of speakers, whose hydrological careers started in at least six different decades, will share inspirational stories of what they have learned from other generations. The meeting will look back over the progress in hydrological research and practice, asking what we can learn from the past. It will also look forward to current and emerging initiatives, such as the Flood Hydrology Roadmap and the Floods and Droughts Research Infrastructure. It will celebrate the increasing diversity in hydrology, with a particular focus on the contributions of women.

Speakers will give perspectives from academia, consultancy and operational hydrology. They will cover a wide range of topics in hydrology, all relevant to both researchers and practitioners.

There will be time for discussions and opportunities to meet old friends and make new ones.

The meeting will start at about 10am. Immediately after the end of the meeting there will be a drinks reception to celebrate BHS's birthday, ending at about 6.30pm.

For more information contact Duncan Faulkner:

duncan.faulkner@jbaconsulting.com Phone 01756 799919.

President's Perspective

The last three months, I have been reflecting on being President of the British Hydrological Society and what a pleasure and a privilege it has been, as I hand over the reins to Duncan Faulkner in September, to take the Society through to its 40th Anniversary in November. We have a number of events planned, including an event celebrating 40 years of BHS at the ICE on the 6th November, and I have led an application, with the committee, for a 2-day conference at the Royal Society which, if successful, would be held in the first half of 2024. It is my belief that increasing demands on the hydrological community in the 21st century require a focus beyond hydrological science, towards cross-disciplinary working and policy and practice. This rethinking of approach towards more complex, transdisciplinary solutions responds both to the climate and biodiversity crises and what we see playing out in society now, with severe shortages of water in some parts of Europe (and the world) and far too much in others; the recent flooding in Devon possibly broke the UK 1hr rainfall record (by a substantial margin). The discussion meeting will highlight new science and, together with industry and policy-makers, suggest new ways forward for the scientific discipline. Hydrologists have never been more needed.

The first meeting of the newly formed British Hydrological Society was held at the Royal Society in November 1983, following the decision to form the BHS in 1982 at an International Association of Hydrological Sciences meeting in Exeter. The Discussion Meeting in 2024 will bring the UK and International Hydrology communities together to celebrate 40 years of the British Hydrological Society and reflect on how hydrology has advanced in the last 40 years. We will discuss the advances made, the challenges that still remain, and mechanisms to speed up the adoption of new science in policy and practice; something that is vital in our rapidly warming world. The meeting will be a timely opportunity to review progress and examine the opportunities that exist to address grand challenges in society that are centred on hydrological understanding, but with the opportunity to bring in transdisciplinary expertise, particularly across policy and industrial practice.

The meeting will be centred around four main themes and will reflect on the progress that has been made in each area in the last 40 years, the gaps and challenges that remain, and the opportunities available for future advances. The four main themes reflect on Challenges in Data and Observations, Challenges in Methods and Modelling, Managing Hydrological Extremes and Grand Challenges and future perspectives (including the identification of main areas for future progress). The themes will be organised around talks and discussion sessions that will bring together hydrological scientists and scientists from other disciplines with industry, policy and decision-makers. The

ground-breaking developments to be discussed include open-source data and models, new data sources and sensors, state of the art modelling and open-science, new early warning systems and forecast methods, engineering for extremes, climate change, machine learning and AI, risk communication and decision-making, adaptation policy and practice. Panel discussions will develop new understanding and directions in terms of managing hydrological extremes and preparing society to become more resilient to extremes. The meeting will provide an exceptional opportunity to benchmark current progress and together with other research areas and industry to examine a path forwards.

Hydrological extremes appear to be increasing in frequency and intensity. It is important in managing these new extremes that we understand more about the processes, from precipitation through hydrology, all the way through the downstream effects on our infrastructures systems and ecosystems, and to understand how these processes will change with climate change but also additional pressures brought by increased use of natural resources and population growth. For this our community needs new datasets, new methods and models and these must be shared, quality controlled, verified and open source so that we can build together and co-create new knowledge across fields. This is vital for a shared response to the climate crisis, building new information that can be quickly taken through into policy and practice, ultimately to the decision-makers who can transform our society. There are a number of initiatives already applying this focus, from the Flood Hydrology Roadmap, the Flood and Droughts Research Infrastructure initiative, and the recent Hydrology Skills Survey, the results of which will likely feature in the next issue of Circulation. All point towards the need for increased digital skills in hydrology and for cross- and trans-disciplinary training.

We are also making progress with our move to modernise the governance of the society, with the target of completion by the AGM in September, and then thinking through to a transformation of our website by the 40th Anniversary in November. It has certainly been a busy two years, but a privilege to serve the Society, particularly as we finally emerge from the pandemic and go back to a full in-person meeting schedule from September 2023, while retaining the online webinars that proved so popular and successful in lockdown. The Committee members give much time, for free, as volunteers, and the new governance processes will allow us to include more members in sub-committees to spread the load. Thanks to them for supporting the Society. I will hand over to Duncan knowing that the Society is in safe hands. I do hope that the vibrant Society that I have been part of for nearly 25 years now is modernised but not fundamentally changed from the welcoming culture that it has always had as it enters its fifth decade.

Hayley Fowler
BHS President,

How abrupt are 'walls of water"?

Flood hydrographs in which gauged water level rises by more than one meter in 15 minutes have been described by Archer and Fowler (2018) and Watkiss and Archer (2023) and represent a hazard to river users in addition to the impact of the peak level or discharge. These event descriptions were based on level measurements made at 15-minute intervals, so there remains uncertainty as to whether the rise in level was typically spread over the full 15 minutes or within seconds or a few minutes within the measurement interval.

Nearly 300 historical events also described as a wall or a breast of water have been described in the Chronology of Flash Floods hosted on the JBA Trust website on https://www.jbatrust.org/how-we-help/publications-resources/rivers-and-coasts/uk-chronology-of-flash-floods-1/. Such newspaper accounts by untrained observers of 'walls of water' have been suspected of exaggeration. Confirmation of the rapidity of the rise in level requires measurement at a much smaller time step, or in its absence, a photograph or video of the abrupt wave front or an unequivocal description of a sudden impact.

A video of one small event in July 2017 on The River Twiss above Ingleton on a previously dry river bed was uploaded to Twitter by Thomas Beresford. (https://www.facebook.com/NorthYorkshireWeatherUpdates/videos/1368570846595775/).

Otherwise, we have not yet seen a photograph of a wall of water on a main river. The nearest photographic evidence is provided by two photographs at 10-minute intervals on the River Ure at Bainbridge on 20 August 2022 where the gauged rise in 15minutes was 1.05 metres, illustrating the potential hazard of such events.

Farson Digital Watercams are currently the only providers of a network of live webcams across the UK and Ireland giving access to live video feeds and searchable archives of river condition. Whilst working with the Environment Agency, Scottish Environment Protection Agency, and councils, it is understood that Farson cameras are often only funded on a local basis, set up with research projects, for businesses or water-sports clubs. In real time, feeds update approximately every 10-seconds, however, archives are only saved at 10-minute intervals – increasing to 1-hour after 24-hours. Therefore, unless you are an extremely eager 'wall of water' watcher viewing the live feeds having tracked live rainfall radar, the breast of the wavefront will likely be missed - as above on the Ure. So, perhaps with sufficient interest it may be viable to decrease the timestep of archived images at certain locations, therefore, capturing the character of the wavefront propagating downstream. Additionally, whilst spatial distribution is currently pretty good – it would certainly be beneficial to set up more cameras across 'wall of water'-producing steep tributary catchments and receiving main rivers as a basis for forecasting at vulnerable locations.

Some descriptive accounts of the speed and magnitude of a 'wall of water' can hardly be

discounted, notably this one from Roger Bettess. In August 2004 the major flood in Boscastle also affected surrounding catchments. I was a member of the HR Wallingford team commissioned with CEH and Met Office to collect event data. As part of the study, I collected eye-witness accounts of the flood to understand more about the timing of the event and the flood levels. As well as the flood through Boscastle there was a major event on the Crackington Stream which discharges to the sea at Crackington Haven. I interviewed a café owner whose medium-sized café was on the east side of Crackington Haven close to the sea. The following is my memory of what he told me.





On the afternoon of the flood, he was working in the café with his wife and a young girl. Late in the afternoon he went to the door of the café to brush off the water from the paving at the entrance to the cafe. They had had no customers for some time and so he decided to shut the café and he closed the door. He then walked from the front door of the café towards the kitchen. When he was about two-thirds of the way to the kitchen, having walked about 4 to 5 metres, the room went dark and the back door to the kitchen blown open by the flood water. The room had gone dark because all the windows were underwater. The café rapidly filled with water to within a couple of feet of the ceiling. The water level was above the level of the door lintel. The owner, his wife and the young assistant were swimming in the café.

He said that he had a distinct memory of thinking, 'Do I want to drown inside or outside?' He said that he decided he would prefer to drown outside. One by one the three of them bobbed down under the lintel of the door and swam outside into the passing flow. One would have expected them to have been swept out to sea but

just where they emerged from the café was part of a recirculation zone so though initially washed into the sea the flow then carried them back towards the beach. On the beach there was a spectator who grabbed each in turn as they came within reach and brought them to safety.

When I (Roger) started my professional life, I was told that one did not get 'walls of water' in British rivers and hence I have been very sceptical of accounts of such events. What I found very compelling about the Crackington Haven account is that there are clear observations on both the height of the wave, which, presumably, must have been at least 2 m and the time of the rise which must have been of the order of 5 to 10 seconds.

David Archer
JBA Trust and Newcastle University
Sam Watkiss
JBA Consulting Engineers and Scientists
Roger Bettess
formerly of HR Wallingford

References

Archer, D. R., & Fowler, H. J. (2018). Characterising flash flood response to intense rainfall and impacts using historical information and gauged data in Britain, J. Flood Risk Management: 11, S121–S133. DOI:10.1111/jfr3.12187

Watkiss, S. A. & Archer, D. R. (2023). The characteristics of 'Abrupt wave front' floods on Pennine catchments, northern England, and their transmission downstream, Hydrology Research, DOI: 10.2166/nh.2023.126

Royal Society Publishing: Philosophical Transactions

The issue 'Intensification of short-duration rainfall extremes and implications for flash flood risks' organised and edited by Hayley Fowler, Conrad Wasko and Andreas F Prein has been highly cited and downloaded is now COMPLETELY FREE TO ACCESS directly at www.bit.ly/TransA-2195

Purchase the print issue at the reduced price of £40 by contacting sales@royalsociety.org

---

Felicity Davie
Royal Society Publishing

Review of selected extreme rainfall events within England for FEH22

The FEH22 (Vesuviano, 2022) depth, duration, frequency rainfall model was released in December 2022 by UKCEH and is available from the FEH Web Service (https://fehweb.ceh.ac.uk/). It is the new industry standard method for generating design storm rainfall and is more robust than its predecessor FEH13 due to the significant increase in data used to develop the model. The main source of the additional daily/hourly rain gauge rainfall data was the Hydro-JULES project.

The Environment Agency National Flood Hydrology Team undertook a review of the hourly data for 56 AMAX events collated for potential calibration of the FEH22 model, some of which were originally used in the FEH13 dataset. These events were selected by UKCEH following an automated quality assurance review, prior to final model calibration, as they represented the most extreme events recorded and were considered to be influential. The selected events were categorised according to whether the event was smaller than either the preceding-day, same-day or next-day total (or the sum of all three) at one or more of the three nearest Met Office daily gauges. The site locations of the selected events, and reasons for checking are detailed in Figure 1.

This review sought to verify the authenticity of these events, in order to ensure confidence in the data used for the final FEH22 model calibration. This article provides a summary of the methodology and results, and highlights the potential implications of these for wider awareness. Our full paper can be requested from the National Flood Hydrology Team at **FloodHydrology@environment-agency.gov.uk.**

The full FEH22 calibration dataset has a total of 37,856 hourly events with this exercise only reviewing 56 AMAX events from 49 different gauges. A full quality assurance review of all

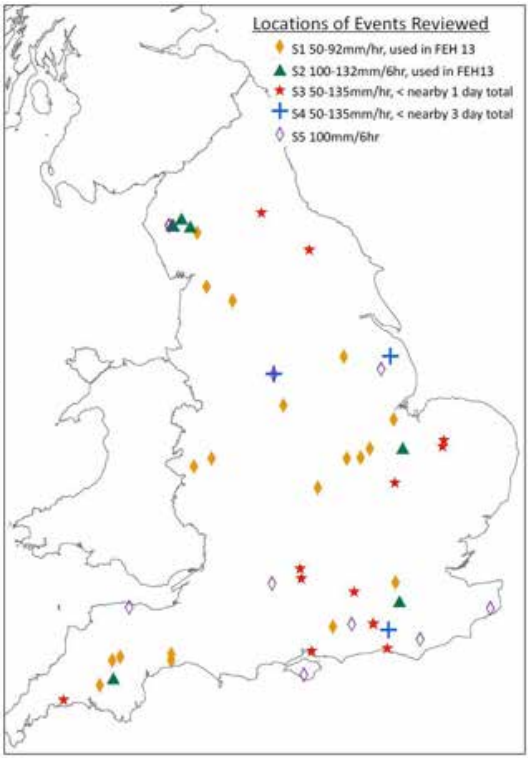


Fig. 1: Locations of the events reviewed

events could identify more erroneous data but was not practical in the timescales available.

The review process applied a consistent method utilising existing quality assured data from the Environment Agency hydrometric network and Met Office to enable assessment of the authenticity of the AMAX events. The first step was to identify any local available data for assurance. This was ideally rain gauge data, but flow and level data from our hydrometric stations were also utilised. If this data verified the observed event with similar totals recorded to the FEH22 AMAX event it was

The three main reasons for rejecting data were: (1) local data did not support the occurrence of the event, (2) evidence of clear errors in the way data had been processed and recorded, and (3) instrumentation errors which were noted in our records.

Results

Our review of 56 events from the potential FEH22 hourly AMAX dataset resulted in 28 events being rejected and 28 being accepted. Only the 28 accepted events were used in the final calibration of the FEH22 model. Of the 28 rejected events, 15 were included in the FEH13 dataset and dated from 1981 to 2005, while 13 were introduced from the Hydro-JULES project and dated from 1973 to 2016. By date, 21 rejected and 13 accepted events were pre-2006, while 7 rejected and 15 accepted events were from 2006 or later. Table 1 summarises the results, with Figure 2 showing their spatial distribution.Following this review, most of the events rejected were from Devon, Central to Eastern England, and the South East. However, there is no significant regional bias in the events accepted/rejected within each group.

For groups S1, S3 and S4 the events rejected are the more extreme records within these groups. Whereas for Groups S2 and S5, there is no clear separation of accepted/rejected events based on event intensity.

This review only assessed a small number (56) of extreme rainfall events, and only led to the exclusion of half of these (28) from the final FEH22 calibration dataset. However, the rejection of some events previously used in FEH13, coupled with the acceptance of some new

Table 1:The number of accepted and rejected events based on the reason for review

Group Name	*Reason for review*	*Total*	*Accepted*	*Rejected*
S1	FEH13: High rainfall total (more than 50 mm/hr)	19	7	12
S2	FEH13: High rainfall total (more than 100mm in 6 hrs)	10	7	3
S3	FEH22: High rainfall total (more than 50 mm/hr), consistent with daily total (1 day)	14	8.	6
S4	FEH22: High rainfall total (morethan 50 mm/hr), consistent withdaily total (3 days)	3	2	1
S5	FEH22: High rainfall total (more than 100mm in 6 hrs)	10	4	6

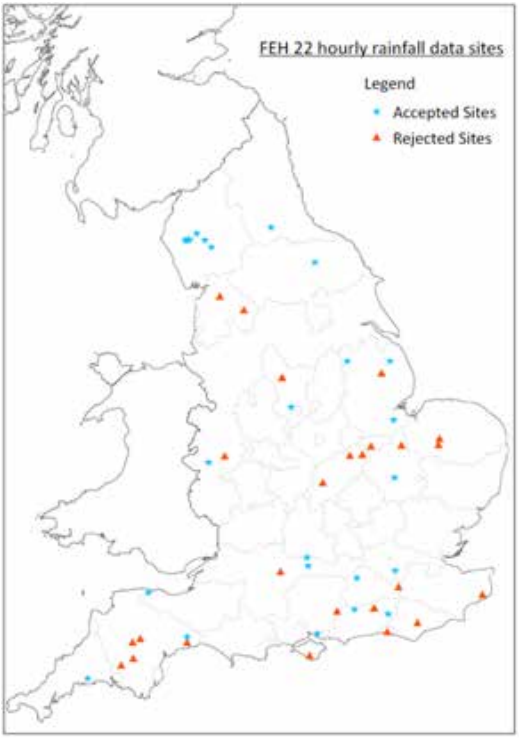


Fig. 2: Spatial locations of the accepted and rejected events

extreme events, has led to a limited number of significant localised differences between FEH13 and FEH22 design rainfall. This exercise has highlighted that:

(1) quality assurance has not consistently been undertaken on our raw 15 minute rainfall series,

(2) it is important that studies using this data take this into account as it could have a significant impact on results, and

(3) quality assurance is improved by using a number of different data sources in the local catchment, but this is difficult to automate and is a labour intensive exercise.

Angela Barber and Donna Wilson
National Flood Hydrology Team, Environment Agency

Reference

Vesuviano G. 2022. The FEH22 rainfall depth-duration-frequency (DDF) model. UKCEH. Available via https://fehwebdocs.hydrosolutions.co.uk/docs/DDF-Science/FEH22/

To celebrate World Water Day, a Special Issue put together by the IUFRO Forest and Water Task Force has been published today in Forest Ecology and Management. The Special Issue is entitled 'Global Reviews on Forest Management and Provision of Hydrological Functions'All papers are open access for 6 months:https://www.sciencedirect.com/journal/forest-ecology-and-management/special-issue/10TJPKKHN55

The 2023 UK Skills and Satisfaction Survey

The 2023 UK Hydrology Skills Survey was conducted by the Environment Agency's Flood Hydrology Improvements Programme as a delivery partner of the UK Flood Hydrology Roadmap (UKFHR). The UKFHR is a 25-year plan to improve scientific understanding, methods, data, and ways of working in UK flood hydrology. In total, 286 UK users of hydrology responded to questions about themselves, their careers, the skills they have, and the skills they needed to or wanted to learn. The key topics and concepts that came up in the survey results are presented in the figure below and the full results will be available on the project webpages in the early summer here: https://engageenvironmentagency.uk.engagementhq.com/w4-skills-survey

To help us consider and communicate the findings of the skills survey the Flood Hydrology Improvements Programme would like to collate a series of reflections from individuals across the community to give us a wide range of voices. If you would like you to provide us with your thoughts, we would love to hear from you! We anticipate the reflections being short responses to a series of questions that will then be incorporated into the final report with your contribution acknowledged. The report will be published publicly via the FHIP webpages and promoted via articles, webinars, and social media.

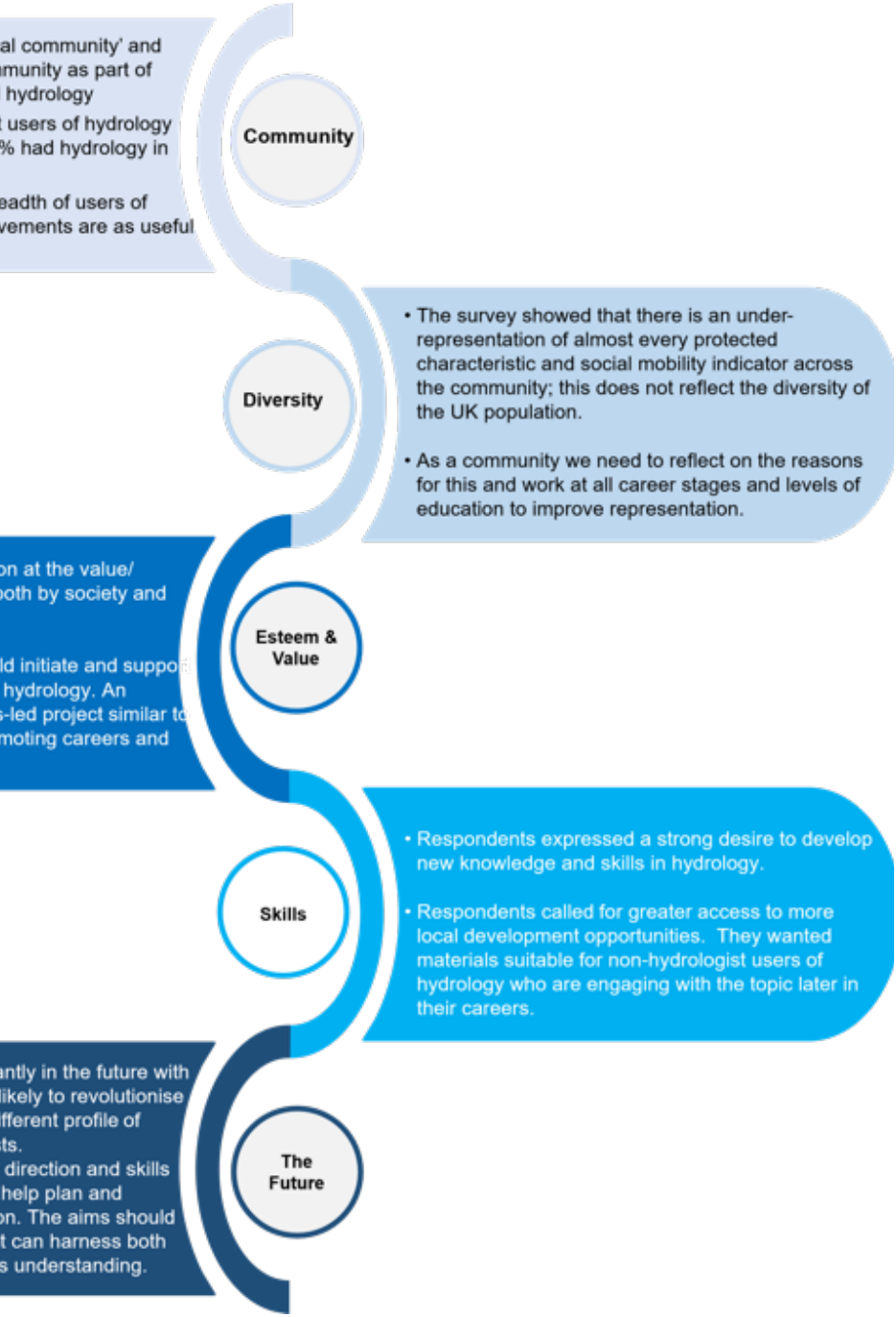
If you would like to get involved and provide us with your thoughts please contact

FHIP@environment-agency.gov.uk.

- We often refer to a 'hydrologic
  attempt to encourage this com
  actions to improve operational
- The survey revealed that most
  are **not** hydrologists – only 12
  their job title
- We should consider the full br
  hydrology to make sure improv
  as possible

- There was strong dissatisfacti
  esteem placed on hydrology, b
  within organisations
- Leaders in UK hydrology shou
  actions that raise the profile of
  example could be a grassroots
  Geoscience for the Future pro
  role models in hydrology.

- Hydrology will change significa
  numerous emerging methods
  the field; these will require a di
  technical skills from hydrologis
- Horizon scanning of the future
  requirements in hydrology will
  develop future training provisio
  be to produce hydrologists tha
  the technical skills and proces


al community' and
mmunity as part of
hydrology
users of hydrology
% had hydrology in
eadth of users of
vements are as useful
Community
Diversity
• The survey showed that there is an under-representation of almost every protected characteristic and social mobility indicator across the community; this does not reflect the diversity of the UK population.
• As a community we need to reflect on the reasons for this and work at all career stages and levels of education to improve representation.
on at the value/
oth by society and
ld initiate and suppo
hydrology. An
-led project similar t
moting careers and
Esteem & Value
Skills
• Respondents expressed a strong desire to develop new knowledge and skills in hydrology.
• Respondents called for greater access to more local development opportunities. They wanted materials suitable for non-hydrologist users of hydrology who are engaging with the topic later in their careers.
ntly in the future with
likely to revolutionise
fferent profile of
ts.
direction and skills
help plan and
n. The aims should
t can harness both
s understanding.
The Future

Making more hydrometric data open
…the enhanced Hydrology Data Explorer

Detailed hydrometric records are an essential resource for the hydrology community, supporting operational and research work. The Environment Agency has an extensive network of measurement sites, and it stores the observed data in the digital WISKI archive. The Hydrology Data Explorer (HDE) tool hosted on the Defra Data Services Platform makes key hydrometric datasets throughout England from the Environment Agency open to external users.

The Environment Agency has now made a major upgrade to the HDE service by adding in daily and sub-daily rainfall, river flow, river level and groundwater records for the majority of its open (operational) stations, together with water quality data from both open and historic telemetered sites. The service enables external users to freely access these hydrometric data as and when required. With data from over 4 billion data points across 7,000 hydrometric sites open to the public, this will make the service one of the biggest online hydrological archives in the world.

Key features of the enhanced HDE are:

- Real-time and quality assured historic hydrometric data.
- Sub-daily data now available in addition to daily.
- Facility to download data from the website or via the API.
- Real-time data of up to 10 water quality parameters.
- Ability to display data including the quality flags.

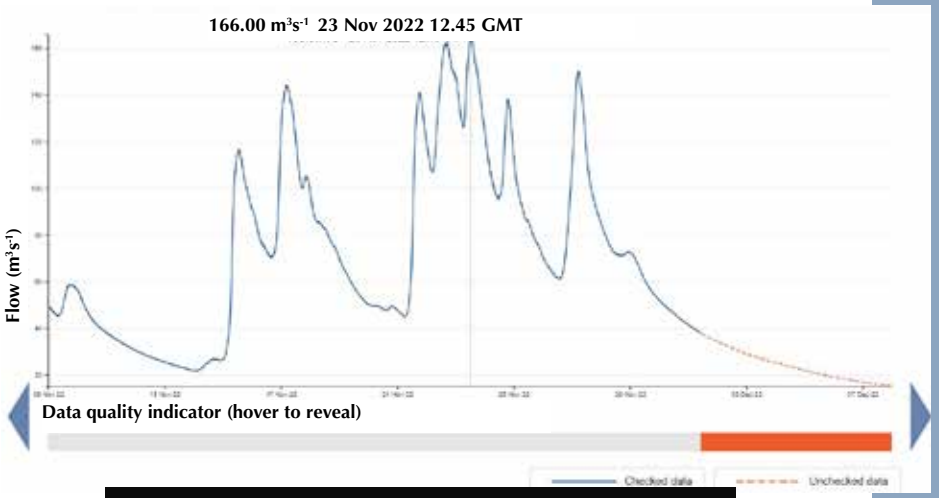
The upgrade has been co-developed by the Flood Hydrology Improvements Programme, Defra Data Services Platform and Water Land and Biodiversity in partnership with a number of teams (including hydrology, H&T, Groundwater, telemetry and WISKI) within the Agency. The Hydrology Open Data Project set out to increase the amount of hydrometric and water quality data available, improving the efficiency of how we make these datasets available to external customers.

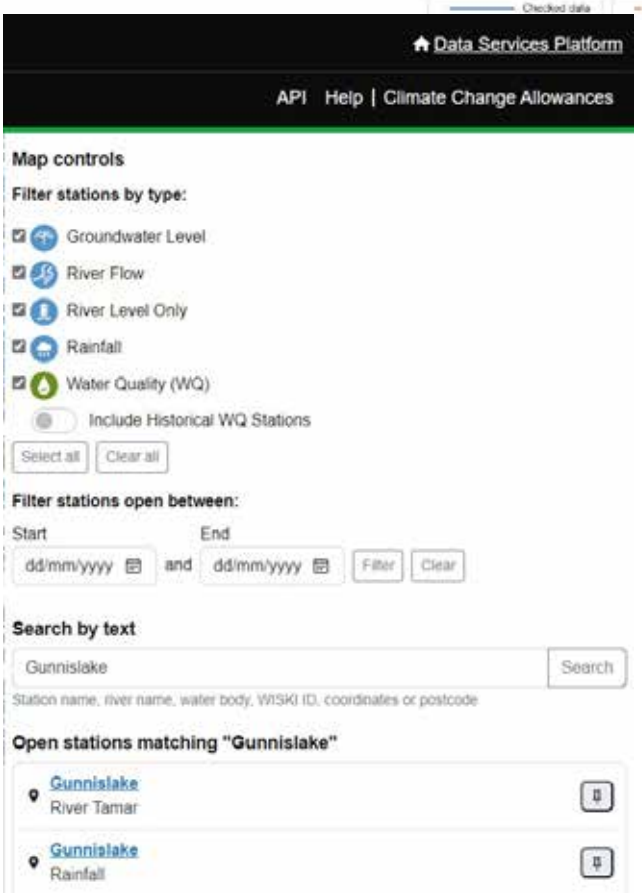
We are keen for the service to be as efficient as possible for users and we would like to hear your feedback. There is a link on the HDE site for users to provide feedback or feel free to email your feedback to us directly

Please note that we ask that users exercise judgement with any API requests as the HDE is a shared service. If users require a particularly large volume of data, then please get in touch with us at **HydrometricOpenData@environment-agency.gov.uk** so that we can work with you to ensure you get what you need without compromising the service for others. Please also note that the HDE is not a replacement for the records of the highest river flows observed each year in the National River Flow Archive (NRFA), which continues to be the primary source for peak flows for flood estimation.

The HDE is available at ***https://environment.data.gov.uk/hydrology***

Martin Borthwick
Flood Hydrology Improvements Programme,
Andrew Chiverton
EA Hydrology Data Explorer Manager,


166.00 m³s⁻¹ 23 Nov 2022 12.45 GMT
Flow (m³s⁻¹)
Data quality indicator (hover to reveal)
Checked data
Unchecked data


Data Services Platform
API Help | Climate Change Allowances
Map controls
Filter stations by type:
Groundwater Level
River Flow
River Level Only
Rainfall
Water Quality (WQ)
Include Historical WQ Stations
Select all
Clear all
Filter stations open between:
Start
End
dd/mm/yyyy
and
dd/mm/yyyy
Filter
Clear
Search by text
Gunnislake
Search
Station name, river name, water body, WISKI ID, coordinates or postcode
Open stations matching "Gunnislake"
Gunnislake
River Tamar
Gunnislake
Rainfall

FEH22 rainfall depth-duration-frequency model

The British Hydrological Society, UK Centre for Ecology and Hydrology (UKCEH) and Wallingford HydroSolutions (WHS) organised a lunchtime webinar on Tuesday 21 February 2023, in which Dr James Miller (UKCEH), Dr Gianni Vesuviano (UKCEH), and Jude Jeans (WHS) presented the FEH22 rainfall depth-duration-frequency model and updates to the FEH Web Service and ReFH 2 rainfall runoff model.

This webinar presented the UK-wide recalibration of the FEH13 rainfall depth-duration frequency (DDF) model – FEH22. An overview of the FEH Web Service, and how the income it generates supports such new developments, was provided. The FEH22 portion of the webinar covered the significantly increased raingauge data and network that were available from across the UK, and the revised quality control process that involved regulatory review of notable rainfall events. The resulting changes in rainfall depth relative to FEH13 were presented for a range of durations and return periods. Access to FEH22 design rainfalls via the recently updated FEH Web Service was presented, along with progress with regards to related updates for ReFH2.

The event was well-attended, with approximately 400 attendees, and resulted in a detailed discussion on the implications of the update to existing methods. A number of questions were raised on topics including the revised quality control process (which Angela Barber and Donna Wilson discuss in more detail from an Environment Agency perspective in this issue of Circulation), localised differences between the FEH22 and FEH13 models, the application of climate change guidance and allowances, and clarifications and regulatory positions on the use of FEH22 and ReFH 2. Questions are always welcome to be sent to fehweb@ceh.ac.uk (for FEH22) or info@hydrosolutions.co.uk (for ReFH 2). %20(DDF)%20model-caa11347-4ff7-4c89-b707-bf5bb1c05d79.pdf

The Environment Agency's position statement and further advice on using FEH22 in Environment Agency related projects can be requested from FloodHydrology@environment-agency.gov.uk

A guide on quantifying uncertainty in FEH methods can be found in: https://www.hydrosolutions.co.uk/app/uploads/2021/11/Uncertainty-in-FEH-methods-v1.1.pdf

This webinar can be replayed at https://www.youtube.com/watch?v=y33Z4hM_6Os, via the British Hydrological Society's YouTube channel.

James Miller & Gianni Vesuviano
UK Centre for Ecology & Hydrology

Travel Grants

Important message from the Treasurer: don't be bashful about applying for BHS grants as we are in the fortunate position of being able to be generous this year.

Obituaries

We have three in this issue. I believe that an update on members' 'Arrivals and Departures' is an important aspect of our communications within the membership. The 'New Members' slot is easy: Moira has access to the appropriate records. It is harder to follow 'Exits' and so far has relied on ad hoc contributions submitted for publication. We propose to have a permanent feature in Circulation listing known deaths with the expectation that we will receive subsequent offers for personal tributes to appear in future issues

Editor

Laura Baird

Laura Baird passed away on 5th October 2022 at Sue Ryder hospice in Peterborough, having lived with cancer for several years.

Laura studied at the University of East Anglia, gaining a BSc in Environmental Science in 1986. She then gained a PhD in Flood Forecasting in Ungauged Catchments from the University of Bristol in 1989. During this time she worked for the US Army Corps of Engineers, working for a year on finite element hydraulic modelling of flood propagation along rivers. Her post PhD work was published in two papers in the Journal of Earth Surface Processes and Landforms. In 1990, she joined Sir William Halcrow and Partners based in the Swindon office, as part of the Environment team. She quickly became known for her hydraulic modelling and hydrology expertise, as well as her enthusiastic nature and sense of fun! Her career with Halcrow, CH2M and Jacobs spanned three decades and across offices in Swindon, Leeds, Manchester and Peterborough.

Laura was a Member of the Chartered Institution of Water and Environmental Management (MCIWEM), Chartered Scientist (CSci) and Chartered Environmentalist (CEnv). She was also a member of the British Hydrological Society.



From the Peterborough office Laura grew a centre of excellence around flood risk management and hydrology that provided and continues to provide advice to a diverse range of projects across the UK and

beyond. As an expert in flood risk and hydrology, Laura sought out the most challenging projects and problems which she always approached with calm pragmatism. Laura's work touched on many areas both in the UK and abroad. Her significant contribution to UK flood management includes flood alleviation projects, which protected thousands of homes on the Salmons Brook, River Mersey, River Eden and many others; flood mapping projects across the UK; and the development of flood forecasting tools which remain in use today running continuously to help mitigate flood risk to numerous communities. Laura spent a considerable part of her career working for the Environment Agency where she was respected for her technical knowledge, experience and professionalism. She was key to the delivery of much of the Environment Agency's national flood risk management portfolio across twenty years. This included periods as a framework manager for the Water and Environ-ment Management (WEM) Framework, the National Engineering and Environmental Consultancy Agreement (NEECA) and the Mapping and Modelling Framework (MMF).

Laura was not just a technical specialist, she was a leader, manager, mentor, trusted colleague and friend who always found time for others. Everyone who worked with Laura will remember her approaching situations with pragmatic determination and a sense of positivity. Laura mentored many up and coming professionals, inspiring them to develop skills in the field of hydrology and putting them on a trajectory to career success. Laura was a true role model for those who were lucky enough to have worked with her. Those Laura worked with, both colleagues and clients alike were always greatly assured by having Laura close by to ask questions and provide reassurance, she was a true professional. Laura was also a people person, she would always find time to talk to and support anyone who needed it. Whatever the problem she would always make those she was engaged with feel like they were her priority, she would always provide pragmatic advice mixed with just the right amount of humour, and bring a different perspectives to whatever challenges were being faced.

Outside of work, Laura had many hobbies through her life, including parachuting, tap dancing, kitchen discos, swimming, and body boarding. Family holidays around the UK; always coastal - were a particular highlight of her year.

Laura made a very positive impact on the hydrology industry and the community. She will be greatly missed. Our thoughts are with Laura's husband, Andy and daughters; Aileen and Hester.

A belated obituary and appreciation of

David Marshall

compiled by ***Duncan Reed and Duncan Faulkner***

David Charles Williams Marshall, who worked at the Institute of Hydrology, died aged 68 in June 2021. Hydrology played a very large part in David's life because heart disease and associated disorders, including limited hearing, constrained so much else.

David worked initially on water resources, contributing to a major study of "Compensation waters". Later he moved mainly into floods work. If you count citations by regulators and practitioners, Marshall and Bayliss's "Flood estimation for small catchments" *IH Report 124* must score as one of the most highly cited publications in UK hydrology. The report documents enterprising and effective research in instrumenting ungauged watercourses to detect flood response times to heavy rainfall. These were not esoteric research catchments but real-world small catchments chosen to be of a kind for which flood estimates are actually required. Rather than admiring the splendid fieldwork and marshalling of datasets, it is the extra bit that the project was asked to do that wins most of the citations: a simple formula for estimating the mean annual flood from indices representing catchment size, soils and wetness. No, the *IH124* formula shouldn't be used for estimating greenfield runoff rates on very small areas … areas that are seldom even catchments … in connection with modelling the effect of "development" here, there and everywhere. But it is.

David had a particular affinity with research on low-lying and artificially drained catchments in Eastern England and on the Somerset Levels. Both his commitment to individual projects and loyalty to large team projects were immense. If something needed verifying, David was often the person to turn to.

As an Advanced Motorist, he kept his car in good order and – when feeling strong enough – made pilgrimages by road. His love of Northumbria was unlimited: gained in his MSc in Engineering Hydrology at Newcastle-upon-Tyne and from an early period working for Northumbrian Water Authority. Bamburgh Castle was one of his all-time favourite locations. In some Betjemanesque or Bryson way, David really appreciated the English landscape.

David remembered fondly all those who treated him considerately, and, with less enthusiasm, those higher-flying research hydrologists who misjudged him or couldn't raise their speech above a mutter. His comments tended to be grounded but unusual: spotting things that others missed. Some were loosely related to his original discipline of civil engineering. In 1959, city planners in Stockholm announced a design challenge for a roundabout in their city square Sergels Torg. Who knew that Piet Hein's winning proposal was based on a superellipse with n = 2.5 and a/b = 6/5?

David Marshall did.

Future Book by James Dent

James (Jim) Dent is no stranger to the pages of 'Circulation' and, as one of the earliest members of BHS, is well-known to the older generation of hydrologists. For the last year he has been working on writing a book on his career experiences. This is due to be published shortly, with the title of "*Water Under The Bridge*".

The book generally follows the chronological pattern of James's life, but liberally scattered with comments and personal experiences to give it a different slant.

As a Hydrologist and Meteorologist he worked in 12 countries apart from the UK, which in chronological order have been: Indonesia, Iran, Malaysia, Bangladesh, Pakistan, Papua New Guinea, Switzerland, India, South Africa, Sri Lanka, Mozambique and Ireland. Various lengths of time were spent in these places, some for as long as 4 years, as well as making a number of short visits to some European countries. Starting with hydrometry and water resources and ending up with flood forecasting and warning, he accrued various professional qualifications, and at the height of his working career was a Fellow of the Royal Meteorological Society, Chartered Meteorologist, Fellow of the Chartered Institution of Water and Environmental Management, Chartered Environmentalist and Professional Engineer (Papua New Guinea). This led to a very crowded business card, which always impressed when used on the Indian sub-Continent! He describes the high-points of his career, including being head of a national water resources operation and then head of a national flood forecasting and warning service, as well as being a consultant to the World Meteorological Organisation, but this was interspersed with periods of 'resting', when he worked as a barman and a local postman in The Fens.

While not claiming in any way that his career was exceptional, he admits he could not have dreamt it up, nor did he wake up one day with a burning desire to be a hydrometeorologist. Similarly, he tries to avoid giving the impression that these events were all part of the an inexorable path to the achievement of an ultimate goal. He expresses the hope that he was happy to be in the position to be flexible, and considers that a young person today is unlikely to look forward to such variety. He certainly has met a great variety of people and seen many strange sights and sounds, not to mention a range of smells, quite often a combination of spicy cooking and bad drains. His dietary (and intestinal) experiences have been similarly extensive!

Above all, this autobiography comes over that he was fortunate to have worked in topics that were interesting and useful to others.

UK Hydrological Bulletin: February – April 2023

The inherent variability of UK weather patterns achieved full expression over the period under review. Whilst, at the national scale, the February-April period was notably mild with rainfall very close to the average over the last 50 years, the temporal variations in rainfall were very exceptional. This was particularly true of the southern half of the country where an extremely dry February was followed by extremely wet conditions in March. As a consequence, drought and flood risk vied for prominence in most media commentaries. A particular late winter concern focussed on depleted reservoir stocks in the South-West and, more extensively, the potential threat to agriculture production later in the year. March was transformational, many southern river basins registering more than twice the average monthly rainfall. Correspondingly, river flows increased dramatically with runoff from England & Wales during the second week closely approaching the highest on record for the time of year; flood warnings were both widespread and persistent. Flood risk declined substantially through April but healthy groundwater contributions maintained well above average flows in many southern rivers. By month-end reservoir stocks had generally returned to the within the normal spring range but remained depleted in several major impoundments in the South West.

February was a remarkably dry month: rainfall for England & Wales was only a quarter of the long-term average. Southern England registered its second driest February since 1934 and parts of East Anglia recorded less than 5 mm of rain. With seasonally high soil moisture deficits and some farm reservoirs much depleted, anticipated harvest yields became a matter of increasing concern. However, around a dozen Flood Alerts remained in operation during the first week — all groundwater related and largely a legacy of the abundant recharge in January — road and cellar flooding remained a residual nuisance particularly in parts of Dorset and Hampshire. In contrast, flows in rivers with limited baseflow support declined steeply and by mid-month many rivers from the Tamar (Devon) to the Eden (Cumbria) were close to their minimum on record for the time of year. This was true of the Annacloy in Northern Ireland also.

Across much of southern Britain a substantial proportion of rivers recorded less than a third of their average February runoff and overall outflows from Great Britain were more typical of the late summer. Correspondingly, reservoir stocks for England & Wales declined through the month, most notably in the South West where Colliford reported its lowest end-of-February stocks on record; this was also true of Daer reservoir in South Lanarkshire. Groundwater levels continued to benefitt from the above average January recharge but contrasting aquifer characterstics and rainfall patterns made for large regional contrasts, levels being particularly depressed in the East Anglian Chalk

March is often a pivotal month in relation to the water resources outlook given that April is, on average, the UK's driest month and one when evaporation demands and soil moisture deficits have an increasing impact on river flows

and reservoir replenishment. In 2023, the March rainfall was transformative. It was the UK's 5th wettest March in the Met Office series from 1836. Much of southern England and south Wales registering more than twice the average rainfall. For Northern Ireland, the March rainfall was five times that for February; more locally, rainfall for Reading approached 50 times the February total. After a relatively dry first week when the Trent, Wye (Wales) and Eden (Cumbria) were among many index rivers with very depressed flows, soil moisture deficits were rapidly eliminated and runoff rates increased dramatically. Outflows from Great Britain approached their highest on record for mid March (Fig. 1). Correspondingly, flood warnings became widespread and persistent. Groundwater levels reflected the contrasting responsiveness of individual aquifer units — seasonally high in the Jurassic Limestone of the Cotswolds but remaining below average in much of the slower-responding Chilterns Chalk (see Fig 2). Generally, reservoir replenishment was exceptionaly healthy and, after almost a year of seasonally depleted stocks, end-of-April stocks for England & Wales modestly exceeded the long-term average (Fig. 3). The South West was an important exception — Roadford and Colliford reservoirs remaining substantially below the average for the time of year.

The UK rainfall total for April was very close to the long-term mean; most regions registering monthly totals within 15-20% of average. Much of southern England and Northern Ireland were again particularly wet whilst below average rainfall characterised parts of northern Britain. Despite the dominance of high pressure early in the month, the legacy of the late-March storms ensured that flood warnings remained very extensive during early April — particularly across southern Britain — and again following the arrival of Storm Noa on the 12th. High groundwater levels were an aggravating factor across much of southern Britain. Subsequently, river flow recessions became established and some index rivers in northern Scotland recorded less than 70% of the April average runoff.

By contrast, runoff across southern England was exceptionally high — the Medway and Sussex Ouse eclipsing previous runoff maxima for the month. Correspondingly, month-end reservoir stocks were

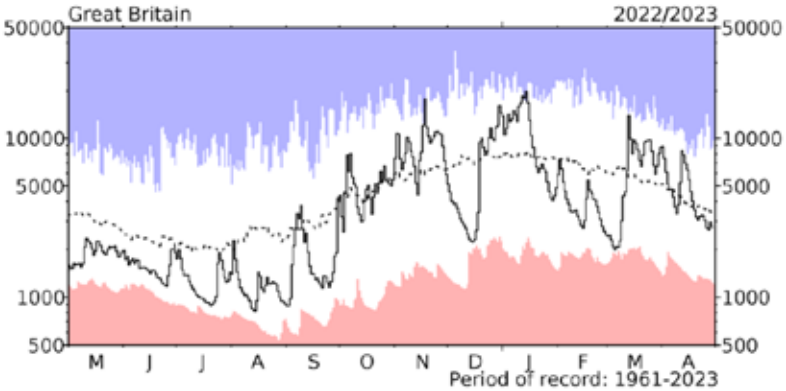


Fig. 1 *Daily outflows (m^3s^{-1}) from Great Britain (solid trace).The blue and red envelopes are the daily extremes and the dotted trace is the long term daily average)*

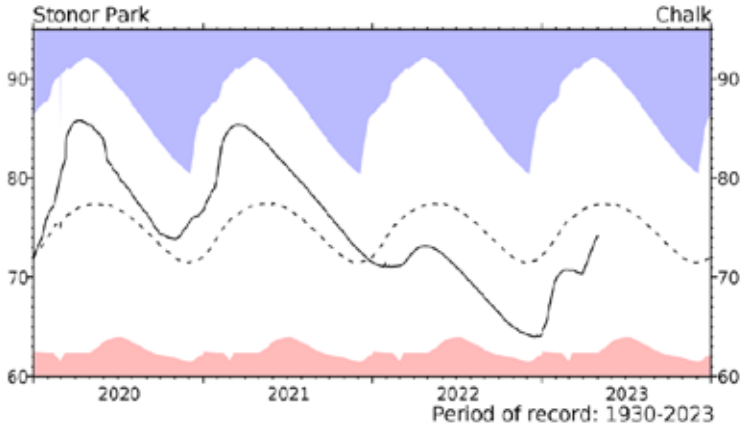


Fig. 2 *Groundwater levels in the Chalk of the Chilterns (black trace). The blue and red envelopes are the long-term maxima and minima; the broken trace is the long-erm average*

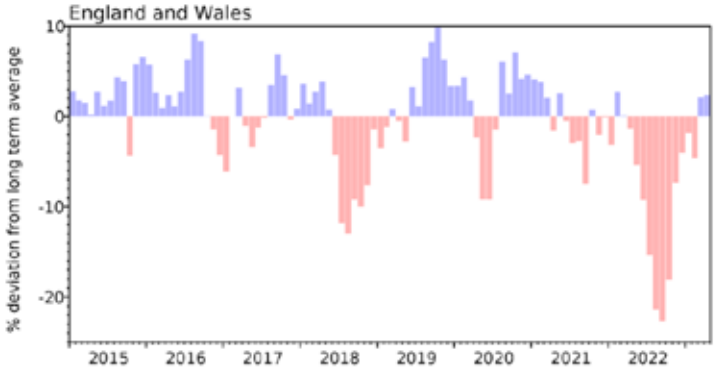


Fig. 3 A Guide to the monthly variation in overall reservoir stocks for England & Wales

close to capacity across the great majority of the country. Again, Devon was an exception **and** South West Water extended a hosepipe ban to affect around 390,00 homes in Devon.

Terry Marsh
CEH Fellow
17/05/2023

This report draws primarily on data and information from the UK Met Office and the CEH/BGS National Hydrological Monitoring Programme – the latter comprising data supplied by the Environment Agency; Scottish Environment Protection Agency; Natural Resources Wales; Northern Ireland Environment Agency and the UK water companies.



A water quality issue in the making?