Understanding the Effectiveness of Natural Flood Management (NFM)
Announcement of Opportunity (AO) – Outline bids

Closing Date for Outline bids: 16.00 on 21 February 2017
Closing Date for Full bids: 16:00 on 23 May 2017

1. Summary

NERC is inviting Outline Bids for a new NERC funded programme on Understanding the Effectiveness of Natural Flood Management. This research programme will fund the novel environmental science to improve understanding of the suitability and effectiveness of different Natural Flood Management (NFM) measures for a range of flood risk scenarios.

This is a four-year, £4m programme in which applicants are invited to request up to £1.25m (80%FEC), it is anticipated that 3-4 projects will be funded. Applicants successful at the Outline Bid stage will be asked to submit a Full Bid to a closing date in May 2017. Please note that only applicants successful at the Outline Bid stage will be eligible to submit Full Bids.

This programme has been co-designed with Defra, the EA, SEPA, the Welsh Government and NRW and as such stakeholder engagement and Project Partner contributions are an essential component of this call.

The closing date for the Outline bids is 16.00 on 21 February 2017.

2. Background

Climate change projections indicate that total rainfall will increase in winter in the UK and, although total summer rainfall is expected to decrease, models are predicting that there will be a five-fold increase in high intensity rainfall events in summertime by 2100 (Kendon et al, 2014, Nature Climate Change). As this will increase the likelihood of fluvial, pluvial and groundwater flooding the Committee on Climate Change has advised that more ambitious adaptation measures are needed to manage flood risk in the UK (UK-Climate Change Risk Assessment (CCRA) 2017). In many areas adaptation measures will include Natural Flood Management (NFM) approaches.

NFM approaches are defined as managing flood risk by protecting, restoring and emulating the natural regulating function of catchments and rivers; i.e. reducing flood risk by storing water, slowing water, increasing flow connectivity and increasing soil infiltration. NFM has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible, and to increase the lifespan of existing flood defences.

Natural Flood Management is part of flood policy; the Flood and Water Management Act (England & Wales) 2010 advocates NFM and the Flood Risk Management Act (Scotland)

2009 requires that NFM approaches are considered when designing flood management schemes. The recently published National Flood Resilience Review also highlights the benefits of NFM, noting the value of managing catchments to both reduce flood risk and deliver wider environmental benefits.

NFM is already part of flood management policy and the Environment Agency (EA), Scottish Environmental Protection Agency (SEPA) and Natural Resources Wales (NRW) are planning and undertaking some pilot studies to provide information on the effectiveness of NFM measures. However a number of key evidence gaps remain, for example the current pilot studies have focussed on small catchments (e.g. less than 10km^2) and only investigated how NFM measures attenuate peak flows. This programme will start to address these evidence gaps to help policymakers, businesses and householders to make more informed decisions about the implementation of NFM measures.

NERC, the EA and Defra held a jointly organised workshop for researchers and users from policy, local authorities, business and NGOs in June 2016, to define the priorities and scope of this research call. Further information can be found in the Using natural processes to reduce flood risk report.

3. Scope

3.1 Programme objectives

The aim of this programme is to support the novel research on hydrological, sediment and geomorphological processes and flood modelling needed to:
improve understanding of the suitability and effectiveness of different NFM measures for a range of flood risk scenarios, including the impact of NFM at the catchment-level.

The outputs and outcomes of the programme will support the development of the NFM evidence base and to ensure that these outputs and outcomes address the requirements of policy, regulators, business and the public, stakeholder engagement will be a key element of the programme.

Specific research questions to be addressed include, but are not limited to:

1) How effective are particular NFM approaches at reducing flood risk for events of different magnitude?

2) Can NFM increase flood risk, for example from a different type of flooding or in a different part of the catchment?

3) Can clustering NFM measures help to reduce flood risk?

4) How do NFM measures affect the movement of water through a catchment, including in periods of normal and low flow as well as high flow, e.g. can NFM reduce the risks associated with both floods and drought?

As this is a NERC-funded programme it is a requirement that the proposals fall within NERC's remit, i.e. the focus should be on novel environmental science. Work on other aspects of NFM, e.g. engineering or economics, may be included where this is a contribution from a project partner and is not directly funded by NERC. Applicants who are unsure whether their project falls within the scope of this programme are advised to consult with the Programme Secretariat prior to submission.

The programme will support 3-4 case studies that will explore the effectiveness of NFM measures in mitigating flood risk within the study catchment or catchments. There will be an emphasis on understanding how NFM can contribute to the development of catchment-level flood management plans, and each project will be expected to investigate the range of risks in the study catchment, including:

- the risks from fluvial, pluvial and groundwater flooding;
- the risks in different parts of the catchments and how these are linked: and
- the risks associated with flood events of different magnitude.

Each project is expected to explore how the project specific models, novel methodologies and the location specific information on flood risk generated by the case studies can be applied to a range of catchments.

NERC will seek to ensure that a balanced portfolio of research that covers a range of NFM approaches and catchment types is supported to enable this outcome to be delivered.

Case studies must be focused on a catchment, or catchments, in the UK and as the aim is understand the impacts of NFM at the catchment-scale; coastal flooding is out of scope of this call.

3.2 Stakeholder Engagement

The programme is aiming to improve the NFM evidence base and help policymakers, businesses and local communities make best use of NFM measures. As such stakeholder engagement is a key element of the programme. The programme has been co-designed with Defra, the EA, SEPA, the Welsh Government and NRW and other partners who have a strong interest in NFM, such as ARUP and the National Trust. The expectation is that this stakeholder engagement will continue at both the programme and project-levels for the duration of the programme.

NERC strongly encourages projects to engage with potential partners to ensure that the research proposals are designed to provide the evidence needed to support policy, regulators, local communities and industry as appropriate. Where possible applicants should make every effort to build on partner activity to add value to existing investments, to align with on-going activity and make use of partner knowledge and expertise.

Some organisations who have indicated in advance a desire to partner with applicants to this call can be found in Annex A; applicants are actively encouraged to make contact where appropriate to discuss possible collaborations. Please note that the inclusion of partners in organisations not included in Annex A, for example local stakeholders, is also strongly encouraged.

It is recognised that at the Outline Bid stage project partners may not yet be confirmed, but the Outline Bids should note the partner organisations being engaged and the status of the partner discussions, including the likely nature of the contribution to the project. Letters of Support from Project Partners are not required at the Outline Bid stage, but will be required at the Full Bid stage.

4 Programme requirements

4.1 Programme funding

This is a four-year NERC funded research programme, with one research call. There is £4m available for this call and each project can request funds of up to £1.25m. The NERC

funding contribution will be 80% of the full economic cost (FEC) (with the standard exceptions paid at 100% FEC).

It is anticipated that 3-4 projects will be funded. The Understanding the Effectiveness of Natural Flood Management programme is a strategic research programme and as such the funders plan to support a balanced portfolio of projects that explores how NFM can mitigate the range of flood risk scenarios in the UK.

Awards will be made under the standard NERC research grant terms and conditions. Plus the additional condition; that the grants are expected to start by 1 November 2017 and last for up to four years in duration. The Starting Certificate must be returned by mid-November 2017 to allow for financial payments to be made to the project teams in quarter 3 and quarter 4 of 2017/18 financial year.

The call has two stages: an Outline Bid and an invited Full Proposal. The submission of an Outline Bid is a requirement for this programme and only applicants successful at the Outline Bid stage will be eligible to submit Full Proposals.

The funding available for NFM is relatively modest, thus proposals should not be directed towards major capital investments, rather it is expected that as far as possible projects should utilise existing operational observation networks in the study catchment(s), but may also deploy new sensors to augment these networks.

4.2 Studentships

No associated studentships can be requested under this call.

4.3 Programme Level Coordination and Integration

The PIs of the successful grants will be expected to form a Programme Coordination Team and will be responsible for programme-level coordination and integration, and the development of programme-level research and knowledge exchange outputs. These programme coordination and integration activities will build on and not duplicate or replace project-level research and Pathways to Impact activities. Additional funding to support these activities will be available once the projects are underway and a kick-off meeting to discuss these arrangements will be organised.

5. Application Process - How to apply

5.1 Outline Bid stage

The Outline Bid stage will be used to identify a number of projects to be invited to Full Bid stage. One Outline Bid is required for each proposed project; i.e. projects that expect to be submitted as joint applications at the full proposal stage need only submit one Outline Bid covering the whole project. It is expected that the Outline Bid will be submitted by the Principal Investigator.

The Outline Bid proforma can be downloaded from the NERC Natural Flood Management programme website and submitted to the programme email address: nfm@nerc.ac.uk before 16:00 GMT on 21 February 2017. Applications received after this deadline, or where the proforma is incomplete or has exceeded the word limits will not be accepted.

Applicants must include the following information in the proforma:

- Objectives and anticipated outputs, demonstrating how the outputs will contribute to the delivery of the programme goals;

- Outline of research proposed and how it fits the scope and addresses the scientific objectives of the call;
- Composition and experience of the research team;
- Outline project management plan;
- Role of Project Partners and level of contributions (proposed and secured);
- Impact & engagement plan – how will the proposed research address local/national needs and engage local/national stakeholders
- Resources;
- Proposed use of NERC Services and Facilities; and
- Justification of Resources.

A detailed budget is not required at this stage, but applicants should include the following information in the Justification of Resources section in the Outline Bid proforma:

- an indicative budget setting out the resources required for the proposed research project; and
- information on any anticipated contribution to be made by project partners.

Details of eligible costs are given in the NERC Research Grants Handbook

Full Pathways to impact and Data Management plans are not required at the Outline Bid stage, but will be required for full proposals.

Applicants will be informed in March 2017 if they are to be invited to proceed to the Full Bid stage.

5.2 Full Bid stage

Only applicants successful at the Outline Bid stage will be invited to proceed to the Full Bid stage. It is expected that proposals will evolve between the Outline Bid and the Full Bid (including personnel and partnerships), but the major science elements are expected to remain broadly the same, within the confines of any feedback from the Outline Bid stage. Applicants considering any significant changes in the scope of a project should agree any significant proposed changes with NERC prior to submitting their Full Proposals.

Details on the submission and assessment procedures for Full Bids will be provided to the PIs of successful Outline Bids. As an indication of expectations for this stage, Full Proposals will be submitted through JeS and have a similar format to NERC Large Grants scheme. The primary assessment criteria will be Excellence and Fit to Scheme. The deadline for Full proposals will be 23 May 2017. The Full Bid proposals will be internationally peer-reviewed and go to a Moderating Panel who will make recommendations to NERC as the programme funder. In determining which projects to fund, NERC will select a balanced portfolio of projects that best addresses the overarching aims of the programme.

5.3 Eligibility

Normal individual eligibility applies and is in Section C of the NERC research grant and fellowships handbook. NERC research and fellowship grants for all schemes may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs). Full details of approved RCIs and IROs can be found on the RCUK website.

The Research Councils have agreed that to help remove potential barriers to interdisciplinary research, all RCIs are eligible for grant funding from all Research Councils.

Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead Principal Investigator.

6. Assessment Process

All Outline Bids received will be assessed by an Assessment Panel to shortlist those that will be invited to submit Full Bids. Any sift of proposals will be made on the basis of the likely fit of applications to requirements of the call. Applicants will be given brief feedback from the Panel summarising the reasons why the application was successful/unsuccessful.
No further feedback will be available.

7. Timetable

• Outline Bid AO published	December 2016
• Outline Bid call closes	21 February 2017
• Outline Bid Sift Panel	14 March 2017
• Full Bids Invited	21 March 2017
• Full Bid call closes	23 May 2017
• Peer review	May – September 2017
• PI response	Late August 2017*
• Moderating panel	September 2017
• Grants start date	1 November 2017
• Kick-off workshop	November/December 2017

* *Applicants should be prepared to respond to reviews during this stage.*

8. Contacts

- **NERC**

Application process and programme enquiries:
Daniel Knight – nfm@nerc.ac.uk
01793 411672

Annex A – Stakeholder interests

This annex details the importance of NFM to the stakeholders, their interests and the potential offer of Project Partner support to this call. It should be noted that the partners are not obliged to be part of every project to the call and will only partner those projects that align to their interests.

All queries regarding collaborations should be directed to the contact points listed in this annex. Where applicable the contact points will liaise with colleagues to determine the scale and nature of any in-kind contributions.

ARUP

Two primary areas of research of interest to Arup and industry in general are outlined below.

Quantification of the Benefits of NFM

Quantification of NFM in terms of flood risk benefit is key to unlocking funding sources from central government. Flood risk management authorities (FRMAs) such at the Environment Agency need to assess the cost to benefit ratio for a scheme to be granted funding. As a practitioner in the field of NFM, Arup is looking for the most appropriate modelling techniques to assess the impact of change to a given river catchment. Arup is interested in proposals for projects that will result in better understanding of the interactions between NFM and the hydrology of a river catchment, whether it be through monitoring of interventions to measure response, or the development of tools and models to simulate impact. Some focus should be placed on the testing and development of industry standard modelling techniques.

Questions arise such as:

- Can these 'off-the-shelf' tools be adapted for modelling NFM, or does more focus need to be placed on developing new and innovative modelling tools? And;

- How much evidence is enough to unlock funding?

NFM provides multiple benefits and ecosystem services, such as sediment capture, water quality improvements, habitat creation, increased carbon sequestration and air quality improvements. Arup is interested in proposals to investigate the multiple benefits of NFM and the value of such benefits. Multiple benefits can help identify partnership funding sources, which could enable schemes to become financially viable.

Social and environmental complexities of implementing NFM on a catchment scale

An understanding of the benefits of NFM is potentially useless without an understanding of the feasibility of installing a spatially diffuse flood risk management scheme on a large catchment scale. A NFM scheme implemented on a large scale has the potential to involve hundreds of private landowners.

Related to this, questions arise such as:

- How can FRMAs engage with landowners on this scale?

- Can NFM be incentivised by delivering local benefits to these private landowners, or is it necessary to access compensation and maintenance funding to ensure multiple NFM features have the desired design life of a scheme?

- How is this guaranteed when land is bought and sold? Are landowners to be liable for NFM features if they fail?

- Should certain features be owned and maintained by FRMAs?

Traditional flood defences are allocated annual maintenance budgets to ensure design life is achievable. Arup are interested in a better understanding of the differences of maintaining thousands of NFM features rather than a few traditional engineered features.

Defra/EA

Partner Interest

Why this research is important to us

At Defra and the Environment Agency we recognise the need to Work with Natural Processes to allow flood and coastal erosion risk management to be carried out sustainably, improving the environment for people and wildlife. We support research that will help Flood and Coastal Erosion Risk Management Authorities understand, justify, develop and implement Flood and Coastal Erosion Risk Management (FCERM) schemes which include Natural Flood Management (NFM) measures to reduce flood and erosion risk.

What will the impact of this work be on our objectives and how will we use the results?

This research will help us better understand the effects of NFM measures by filling known research gaps. Ultimately it should help FCERM authorities plan and design schemes which reduce flood risk through slowing and storing flood waters, and reduce the need for sediment management.

This proposal also fits with:

- **Defra's one departmental plan** which recognises the need for, '*a nation better protected against natural threats and hazards, with strong response and recovery capabilities.* There are also likely to be opportunities for the call to support the forthcoming 25 Year Environment Plan and the Pioneer projects that are planned.
- **Our organisational objectives for 2020** which will ensure, *'better protection for people and businesses against flooding and coastal erosion;* and, '*greater resilience to climate change.'*
- The Secretary of State's announcement as part of the Autumn Statement of a £15million fund to support NFM.
- **Our Working with Natural Processes framework/Natural Flood Management** internal position statement which seeks to mainstream this approach to flood risk management.

We would be interested in supporting proposals which:

- Help address R&D gaps identified within our **Working with Natural Processes R&D framework**.
- Work with local flood risk management authorities to address know R&D gaps through existing/planned NFM schemes, ensuring practitioner involvement to enable knowledge transfer.

How will we support this call?

At the bid development stage we will:

- Contribute staff time to discuss content of proposed submissions.
- Link bid writers to local area staff and other partners who may be interested in being named partners on bids.
- Link bid writers to existing/proposed FCERM schemes where research could be trialled.
- Provide letters of support to those proposals which we consider to be best aligned with our R&D gaps (scoring highest in our application for support form).

- Coordinate letters of support nationally (see contact details below) so that you only need to ask Defra/Environment Agency for one letter of support per bid. As part of considering your bid, we will contact our area staff for their views on your proposal should they fall within an area where they are working.

How to contact us
To arrange a suitable time to discuss your proposal with the Environment Agency and Defra please e-mail Lydia Burgess-Gamble at: wwnp@environment-agency.gov.uk

Letters of support
We ask that all those requesting Letters of Support complete our application for support form and submit this to us no later from **1 month before the deadline for submission**. Requests received at the last minute are not likely to receive support from Defra/EA.

National Trust

The National Trust is a major land owner with almost 250,000 hectares of land in England, Wales and Northern Ireland. Our ten year strategy looks at how we can better manage this land working with our tenants and neighbouring landowners.

We have a strong interest in managing land for a range of public benefits and have been at the forefront of testing natural flood management techniques through our work on the Holnicote Estate in Exmoor. More recently we have been working with the Stroud Rural SuDs project at Ebworth on our Cotswolds Estate. We are interested in working with research organisations under this NERC research programme and as project partners can offer:

- Practical land and water management expertise and experience;
- Locations within which to apply and test natural flood management interventions;
- Opportunities to engage with land managers and communities in places where natural flood management might be applied.

Our Catchments in Trust programme is a major initiative of catchment improvement work and includes a natural flood management theme. We would strongly favour projects proposing to focus research in these places but would be happy to consider partnerships working in other areas where we have significant land holdings.

The Catchments in Trust locations are:

Catchments in Trust Project	**Environment Agency Management Catchment**
Porlock Vale Streams	South and West Somerset
Culm & Clyst	East Devon
Upper Conwy	Conwy (Natural Resources Wales)
Cole	Cotswolds and the Vale
Upper Bure	Broadland Rivers
Bollin	Upper Mersey
Doe Lea & Poulter	Don and Rother; Idle and Torne
Irt & Derwent	Derwent North West; South West Lakes
Wansbeck	Northumberland Rivers

We are interested in potential collaborations around England, Wales and Northern Ireland and may therefore develop partnerships with more than one research project proposal. However, we will endeavour to coordinate our input and engagement with the research community to avoid duplication and any conflicts of interest.

For further details or to discuss potential collaboration please contact:
research@nationaltrust.org.uk

Scottish Environmental Protection Agency (SEPA)

Why this research is important to us

SEPA is Scotland's strategic flood risk management authority and is responsible for developing Scotland's Flood Risk Management (FRM) Strategies in partnership with local authorities and other stakeholders. We work very closely with our partners to identify the Potentially Vulnerable Areas in Scotland and the most sustainable actions to manage flood risk in these areas. Natural Flood Management (NFM) is an essential component to consider when developing sustainable solutions to reduce flood risk. In Scotland, local authorities are responsible for the development and maintenance of flood protection schemes to reduce the risk of flooding from all sources.

We work closely with the Scottish Government and other partners on a number of activities to support the delivery of NFM actions, including:

- Opportunity maps for NFM and associated guidance
- Modelling Guidance
- Advice on compensation mechanisms that could be used to support land managers with opportunities to undertake NFM Actions
- Natural Flood Management Handbook that outlines the various NFM actions and the various elements to facilitate delivery on the ground.

We are involved in a number of partnership projects in Scotland including the Eddleston Water and various pilot catchment projects to improve the evidence base for NFM. We are also involved in international collaborations including the EU INTERREG Building with Nature project.

What are SEPA's research priorities?

We continue to seek improvements to the evidence base on the effects of NFM actions to inform policy and assessment decisions.

Our highest priority is catchment scale monitoring of the effects of NFM actions on flood risk and the environment. This is to better inform which combination of NFM measures works best and where in different settings (i.e. different types of catchment or land use). Improving the empirical evidence base will also help inform how best to incorporate NFM measures into cost benefit analysis to identify the most sustainable combination of actions in a catchment or along the coastline.

The FRM Strategies and associated Local FRM Plans identify a number of studies and schemes where Natural Flood Management techniques should be considered in more detail. These may provide opportunities for further research into the impacts of these actions.

While we consider acquisition of more empirical data the overriding priority we also wish to see better benchmarking of existing hydrological models to gain a better understanding of the capability, performance and predictive capability of these models on the effects of NFM actions.

How will we support this call?

At the bid development stage we will:

- Contribute staff time to discuss content of proposed submissions
- Coordinate appropriate input across SEPA

- Suggest appropriate partners that may be interested in providing further support to the bid and proposed research if successful. This could include local authorities, other stakeholders or researchers.
- Assist in identifying appropriate locations in Scotland to trial research

How to contact us?
To arrange a suitable time to discuss your proposal with us please email Heather Forbes at: heather.forbes@sepa.org.uk

Please aim to get in touch **1 month** before the submission deadline to discuss your bid. We are unlikely to be able to support requests received at the last minute.

Welsh Government/National Resources Wales (NRW)

Welsh Government and Natural Resources Wales priorities and interests:
Welsh Government and Natural Resources Wales (NRW) support research into Natural Flood Management (NFM) approaches that will help us to better understand the effects and limitations of NFM measures. This in turn should help to inform the wider implementation of cost effective and efficient solutions to flood risk management that incorporates NFM as well as deliver against our new legislative duties.

In Wales, new legislation has been implemented which seeks to drive and promote a sustainable approach to the management of our natural resources and improve environmental resilience. The Well Being and Future Generations (Wales) Act and the Environment (Wales) Act provide both the framework and the process to prioritise action and manage Wales' natural resources in an integrated, proactive, sustainable and joined-up way. The Welsh Government has also instructed NRW to deliver innovative flood risk management solutions which includes improved land use management. The provisions of the new legislation present a real opportunity to plan and design FCERM projects to include natural flood management measures but that also deliver environmental, economic and societal benefits for Wales.

Welsh Government's current National Strategy for Flood and Coastal Erosion Risk Management includes sub-objectives that support the sustainable management of natural resources. Welsh Government and Natural Resources Wales are keen to further promote innovative natural flood management and green engineering methods to complement more traditional engineering to reduce flood risk at the catchment level. The National Strategy is due to be refreshed during 2017/18 and it is envisaged that it will include a greater emphasis on the implementation of these techniques. The NERC proposal will therefore help to develop our understanding of the practical issues and potential impacts of Natural Flood Management methods through practical implementation trials at the catchment scale. This will help to inform a wider catchment approach to managing our natural resources and reducing flood risk.

Support we can offer to projects, i.e. details of possible in-kind contributions:
At the bid development stage we will:
- Contribute staff time to discuss content of proposed submissions.
- Link bid writers to local staff and other partners who may be interested in being named partners on bids.
- Provide letters of support to those proposals which we consider to be best aligned with our Evidence gaps
- Coordinate letters of support nationally (see contact details below) so that you only need to ask the Welsh Government/Natural Resources Wales for one letter of

support per bid. As part of considering your bid, we will contact our area staff for their views on your proposal should they fall within an area where they are working.

Point of contact for further information/discussion

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