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London Flooding Investigations Non-Technical Summary - Stage 1 Report

Project:	London Flooding Review		
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Subject:	Stage 1 Non- Technical Summary		

1 Introduction

On 12 July and 25 July 2021, several London boroughs experienced severe flooding, causing damage to property and infrastructure. To establish why this flooding happened, and how similar events can be managed in the future, Thames Water commissioned an independent expert group (IEG) to lead an Independent Review into the flooding.

The review consists of four key stages:

– *Stage 1: What?* – An objective review of the available data relating to the flooding on 12 and 25 July 2021
– *Stage 2: Why?* – An investigation into the flooding mechanisms and contributory factors that led to flooding on 12 and 25 July 2021
– *Stage 3: How?* – An assessment of how well Thames Water's assets, including flooding alleviation schemes, critical pumping stations and the overall sewer network, performed on 12 and 25 July 2021
– *Stage 4: What next?* – Recommendations to improve current flood mitigation processes and improve resilience to future flooding events.

2 Stage 1 – what did we do?

Stage 1 is known as the 'data discovery phase'. It's the initial phase of the review, where we gather and assess all the data that we're going to use to investigate the flooding events and make our recommendations.

We collected data from multiple sources, such as Thames Water, Local Authorities, Transport for London (TfL), Met Office and the Environment Agency, as well as data from online sources. This data included:

● Rainfall data
● Tide/river level data
● Reported flooding locations and property data
● Drainage monitoring data
● Asset data (surveys, GIS, operational manuals, catchment models)
● Maintenance data
● Topographical data

Rainfall data

This was reviewed by comparing rain gauge data and radar rainfall data. Rain gauges are small containers that collect rainwater at various locations across London. Radar rainfall data is provided by the MET Office and records rain fall intensities in millimetres (mm) per hour across the study area via satellites (see map below).

Radar rainfall grid and rain gauge locations
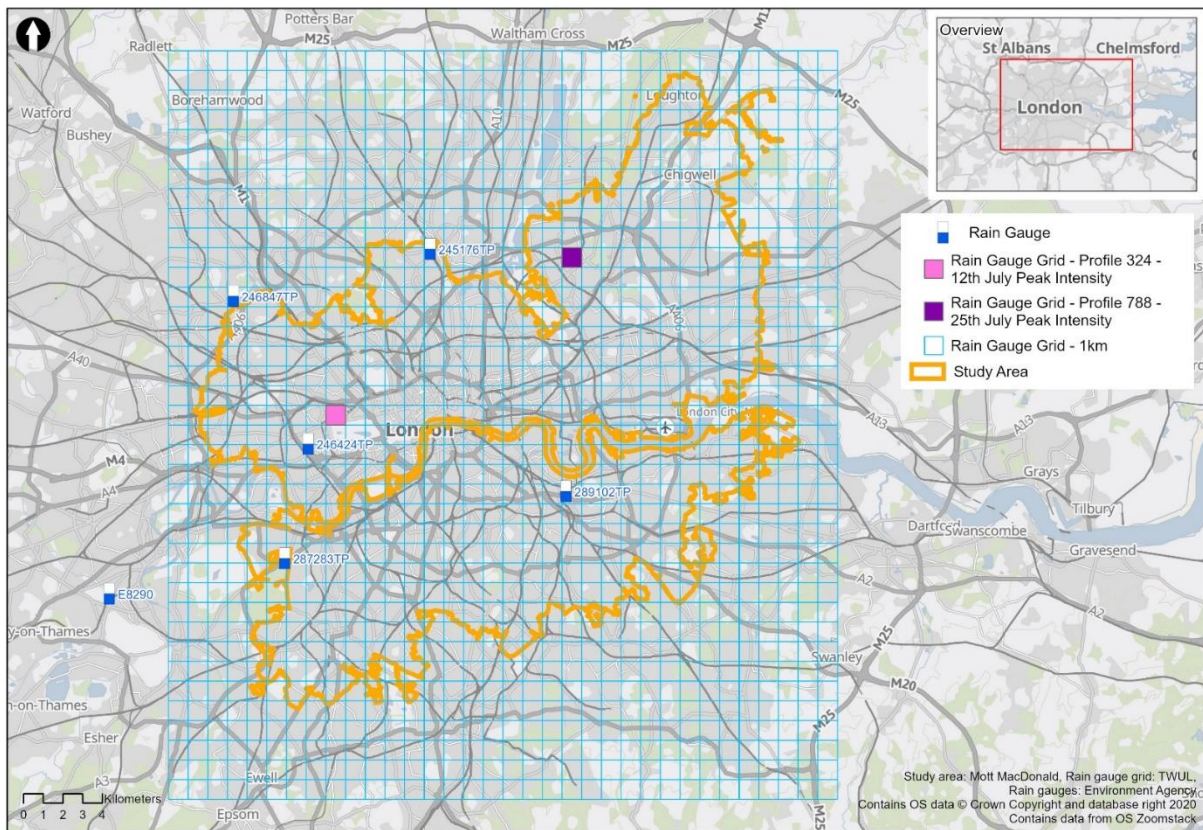
The data shows that the 12 July 2021 rainfall was much more significant in terms of total depth and intensity of the rain but affected a smaller area than the 25 July rainfall. On 12 July, the most severe rainfall was in Bayswater; on 25 July it was in Walthamstow. Both events were greater than the design standard for drainage systems. This refers to the likelihood of a similar flood event occurring in a given year.

Daily rainfalls June-July 2021 (blue = Bayswater, red = Walthamstow)
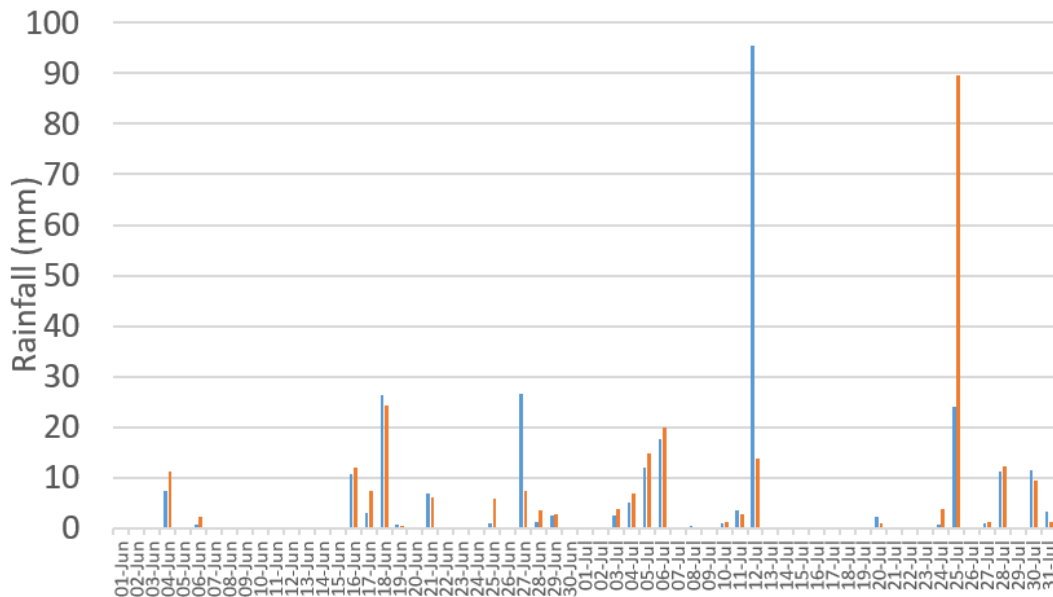
Source: Radar rainfall data

We concluded that the radar rainfall data was acceptable to use in our investigation, but the rain gauge data was limited as the gauges weren't located in the most severely affected areas, but will be used to check against the radar data.

Tide/river level data

We undertook a detailed analysis of tide levels at the time of the flooding to see if this could have had an impact on water levels in the sewer network. We looked at both observed tide levels and predicted tide levels and compared them. We found that tide levels may have contributed to the severity of the flooding as they may have stopped the drainage system from working properly. This is because the level of the tide prevented water from flowing out of the sewer network and safely into the river.

We concluded that the tide level data was reliable and could be used in future modelling.

Reported flooding locations and property data

We used information from a range of sources. This included Thames Water's own flooding history database, national news websites and social media, so that images and data from as many affected properties and locations as possible are captured. We have combined this into one central data set which will be used for comparing future analysis against reported flooding locations.

We concluded that the reported flooding data can be used in our investigation. However, information specifically relating to basement flooding has limitations, as it is based on assumptions rather than precise data (as surveying 44,000 basements for the review was not realistic) so its use in the study will be limited.

Models

We used two catchment models which were provided by Thames Water: Beckton, representing the north London sewer network; and Crossness, representing the south London sewer network. We reviewed the catchment models and found that, generally, the depths of water in the sewer network predicted by the model are higher than the actual depths observed in monitors located at strategic points across the area.

Due to timescales of the review, it is not possible to generate a model that does predict the levels accurately. Instead, we will be altering the rainfall data so the below ground response matches what is observed. In addition we will be testing some of the assumptions in the models to see if a better match would have been achieved with a different approach and this will inform recommendations of how to improve our modelling in the future.

The aim of these tests is to assess the performance of the sewer network during the events and to test the limitations of assumed data in the model and other sources. It will help us understand what factors contributed most significantly to the flooding, and if certain factors made the situation worse during the event.

3 What happens next?

In Stage 2, we will be assessing the evidence of what occurred in the event to identify the flooding mechanism and contributory factors of the flooding.

We will be using the data gathered during Stage 1 and Stage 2 as 'baseline data' to help us get a clearer picture of the 'what, when, why and how' of the flooding events. We will then base our recommendations on these findings.

The final report will be presented at a public session in the first half of 2022 with interim reports provided ahead of this, at key stages of the review.