



Government  
Office for Science

# **Canvey Island: Section 19 investigation report**

**Peer review**

Government Office for Science

## Background

In response to the Canvey Island flooding incident in July 2014, the Secretary of State for Defra asked the Government's Chief Scientific Adviser to provide a review of the draft Essex County Council section 19 investigation report into the circumstances surrounding the flooding, dated 22 September 2014.

The report sets out in some detail the nature of the event.

Canvey Island is an area that has historical susceptibility to flooding and following the severe 1953 coastal surge, has considerable sea wall defences. As a very low lying area, over thick layers of clay surrounded by sea defence walls the importance of the drainage and associated systems is fundamental to managing the rainfall that the area receives.

The rainfall recorded on Canvey Island on 20 July 2014 was an extreme weather event. 100mm of rain fell in four hours, with 80mm of that falling in one hour. While not unprecedented in the UK, this was a very rare and highly unusual event. The impact of the event is still being assessed but it seems that hundreds of homes may have suffered internal flooding.

The coincident nature of the extreme rainfall, problems with the performance of the drainage system, a power cut, and pumps tripping out were foreseeable, albeit unusual, interacting factors.

The alerting system used during the event seems to have operated effectively and to have been appropriate given the convective nature of the storm, which makes it particularly difficult to predict exactly where and when it will rain.

It is clear that Canvey Island needs to be adequately protected from tidal and surface water flooding.

## Immediate local recommendations

We have taken a 'systems engineering' approach to analysing the complex picture of the vulnerability of Canvey Island to flooding.

We are content that the review provides a reasonable assessment of the Canvey Island flooding incident in July 2014, and agree with the set of locally focussed recommendations outlined on p18.

The report highlights a significant problem with local flooding accountability, as a result of the fragmentation of the responsible organisations. Specifically, while Essex County Council may have accountability for flooding, they do not have the authority to effectively manage and coordinate a response.

**Recommendation 1 - A single person should have the authority and accountability to manage and coordinate effective flooding responses in vulnerable localities.**

Despite the foreseeable if extreme nature of the event, insufficient account was taken of the likelihood that the various coincident events might occur. Specifically we were surprised that little account had been taken of i) the problems of gaining access to pumps due to the difficulties of anyone moving around the Island by vehicle during a flooding incident; ii) the likelihood that the surge protection mechanism for the pumps would cause the pumps to fail during an electric storm; iii) the likelihood of a more widespread power failure; or iv) potential concurrency of all of the above.

The report describes the extreme complexity of the drainage system in Canvey Island, and in particular highlights the non-integrated nature of the complex ownership and responsibilities for the different parts of the system, and thus the challenges that this has for its management. The pumps were only required to operate at maximum capacity for a short period of time, which suggests that the water was not flowing to the pumps sufficiently quickly to prevent flooding taking place. There may be a number of reasons for this, but we determine that there is insufficient data or knowledge of this lag between rainfall and water reaching the pumps to be able to recommend mitigating steps.

We support the steps taken by Essex County Council, Anglian Water, and the Environment Agency to commission the Canvey Island Urban Drainage (IUD) study as an important step to understand the complex infrastructure and their interactions and vulnerabilities, and the development of a suitable integrated model. If this is effectively concluded, a better understanding of water flow will lead to appropriate steps being taken.

**Recommendation 2 - An action plan should be drawn up to provide access to pumps during flooding to help ensure continuous pumping when required. Recommendation 3 - A peer review of the drainage and pumping infrastructure needs to take place.**

This should have two components:

1. A peer review of the model being produced and the data being collected as part of the Canvey Island Urban Drainage study. This is to ensure that:
  - it effectively represents the whole drainage environment (both natural and man-made),
  - it is sufficient in providing appropriate evidence for determining how to upgrade, where necessary, the drainage and pumping required to manage likely future rainfall in the context of climate change.
2. A peer review of the drainage and pumping assets and equipment with respect to: maintaining and ensuring clear channels, culverts, sewers and drains, appropriate specifications for the pumping equipment with respect to power failures, electromagnetic compatibility to cope with electric storms, and the ability to pump continuously without overheating.

**Recommendation 4 - An assessment should be made of the resilience of the local population to flooding.** This will ensure that there are effective local area public alerts to potential incidents, and the local population understands how to respond in the immediate event of flooding before emergency response arrives. This should include which other local interventions could assist in providing public confidence, such as training local flood wardens.

# Longer term and strategic recommendations

We noticed language throughout the report in the form of return periods (such as “one in thirty year” events). It is commonly used in risk related documentation generally but is not a form that is generally understood by the public. This approach takes account of the historic record of previous similar events, rather than capturing how that likelihood changes over time; specifically it does not capture how the future effects of climate change will impact on severe weather events.

**Recommendation 5 - The Met Office and the Centre for Ecology and Hydrology should review the likelihood and impact of extreme weather events** looking into the future, and provide a clear approach to understanding the probabilities of specific types of events taking place and communicating that to the public.

It is clear that Canvey Island is not the only part of the country that is likely to be susceptible to flooding of this kind, specifically after a short but very intense period of rain. Lessons can be learned not only for local implementation, but potentially applied where necessary around the country.

**Recommendation 6 - The Environment Agency along with relevant agencies should provide an overview of areas where extreme rainfall events may result in significant local impact, in order to review safeguards in those places.**

**Recommendation 7 -The Natural Hazards Partnership should use the Canvey Island event as a case study in the surface water Hazard Impact Modelling initiative to enhance the development of more effective future alerting.**

## Review

The Government Office for Science convened the following group of experts to provide comment on the section 19 investigation report and to develop this review.

Andrew J Brown	HR Wallingford
Prof Hannah Cloke	University of Reading
Prof Jim Hall	University of Oxford
Dr Helen Reeves	British Geological Survey
Dr Nick Reynard	Centre for Ecology and Hydrology
Prof Jeremy Watson	University College London

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Any enquiries regarding this publication should be sent to:

Department for Business, Innovation and Skills  
1 Victoria Street  
London SW1H 0ET  
Tel: 020 7215 5000

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