



National Flood Resilience Centre

National Flood Resilience Centre - Business case summary



An initiative of:



HUMBERSIDE
Fire & Rescue Service

Overview

This business case sets out the rationale to establish Ark - National Flood Resilience Centre. The first of its kind in the world, Ark is being developed through a partnership between the University of Hull and Humberside Fire and Rescue Service, to construct and operate a world-leading centre of excellence with unique, purpose-built facilities for community resilience, flood research and responder training.

There is a significant and growing national risk around preparedness for major flooding incidents. Many vulnerable communities do not understand their risk or what to do about it. There is an urgent need to improve emergency flood training for responder agencies and undertake effective large-scale research into flood processes and the effects of flooding upon communities and individuals. No single facility currently exists in the world with the operational capability to focus on this specific area. In the US, New York State Department of Homeland Security and Rescue opened a facility in June 2018 which offers the closest comparison. It is based on the Ark design and provides helpful proof of concept and valuable learning, but lacks the breadth of

capability or scope of application planned for Ark.

Training for emergency responders currently does not reflect typical urban operational environments or accurately simulate the risks encountered. Swift water training, widely undertaken by Emergency Services, takes place in river water and presents a range of risks. The Ark facility will address these problems and will also provide a unique research and innovation resource of global significance, helping drive world leading research and international collaboration in flood processes, risk and resilience.

A suitable site has been identified for the project in North Lincolnshire. Ark is strongly supported by the

Environment Agency, the Scottish Environmental Protection Agency and a range of other organisations, including Local Authorities and the Humber Local Enterprise Partnership (LEP).

The partners are now engaging actively with other stakeholders to garner wider support, explore future operational relationships and, crucially, bridge the current gap in funding.

The partners started working together on Ark in 2017 and aim to open the Centre in 2021, subject to finalising funding.





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Mission

To make the UK a world leader in flood resilience, research and response by creating a unique national centre with purpose-built facilities for training, research and innovation.

The 'world first' National Flood Resilience Centre will be built in the Humber, the region which, outside London, is the most vulnerable to flooding and poses the greatest risk to the UK economy, mostly because of its significance as a major energy provider for the nation.

Objectives

Ark, the National Flood Resilience Centre, will be the first of its kind anywhere in the world. It will combine simulated full-scale urban and rural environments that can be inundated to provide flood emergency responders with safe and realistic training in swift and still water and the research community with unique large-scale research and innovation infrastructure.

Ark will:

- ~ Improve responder coordination and training;
- ~ Promote inter-agency understanding and cooperation;
- ~ Inform and empower businesses and communities;
- ~ Enable world-leading research on urban hydrological processes, channel-floodplain interaction and fluid-structure interactions in both waves and currents;
- ~ Support physical and psychological monitoring of rescue personnel;
- ~ Act as a business innovation hub to encourage new technologies in training, management and research around flood rescue and resilience;
- ~ Work with communities to enhance preparedness and resilience amongst businesses, residents and civic organisations at risk from flooding;
- ~ Lead the world in proactive, collaborative and innovative approaches to flood rescue, research and resilience.

What will it do?

Ark is a unique integrated multi-agency training, research, innovation and community engagement flood resilience facility. It will simulate urban swift and still water flood events in a realistic, cost effective, safe, managed environment and will improve coherent regional, national and international flood responsiveness.

It seeks to engage all relevant agencies to address a growing need for fast, effective and efficient responses to flood emergencies and flood mitigation.

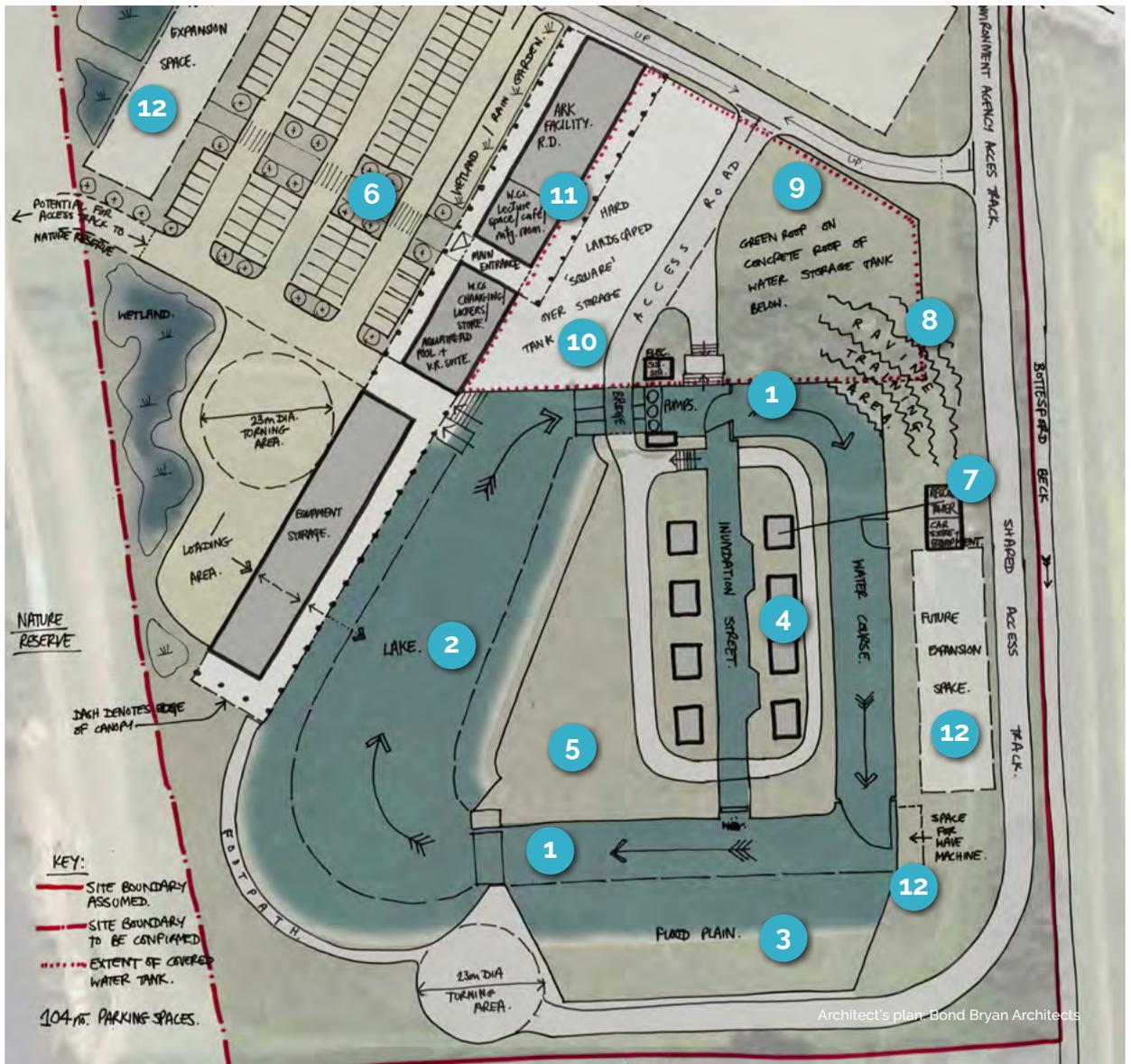
Ark will work with businesses and communities to build resilience, helping to raise awareness and preparedness, ensuring an effective and co-ordinated response to flood risk, protecting life and wellbeing, minimising flood damage and aiding rapid recovery.

It will make its world-class facilities available to businesses for collaborative research, development and innovation to bring forward new products and solutions that mitigate flood risk and increase resilience.

The unique component of the facility is a large, integrated system of basins and channels through which water can be pumped at different rates and levels to create a wide range of realistic flooding scenarios. It uses bathing quality water to

ensure the health of users. This is currently a significant issue in training for emergency services, resulting in lost workdays and cost to the taxpayer in the immediate aftermath of open water training exercises.

At its heart is a full-scale street scene - 'Inundation Street' - simulating an urban environment comprising mock commercial and residential properties and street infrastructure.



The principal components of Ark are:

- 1 **Swift water channel:** 175m long × up to 12m wide, capable of accommodating flow rates of up to $12\text{m}^3\text{s}^{-1}$ and flow depths ranging from 0.1m to 2.4m.
- 2 **Lake** with surface area ranging from 3005m^2 to 4655m^2 and maximum depth of 1.4m to permit boat handling training courses and wading training exercises to be undertaken.
- 3 **Flood plain:** up to 24m wide and maximum length 72.5m, with maximum inundation depth of 1.2m, separated from adjacent swift water channel by a demountable wall to enable on-demand flooding and draining at specific spatial locations.
- 4 **Urban street scene:** capable of inundation in a range of controllable scenarios by surface water or by back-pressuring underground drain network. The street scene comprises a house, a hotel, a commercial property, pavements, two-lane tarmac road, bus stop, speed bumps, road signs, street lighting and roadside drains.
- 5 **Innovation zone:** floodable area which can be configured to meet user requirements for developing flood resilient technologies, devices and products and inundation testing.
- 6 **Sustainable Drainage System (SuDS)** research and testing area: for testing existing and new technologies to manage water and sediment runoff from urban settings.
- 7 **Working at height facility:** Separate towers to enable rope rescue training over water and land hazards.
- 8 **Rocky training area:** large boulder-strewn banking to the swift water channel for access/egress and rescue training from locations with challenging access.
- 9 **Covered water storage:** will provide flexibility in water fill levels and permit different flow depths to be examined, as well as facilitating dry access to the facility for maintenance and cleaning.
- 10 **Water quality:** a water treatment plant will achieve and maintain water at bathing quality to prevent users becoming ill from ingesting contaminated water. Covered water storage will minimise environmental contamination.
- 11 **Support facilities** including reception, teaching space, research labs, changing facilities, recreation user storage, car parking and a café.
- 12 **Plans for future phases** include adding wave-making facilities to address the dearth of suitable facilities in which to test wave impact and 'overtopping' and large-scale environment simulation facilities, building on the University's existing world class expertise.

An outline scheme was developed with civil engineering consultants, Patrick Parsons, architects, Bond Bryan and cost consultants, Sum through an iterative design and value engineering process. Work continues to refine the specification further to seek additional improvements and cost savings.

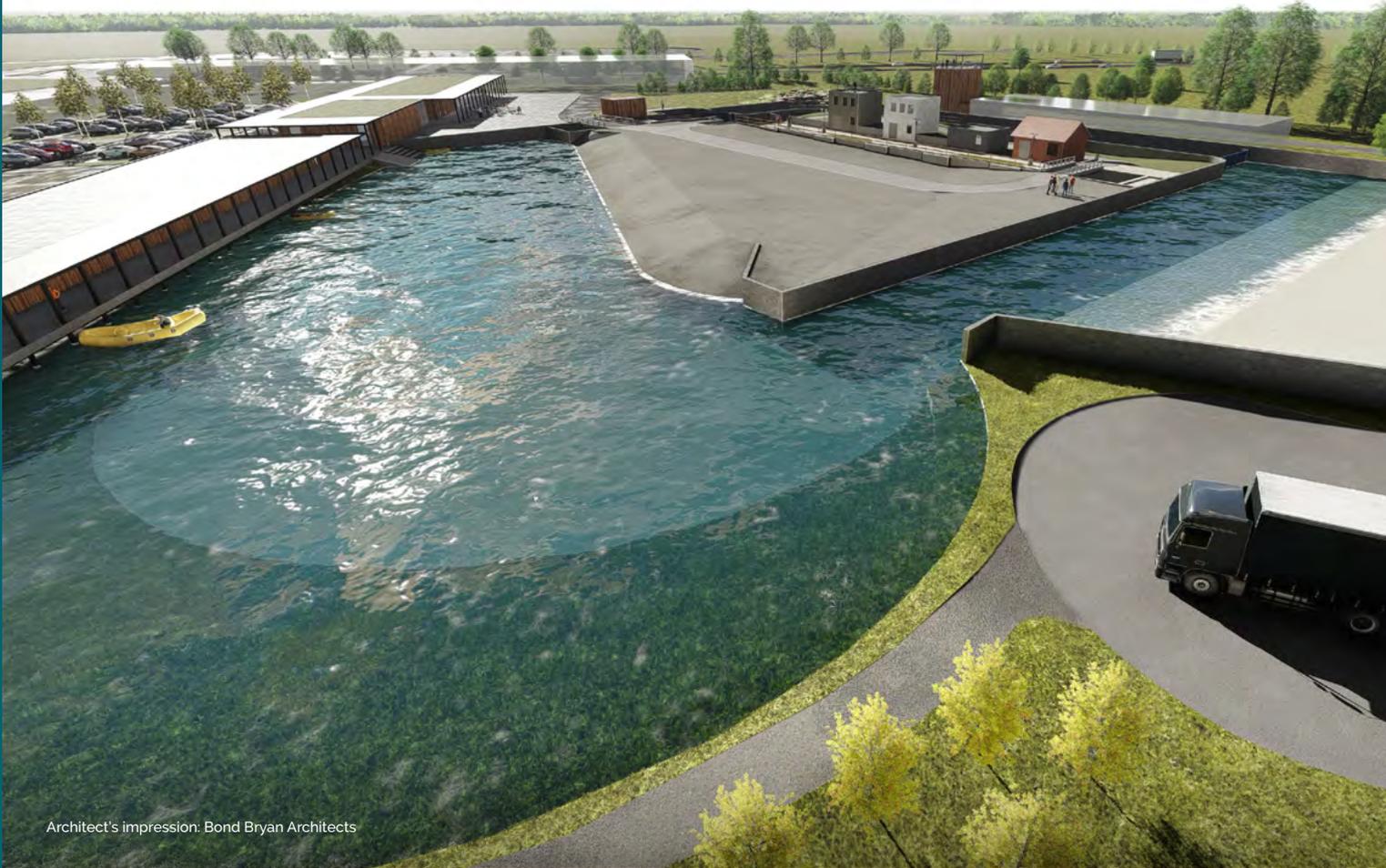


What will it cost?

The estimated capital cost for construction, based on the existing design, is currently £12.5m excluding VAT. Provisionally, the University of Hull and Humberside Fire and Rescue Service have each committed £1m.

Following preliminary market analysis and assessment of operational costs, the Ark team has developed financial projections based on a number of operational scenarios. These consider cautious and optimistic scenarios across a range of income opportunities and clearly indicate the facility will be financially sustainable.





Architect's impression: Bond Bryan Architects

In summary

Humberside Fire and Rescue Service and the University of Hull have come together to address a regional, national and international need for safe, controllable flood risk and resilience infrastructure to support responder training, community resilience, education, research and innovation.

Building on the experience and expertise of the partners, the resulting proposition is to build Ark – National Flood Resilience Centre, including globally unique facilities that place the UK, and in particular the Humber, as a world leader in this field.

A facility opened in the US in 2018 which was based closely on the Ark concept. This has provided proof of concept and valuable learning, but it does not have the breadth of capability or scope of application envisaged by Ark.

Extensive research has demonstrated a market for Ark's services and strong evidence that the scheme is financially viable and capable of generating surpluses.

Initial design and value engineering work has developed a scheme ready for implementation with an indicative capital cost of £12.5m excluding VAT. The project partners have committed significant investment and additional funding and investment is being sought.



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Further information
can be found at
arkfloodcentre.co.uk
or contact the team
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