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Northwich

Section 19 Flood Investigation - Interim Report

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5150735-DG-001



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Glossary

| | |
|-------|---|
| AEP | Annual Exceedance Probability |
| CRT | Canal & River Trust |
| CSO | Combined Sewer Overflow |
| CWaC | Cheshire West and Chester Council |
| EA | Environment Agency |
| FCERM | Flood and Coastal Erosion Risk Management |
| FDL | Flood Defence Level |
| FWMA | Flood Water Management Act |
| GIS | Geographic Information System |
| LLFA | Lead Local Flood Authority |
| mAOD | Metres Above Ordnance Datum |
| PFRA | Preliminary Flood Risk Assessment |
| RMA | Risk Management Authority |
| UU | United Utilities |
| WRAP | Winter Rainfall Acceptance Profile |

Introduction

Cheshire West and Chester Council has commissioned Atkins to undertake a Section 19 flood investigation report. This interim report is required to inform the Council and affected residents and businesses of progress, which will be followed by the full Section 19 report and recommendations for review and improvement.

Executive Summary

The purpose of the Section 19 Flood Investigation Interim Report is to lay out the background, conditions and details of the flooding that occurred 26th – 27th October 2019 in Northwich and surrounding areas. A full Section 19 Investigation Report will be completed following the Interim Report and will include a strategic overview of the Risk Management Authority (RMA) response, flooding mechanisms, flood infrastructure performance and a full list of recommended actions.

A Section 19 flood investigation is undertaken to identify and investigate whether the RMAs exercised their risk management functions as per Section 19 (1) of the Flood and Water Management Act (FWMA, 2010) and adhered to the Flood Risk Regulations (2009).

The RMAs and stakeholders identified are Cheshire West and Chester Council (CWaC), as the Lead Local Flood Authority (LLFA); Highways Authority; Environment Agency (EA); United Utilities (UU); the Canal & River Trust (CRT); riparian owners and local residents; and the Police, Fire and Rescue service. Flooding was reported in three main areas including:

- Northwich Town Centre;
- Sandy Lane near Acton Bridge;
- Lakeside Caravan Park near Winsford.

The table below provides a summary of the flood incidents recorded.

| Internal | External | Highway |
|----------|----------|---------|
| 23 | 8 | 8 |

A detailed timeline including responses and actions by the RMAs, river levels, alerts and warnings can be found in Appendix C. The full Section 19 investigation report will identify areas for future improvement; however, some interim actions have been recommended based on the progress from publication of this report:

- CWaC Council to survey Northwich town centre highway gully drains in the affected areas to maintain a detailed record of drainage assets, including confirming connectivity and discharge points, as well as identifying blockages and any sections in poor repair;
- UU to review condition, including flood resilience, of all telemetry systems, sensors and water sensitive equipment;
- Lakeside Caravan Park owners to sign up to flood warnings/alerts;
- RMAs to review collective incidence response plan, lines of communication and availability during severe flood events;
- RMAs to review response plan during severe flooding to maintain good lines of communication with affected property owners and businesses. For example, coordinating delivery of sandbags and disseminating information;
- All RMAs to review response plan for more vulnerable residents, for example at the Weaver residential home, to ensure specific residents needs are considered during flood response;
- North Quay marina residents to be advised about the risks during flood events and the reasons why they may be asked to evacuate, which include for their own safety and the safety of emergency responders;
- Given the nature of CRT's assets, review how CRT is integrated within current emergency response;
- In Northwich town centre, outfalls with flap valves should be inspected and where not present, flap valves added to outfalls by respective owners.

1. Section 19 – Investigation Requirement

The Flood and Water Management Act provides for better, more comprehensive management of flood risk for people, homes and businesses, helps safeguard community groups from unaffordable rises in surface water drainage charges, and protects water supplies to the consumer. Serious flooding can happen at any time. Climate projections suggest that extreme weather will happen more frequently in the future. This act aims to reduce the flood risk associated with extreme weather.

<https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities>

The Flood and Water Management Act (FWMA, 2010) defines the lead local flood authority for an area as the unitary authority or the county council.

Under Section 19 of the act:

- (1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate:
 - (a) which risk management authorities have relevant flood risk management functions, and
 - (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.
- (2) Where an authority carries out an investigation under subsection (1) it must:
 - (a) publish the results of its investigation, and
 - (b) notify any relevant risk management authorities.

The flooding incident that occurred in Northwich in October 2019 is considered to have met the criteria for Formal Investigation as defined in Section 19 of the FWMA (2010).

In addition to the FWMA (2010), the Flood Risk Regulations was introduced by Government in 2009. CWaC as a LLFA is required to implement its provisions.

As a result of the Flood Risk Regulations (2009), the LLFA has a duty to prepare a number of documents, including:

- Preliminary Flood Risk Assessment (PFRA);
- Flood hazard and risk maps;
- Flood Risk Management Plans.

This Section 19 report contributes to the continual development of flood hazard / risk maps and Flood Risk Management Plans.

2. Identification of Risk Management Authorities (RMAs) and Stakeholders

For managing flooding, the legal framework is distributed to multiple agencies. The responsibilities of each of the agencies are summarised below.

2.1. Cheshire West and Chester Council (CWaC)

CWaC is the Lead Local Flood Authority (LLFA) and the Highways Authority for the area of this Section 19 investigation. CWaC is an RMA. The LLFA is responsible for developing, maintaining and applying a strategy for local flood risk management from the following sources:

- Surface water (pluvial);
- Groundwater;
- Ordinary watercourses (fluvial);
- Highways Drainage;
- Canals.

The Flood Water and Management Act (FWMA) 2010 outlines the LLFA's powers to designate structures and features that affect flooding, in order to provide protection to assets that are relied upon for flood risk management from the aforementioned flooding sources. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it (FWMA (2010) Schedule 1, Section 1).

The LLFA liaises regularly with the EA, as well as the other RMAs, to ensure that all sources of flooding in their administrative area are managed appropriately.

District and Borough Councils can carry out flood risk management works on minor watercourses, working with the LLFA. Through the planning processes, they control development in their area, ensuring that flood risks are effectively managed.

CWaC are the Highway Authority within the administrative area of the reported flooding location. Under Section 41 of the Highways Act (1980), CWaC are responsible for providing and maintaining adopted highway drainage and roadside ditches and must ensure that road projects do not increase flood risk. Highway maintenance includes that of the road drainage networks (drains and gullies).

Under the Civil Contingencies Act (2004), CWaC are a Category 1 Responder and therefore have the statutory duty to put into action emergency plans and assess local risks to inform the emergency planning services. CWaC are also required to make information publicly available regarding civil protection matters, and to maintain arrangements to warn and advise the public in the event of an emergency.

2.2. The Environment Agency (EA)

The EA are responsible for taking a strategic overview of the management of all sources of flooding and coastal erosion and are responsible for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea. The EA is an RMA.

The EA have prepared strategic plans which set out how to manage risk, provide evidence (e.g. online flood mapping) and advise local and national Government. Section 165 of the Water Resources Act (1991) states the EA have permissive powers to undertake maintenance or emergency works on the aforementioned flooding sources. The FWMA (2010) outlines that the EA has powers to designate structures and features that affect flooding in order to protect assets that are relied upon for flood risk management for Main River and tidal sources.

The Environment Agency:

- provides and operates flood warning systems;
- carries out works to manage flood risk from the sea and main rivers;
- carries out works in estuaries to secure adequate outfalls for main rivers;
- carries out surveys to inform Flood Coastal Erosion Risk Management (FCERM) works;

- issues permits for works on or near main rivers, and works affecting watercourses, flood and sea defences and other structures protected by its bylaws;
- advises planning authorities on the implications of development proposals on flood risk;
- designates structures and features of the environment that affect flood or coastal erosion risk;
- has the right to enter private land to carry out FCERM works.

Under the Civil Contingencies Act (2004), the EA are a Category 1 Responder and therefore have the statutory duty to put into action emergency plans and assess local risks to inform the emergency planning services.

2.3. United Utilities (UU)

UU (as the Water and Sewerage undertaker) have a statutory duty, under the Water Industry Act (1991), to provide and maintain efficient performance of the public sewer network within their respective administrative boundary. UU is an RMA. Relevant actions include:

- the inspection, maintenance, repair and any works to their drainage assets.

Under the FWMA (2010), UU are responsible for:

- managing the risks of flooding from their respective surface water, foul and/or combined sewer systems where the sewer flooding is wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitations) entering or otherwise affecting the system.

Since the late 1970s, and with the first publication of Sewers for Adoption in 1980, sewer systems have typically been designed and constructed to accommodate a rainfall event with a 1 in 30 year return period. A severe event is classified by Ofwat as a rainfall event which exceeds a 1 in 20 return period. During severe weather events that exceed the design capacity of the infrastructure, it is more likely that the sewer system would be unable to cope and the chances of significant system surcharge or flooding would be greater.

Since October 2011 UU are responsible for certain private sewers and lateral drains of properties. Transfer of private pumping stations to UU ownership was completed in October 2016. This has removed confusion of responsibility and aids in flood management from the LLFA perspective.

UU are a Category 2 responder under the Civil Contingencies Act (2004) and therefore has the responsibility to co-operate and share information with Category 1 responders to inform multi-agency planning frameworks.

2.4. Canal & River Trust (CRT)

The Canal & River Trust is a charity set up in 2012 to care for England and Wales' 200-year-old waterways, holding them in trust for the nation forever. It has responsibility for over 3,200km of navigable canals and rivers, together with bridges, tunnels, aqueducts, docks and reservoirs, along with museums and archive collections. CRT is not identified in FWMA as an RMA and:

- CRT is not a Category 1 or 2 responder as defined by the Civils Contingencies Act 2004.
- CRT does not have any specific statutory responsibilities in relation to flooding.

CRT have been consulted as they own navigation assets that interact with the river, although they are not an RMA. CRT may however provide specific assistance in the event of a flood incident and support requests for input in a Section 19 flood investigation.

2.5. Riparian Owners

Riparian owners are those who own land or property adjacent to a watercourse. Riparian owners are not an RMA, though are considered relevant stakeholders. Riparian owners have a responsibility to:

- maintain the bed and banks of the watercourse;
- maintain any owned structures, such as trash screens, outfalls, flap valves, sluices and culverts.

Section 25 of the Land Drainage Act (1991) outlines that where the flow of a watercourse is obstructed; the riparian owner is responsible to resolve the condition. Section 28 of the Land Drainage Act (1991) outlines the responsibility of the riparian owner to undertake maintenance of their watercourse if it is impeding the flow of water.

Riparian owners must let water flow through their land without obstruction and must accept flood flows through their land. Riparian owners have no duty in common law to improve the drainage capacity of a watercourse. Further information is contained within the EA document Living on the Edge (2012).

2.6. Local Residents

Residents who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected. Local residents are not an RMA, though are considered relevant stakeholders.

Residents should report flooding incidents or potential problems (such as blockages or sewer collapse) to the water authority or LLFA.

2.7. Cheshire Police, Fire and Rescue Service

The Police, Fire and Rescue Services are a Category 1 Responder under the Civil Contingencies Act (2004) and therefore have a responsibility, along with other organisations for developing emergency plans, contingency plans and business continuity plans to help reduce, control or ease the effects of an emergency. The Police, Fire and Rescue Services are not an RMA, however are considered relevant stakeholders.

3. Catchment Characteristics

Around 340,500 people live in Cheshire West and Chester, a third of which live in rural areas. The borough covers approximately 906 km² of land and is characterised by attractive countryside, varied landscapes and diverse settlements ranging from the historic city of Chester, the towns of Ellesmere Port, Northwich and Winsford to small rural hamlets. Chester is the central urban area of the borough.

3.1. Land Use

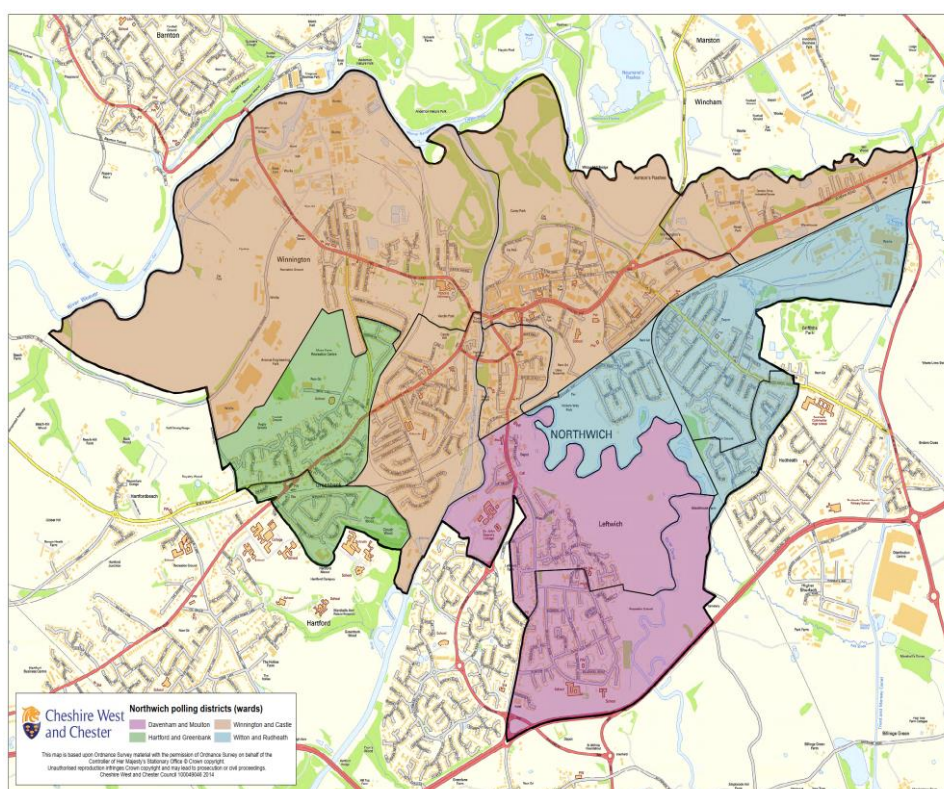
Northwich is a town and civil parish of approximately 20,000 people located at the confluence of the River Weaver and River Dane. Northwich has its own Town Council but is a part of the larger Cheshire West & Chester Council.

The town has well established river infrastructure, originally developed to transport locally produced salt, including the Anderton Boat Lift which links the River Weaver with the Trent and Mersey Canal. Following a period of subsidence, related to salt mining works, a program of stabilisation works in the town centre was completed in 2007.

Northwich is a historic market town with a busy pedestrian centre, surrounded by business, industrial and residential areas. Beyond the town lies the rural parishes of Anderton with Marbury, Marston, Wincham, Lostock Gralam, Rudheath, Davenham, Hartford, Weaverham, Barnton.

The town is well placed and served by good transport links. The railway station is located in the town centre and is on the Mid-Cheshire line linking Northwich to Manchester and Chester. Roads and bus services link it with all parts of Cheshire with the M6 to the east and M56 to the north. The A533 runs north south through the town centre. The River Weaver is navigable from Winsford, through Northwich town centre to Runcorn where it joins the Manchester Ship Canal, providing access for boats through a lock system.

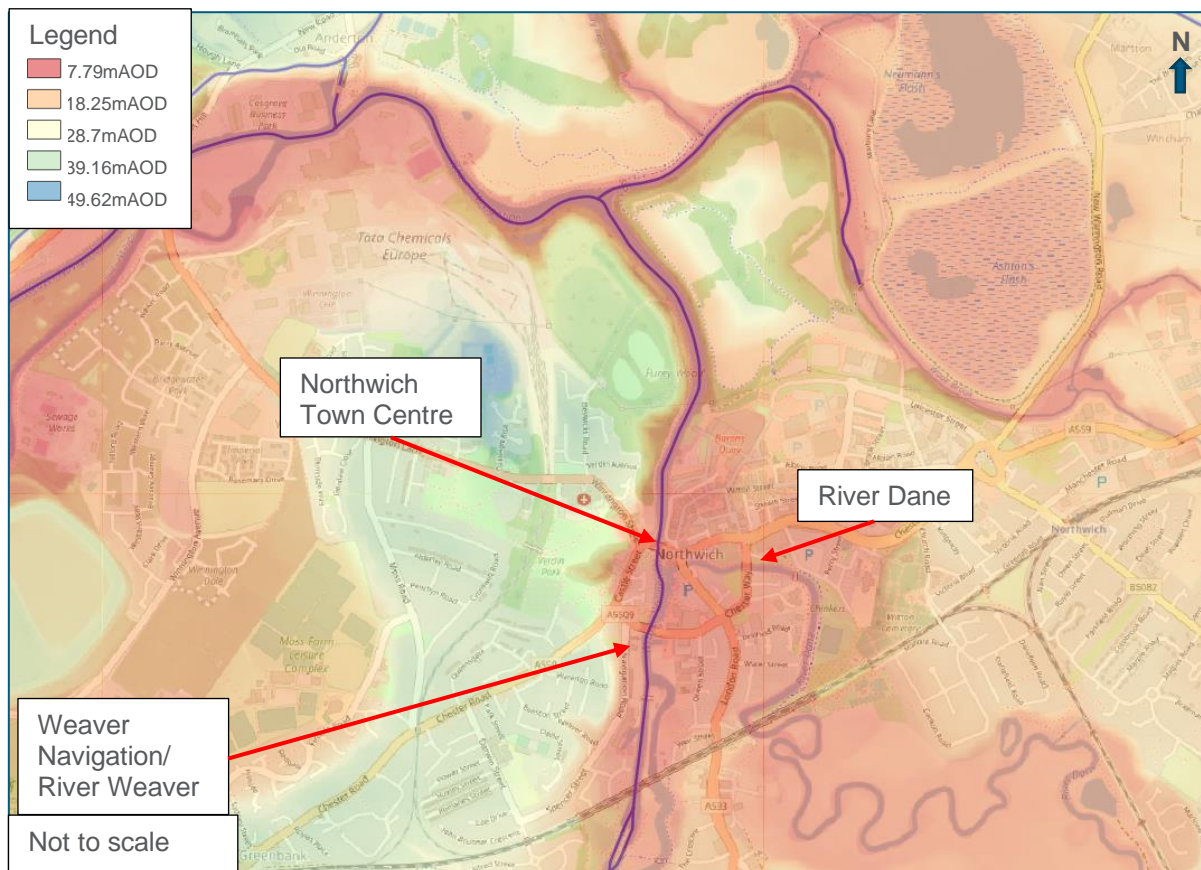
Figure 3-1 - Location Plan of Northwich Parish



3.2. Topography

Northwich town centre lies at the confluence of the River Dane and the River Weaver, which is in a low-lying area. The topographic map below indicates that elevation is generally lower closer to the rivers.

Figure 3-2 - Topography of Northwich



Source – DTM 1M LiDAR data, Environment Agency, 2020

3.3. Soils and Geology

Identification of the geology and soils underlying an area aids in determining the characteristics associated with both surface and ground water flooding. To assess if a flood alert/ warning is required, this also helps develop a prediction to the time of concentration between the rainfall event and receiving watercourse.

The area of land in which Northwich is situated on can be divided into the following layers:

- Soils
- Superficial Deposits
- Parent Material
- Bedrock

3.3.1. Soils

The Wallingford Procedure Geological Survey Map identifies that the Northwich area is made up of Class 1 and Class 4 soil of the Winter Rainfall Acceptance Potential (WRAP) classification. The characteristics of these classes are outlined in the soil class characteristics table below.

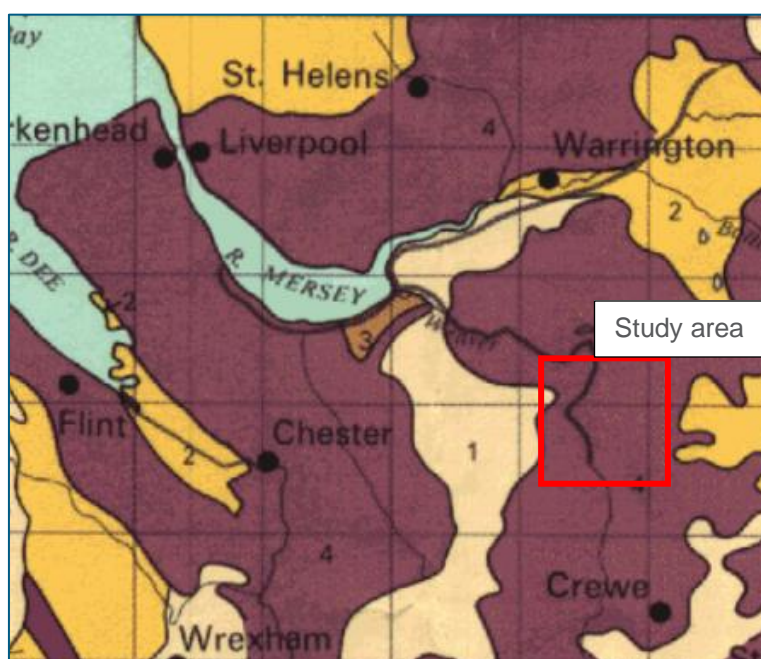
Table 3-1 - Soil Type Characteristics

| W.R.A.P Class | General Description of Map Units |
|---------------|--|
| 1 | <ul style="list-style-type: none"> Well drained permeable sandy or loamy soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts. Earthy peat soils drained by dikes and pumps. Less permeable loamy over clayey soils on plateaux adjacent to very permeable soils in valleys. |
| 2 | <ul style="list-style-type: none"> Very permeable soils with shallow ground-water. Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils. Moderately permeable soils, some with slowly permeable subsoils. |
| 3 | <ul style="list-style-type: none"> Relatively impermeable soils in boulder and sedimentary clays, and in alluvium, especially in eastern England. Permeable soils with shallow ground-water in low lying areas. Mixed areas of permeable and impermeable soils, in approximately equal proportions. |
| 4 | <ul style="list-style-type: none"> Clayey, or loamy over clayey soils with an impermeable layer at shallow depth. |
| 5 | <p>Soils of the wet uplands with:</p> <ul style="list-style-type: none"> Peaty or humose surface horizons and impermeable layers at shallow depth. Deep raw peat associated with gentle upland slopes or basin sites. Bare rock cliffs and screes Shallow, permeable rocky soils on steep slopes |

Source – National Water Council (1981)

Figure 3-3 - Soil Type Map of CWaC Area - Winter Rain Acceptance Potential Soil Map

Based on the New Wallingford Procedure Runoff Model



Source – National Water Council (1981)

3.3.2. Superficial Deposits

Underlying the soil, the superficial deposits are mostly Tidal Flat Deposits (clay, silt and sand), Till (Devensian-Clay, sandy, gravelly, cobbly), Glaciofluvial deposits (Devensian – sand and gravel).

Superficial Deposits map of CWaC Area is contained in Appendix A.1.

3.3.3. Parent Material

Underlying the superficial deposits, the parent materials are riverine clay and floodplain sands and gravel, Glacial till, Glaciofluvial deposits, patches of claystone/mudstone and area of a sand/gravel floodplain.

Parent Material map of CWaC Area is contained in Appendix A.2.

3.3.4. Bedrock

Underlying the parent material, the bedrock is Northwich Halite (halite, stone and mudstone) and Bollin Mudstone (mudstone).

Bedrock map of CWaC Area is contained in Appendix A.3.

3.4. Watercourse Network

3.4.1. Main Rivers

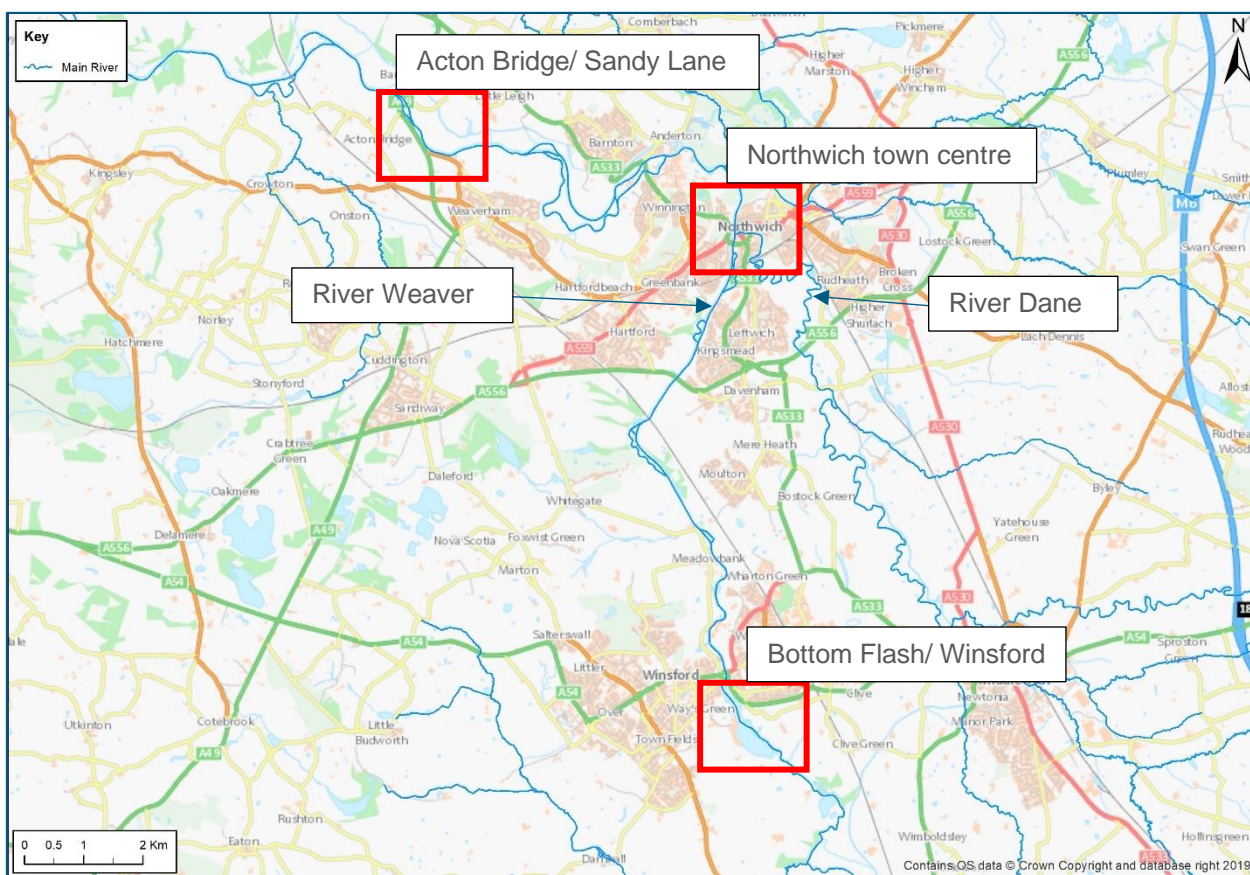
There are two Main Rivers affected by the flooding in Northwich and the outlying areas, for which the Environment Agency are responsible. These are:

- River Dane – Northwich town centre
- River Weaver – Northwich town centre, Bottom Flash near Winsford, Acton Bridge/ Sandy Lane

The River Weaver has been made navigable (Weaver Navigation) from Winsford and flows northwards to the Manchester Ship Canal at Runcorn. River levels on the Weaver and Navigation are controlled by a series of sluice gate and lock assets owned and operated for navigation purposes by CRT. The River Dane is a fast flowing, natural river which brings high peak flows through Northwich. In contrast, the Weaver Navigation is slower and carries a greater volume of flow.

The main river map (Figure 3-4) illustrates the main river sections which flow through Northwich town centre, Bottom Flash near Winsford and Acton Bridge area.

Figure 3-4 - Main River Map



Source: EA Main River Map, 2020

3.4.2. Ordinary Watercourses

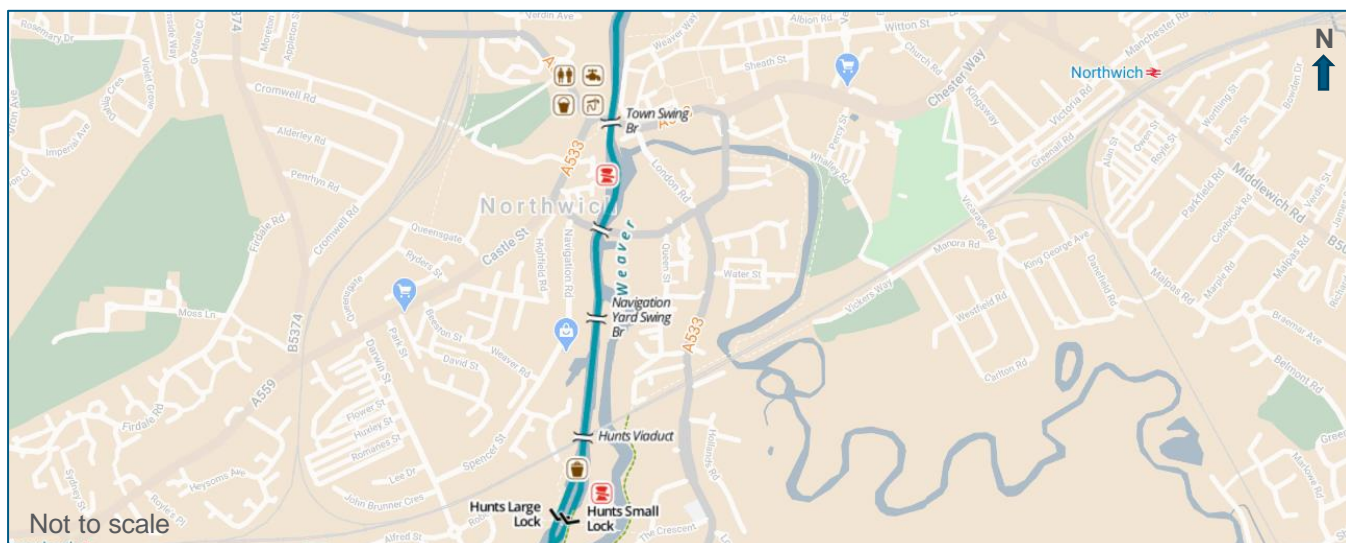
Ordinary watercourses are any watercourses that are not designated Main River, they vary in size and can include rivers, streams, ditches, drains, culverts, cuts, dikes, sluices, sewers and passages through which water flows. There are a number of ordinary watercourses in the affected areas, though there have been no previous reports of flooding in Northwich or the areas of Weaverham or Winsford from ordinary watercourses.

3.4.3. Canals/ Navigable Waterways

Though not a canal, the River Weaver Navigation runs through Northwich Town Centre. The River Weaver Navigation runs from Winsford Bridge to the Manchester Ship Canal at Weston Marsh Lock and Weston Point Docks and connects to the Trent and Mersey Canal via Anderton Boat Lift.

Five sluices at Hunts (four normal, and one deep) act as flow control structures upstream of Northwich town centre. The River Weaver Navigation is 20 miles (32 km) long and has 5 locks. Figures 3-5 to 3-7, from Canal & River Trust network online mapping service, indicate the navigable sections of River in the relevant areas affected by the October 2019 event.

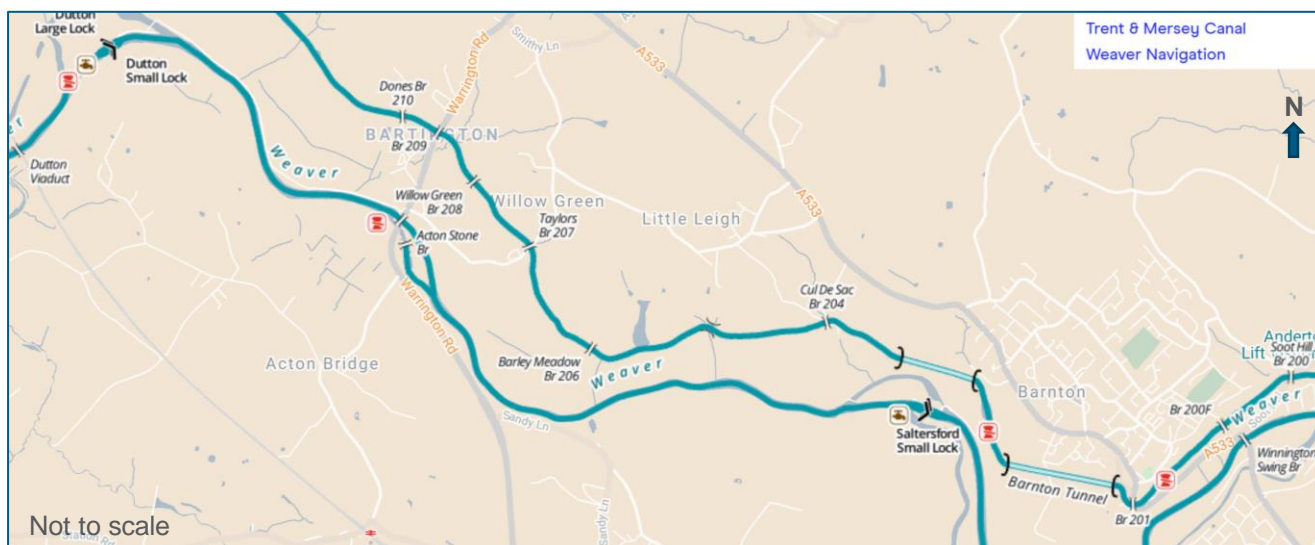
Figure 3-5 - Navigable Waterway Map Northwich Town Centre



Source: Canal & River Trust, 2020 <https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-network>

The Trent & Mersey Canal & River Weaver run parallel to each other. The Dutton sluice gates and locks act as flow control downstream of Acton Bridge. Three sluices at Winnington, Barton and Saltersford act as flow controls for the upstream navigation pound that includes Northwich Town centre.

Figure 3-6 - Navigable Waterway Map Acton Bridge Area



Source: Canal & River Trust, 2020 <https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-network>

South of Northwich, the River Weaver Navigation ends at Winsford, downstream of Bottom Flash. Vale Royal sluice acts as a flow control structure downstream of Winsford.

Figure 3-7 - Navigable Waterway Map Winsford Area



Source: Canal & River Trust, 2020 <https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-network>

3.5. Flood Risk

Flood risk across Northwich and outlying areas comprises of predominantly fluvial flooding (river flooding) from the River Dane and River Weaver, as well as surface water flooding from run-off due to limited open spaces or greenfield areas.

The combined foul and surface water sewers are at risk of surcharge (overloading of the sewer beyond its design capacity), as well as drain blockage. Risk of flooding from canals is considered residual and would occur from leakage, collapse of structures, overtopping or blockage of conduits. These risks are evaluated and presented in detail in CWaC's Level 1 Strategic Flood Risk Assessment.

The Environment Agency Flood Maps for Planning service (Figure 3-8 to Figure 3-10) illustrate the path of the River Weaver and River Dane, and the flood risk areas in which the affected areas of the October 2019 event are situated. The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of surface water flood risk, climate change and consequent changes in the future probability of flooding. The following table explains the Flood Zones which appear on the maps:

Table 3-2 - Flood Zone Definitions

| Flood Zone | Definition |
|-----------------------------------|--|
| Zone 1 Low Probability | Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all |
| Zone 2 Medium Probability | Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map) |
| Zone 3a High Probability | Land having a 1 in 100 or greater annual probability of river flooding or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map) |
| Zone 3b The Functional Floodplain | This zone comprises land where water has to flow or be stores in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments area of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map) |

Source: EA, 2020 <https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables>

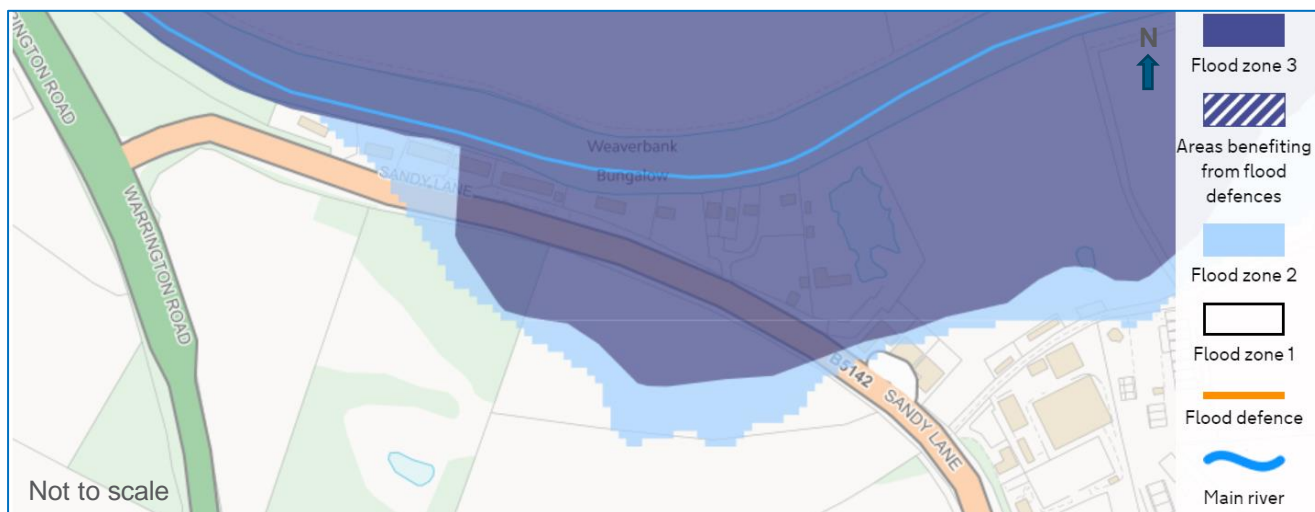
Northwich Town Centre area is largely within the Environment Agency’s Flood Zones 2 and 3 and is at risk from fluvial flooding from the River Weaver and River Dane as shown in Figure 3-8. Following previous flood events in 2015, flood defences were constructed in Northwich Town Centre. The areas benefitting from these flood defences is shown in the figure below. More detail in relation to the flood defence infrastructure has been included in section 4.1.4.

Figure 3-8 - Flood Risk Map Northwich Town Centre


Source: EA, 2020 <https://flood-map-for-planning.service.gov.uk/>

The Acton Bridge area flood map shows properties in Flood Zones 1, 2 and 3, at risk of fluvial flooding from the River Weaver.

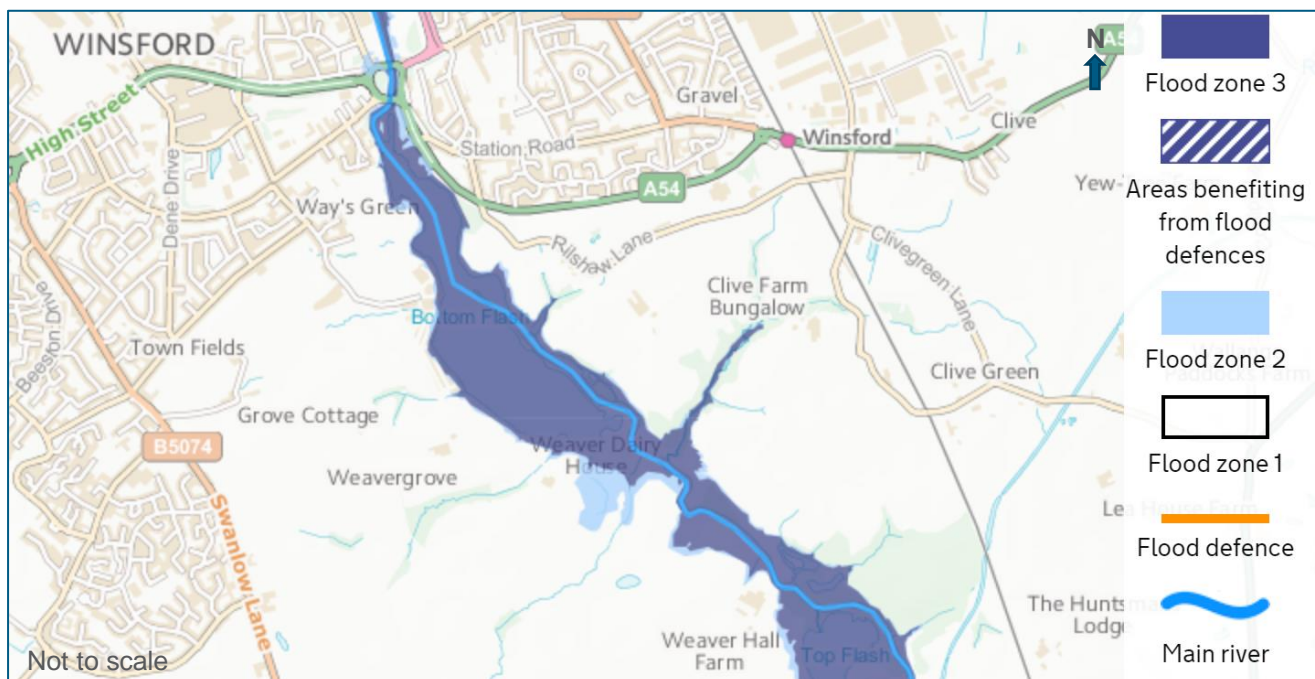
Figure 3-9 - Flood Risk Map Sandy Lane Acton Bridge Area



Source: EA, 2020 <https://flood-map-for-planning.service.gov.uk/>

The River Weaver flows south to north. To the south of Winsford is Bottom Flash, a large lake formed in a depression caused by subsidence after salt mining and/ or brine extraction. The lake covers some 34 hectares and is formed by the River Weaver which extends across the bottom of a relatively low lying, steep sided but narrow valley. The landscape is characterised by fields and agricultural grass land, wooded valley sides and urban development.

Figure 3-10 - Flood Risk Map Winsford Area

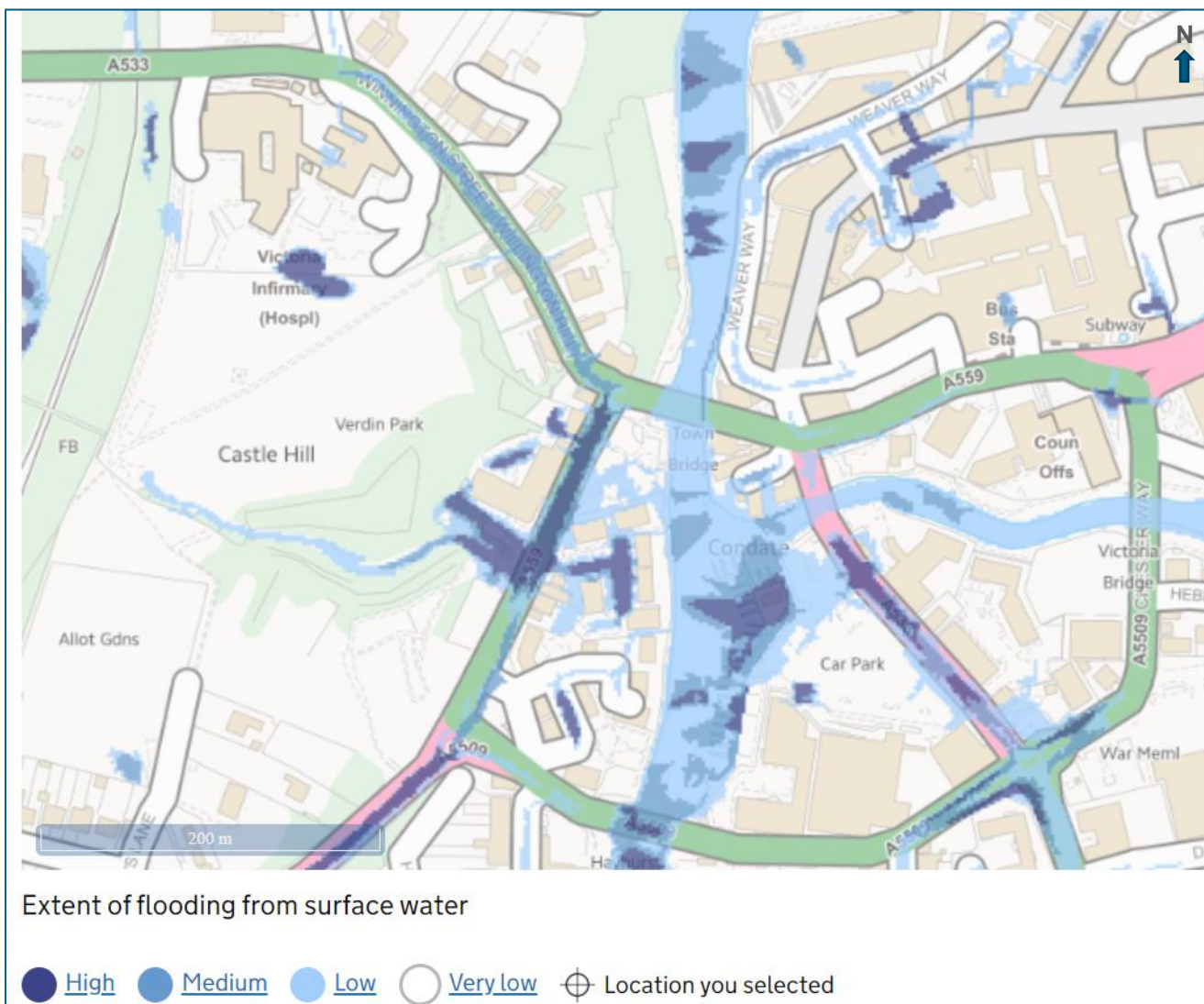


Source: EA, 2020 <https://flood-map-for-planning.service.gov.uk/>

The Environment Agency Flood warning service also produces surface water flood risk maps. High risk means that each year this area has a chance of flooding of greater than 3.3%. Medium risk means that each year this area has a chance of flooding of between 1 and 3.3%. Low risk means that each year this area has a chance of flooding of between 0.1 and 1%. The Northwich Town Centre area appears to have certain areas of low to high risk, refer Figure 3-11.

Surface water flooding, sometimes known as flash flooding, happens when heavy rain cannot drain away, is difficult to predict as it depends on rainfall volume and location, can happen on high ground and away from rivers and other bodies of water, and is more widespread in areas with harder surfaces like concrete.

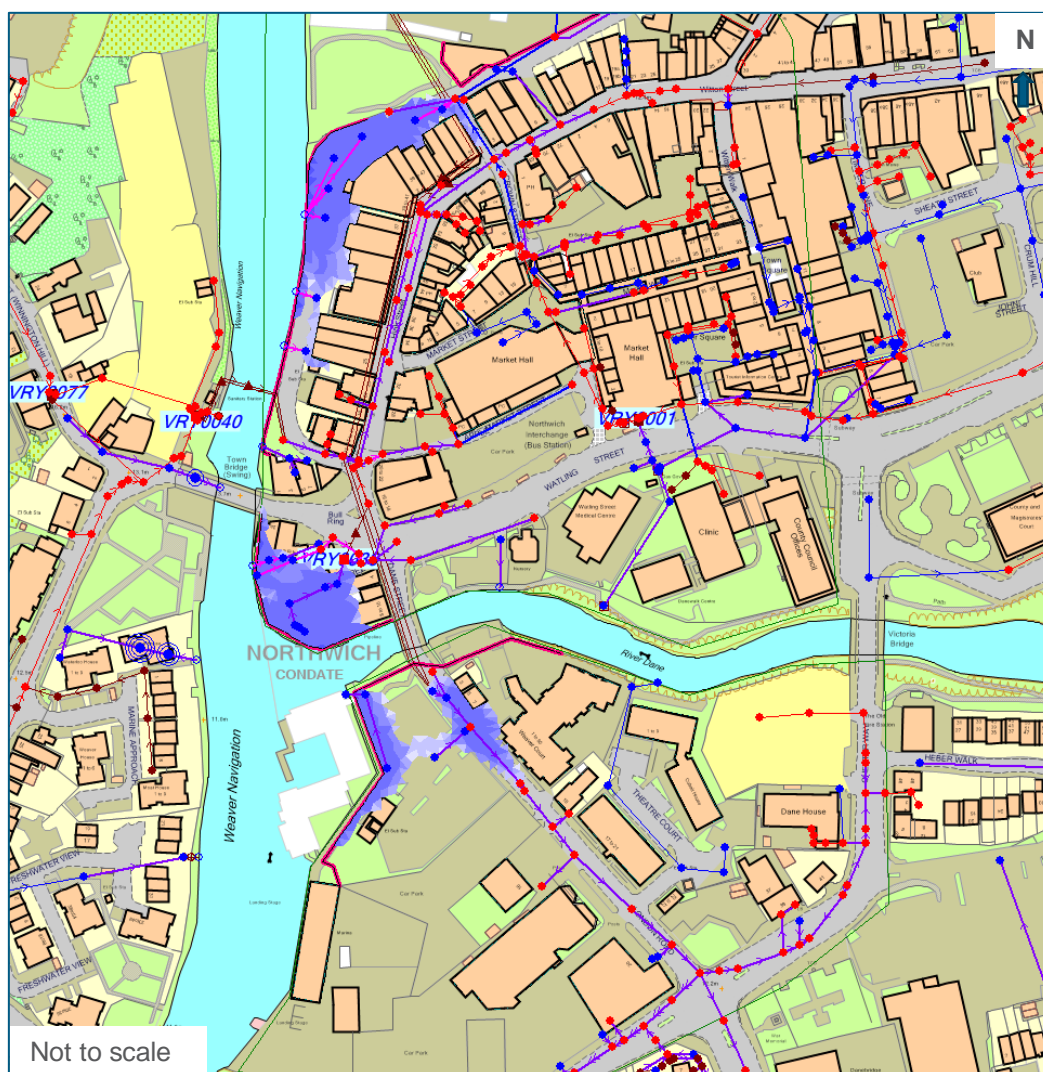
Figure 3-11 – Surface Water Flood Risk Map Northwich Town Centre – EA



Source: EA, 2020 <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=341532&northing=556913&map=SurfaceWater>

Surface water flood maps have also been produced by United Utilities for the Northwich Town Centre. The below map indicates the predicted surface water flood risk when the pumping station is operating at permitted levels and all flap valves to the river are in working order and closed during an event. Comparable rainfall and river levels to the October 2019 event were used to generate this map.

Figure 3-12 - Surface Water Flood Map – Northwiche Town Centre – UU



Source: United Utilities, 2020

3.6. Flooding History

There have been several recorded flood events in Northwiche town centre with the most severe occurring in 1946, and recent events occurring in 2000 and 2012. The 1946 event was estimated to be in excess of a 1 in 100 probability flood event and the flooding was widespread. In 2000 and 2012, flooding of the Bull Ring and old Floatel site (now replaced with the new Waitrose car park) occurred with waters escaping onto the main roads through the town centre causing major disruption and road closures.

4. Existing Infrastructure

The below introduces the relevant infrastructure in the areas affected by the flooding in the October 2019 event.

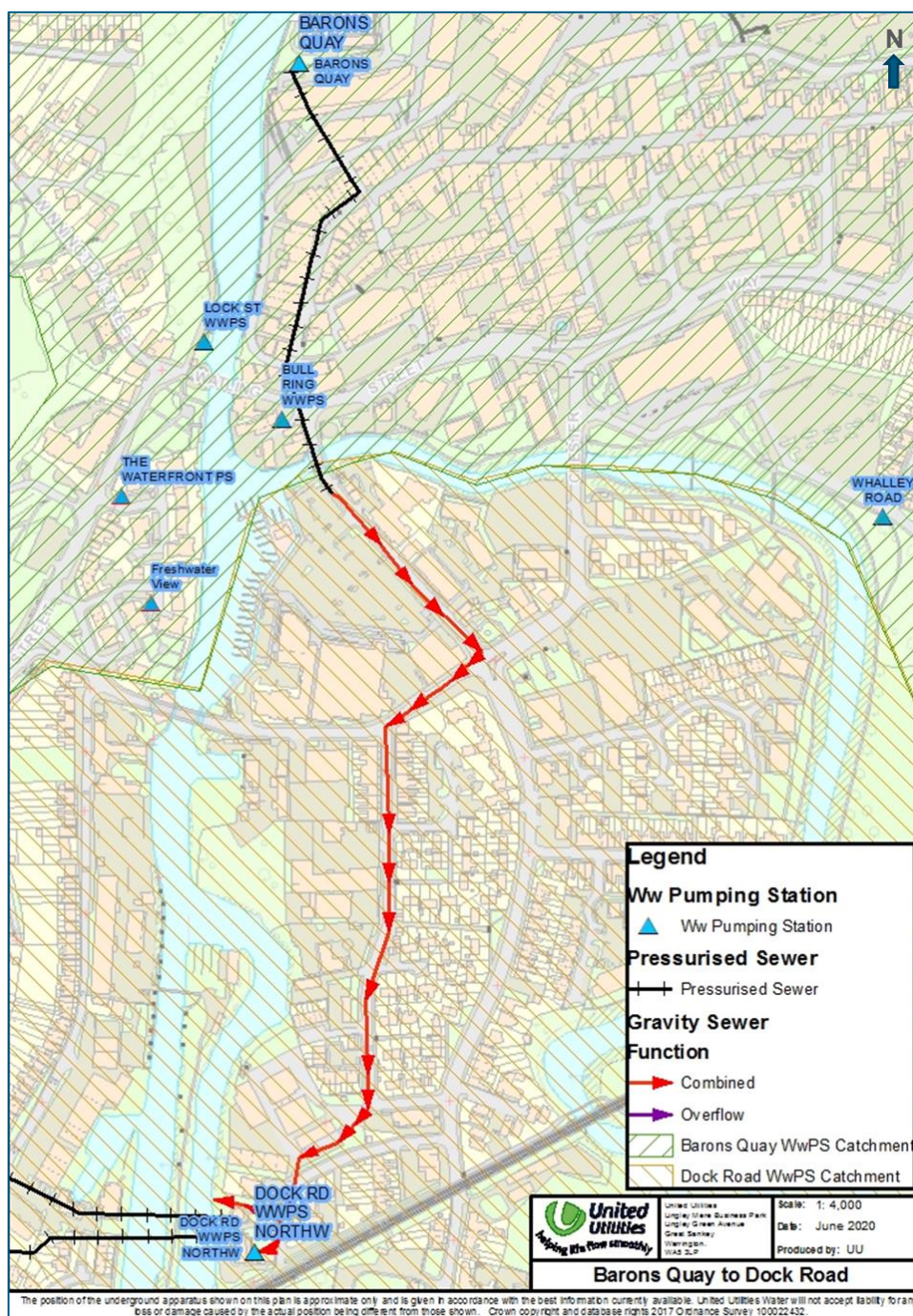
4.1. Northwich Town Centre

Northwich town centre is protected by raised flood defences built by the Environment Agency in 2015-2016 and has a large network of combined sewers owned by United Utilities. There is highways drainage owned by CWaC and private drainage in the area as well.

4.1.1. United Utilities Sewer Network

Drainage in Northwich Town Centre is predominantly made up of a combined sewer system which takes both foul and surface water, a number of smaller network pumping stations with two larger last in line wastewater pumping stations: Barons Quay pumping station which pumps flow from Dane Street until it meets London Road and then flows via gravity to Dock Road pumping station, which then pumps flow on to Northwich Wastewater Treatment Works. This is illustrated in Figure 4-1 below. For both stations, flows above the pass forward flow limits are permitted to be discharged to river. A schematic of the United Utilities network is presented in Figure 4-2.

Figure 4-1 - UU Pumping Station Location Plan



Source: UU data 2020

Figure 4-2 - UU Network and Outfalls– Northwich Town Centre



River Weaver Outfalls:

7200 – Barons Key Road - No flap valve- 150mm s/w overgrown
 6805- Not starred on map but Winnington Hill pumping station and Winnington Hill CSO has 2 flap valves – 375mm
 6811 – Town Bridge 150mm surface water- No flap valve
 6818 – Under Town Bridge 225mm s/w sewer – No flap valve
 6819 – South/East of Town Bridge – 100mm s/w sewer – No flap Valve
 6703 – Navigation House (Marine Approach) – 225mm S/W Unable to determine as outfall under water
 6600- Freshwater View – 450mm s/w has a flap valve
 5208 and 5210 – Waterside House – both have flap valves – 575mm s/w and 450mm comb/s
 6204 – Dock Road Edwardian Pumping station – 1200mm overflow
 6103 – Yarwood Close- No flap valve

River Dane Outfalls:

7828- Watling Street / Dane Street – 150mm s/w- no flap valve
 8700 – Watling Street- Danewalk Centre- 750mm s/w Flap valve.
 0703 – Heber Walk- 300mm s/w – underwater- presume no flap valve
 1707 – Whalley Road Pumping Station overflow- Flap valve present – 1050mm
 1601 and 1501 - Drillfield Road- 300mm- unable to find – overgrown
 1401- Water Street 150mm S/W- submerged- unable to say flap valve or not
 1407 – Opposite Water Street- unable to locate 450mm s/w
 9304- Waterbank Row – 300mm s/w Flap valve present
 9300 – Chapel Court 225mm s/w – Flap valve present
 9202 – Our Lady of Crestochowa Church – 750mm – Flap Valve present
 2100 – Carlton Road / Westfield Road – 525mm s/w- unable to locate as too remote.

Source: United Utilities, 2014

4.1.1.1. Barons Quay Catchment

Barons Quay catchment encompasses:

- A rising main that receives flows from Great Budworth, Wincham, Marston and Lostock Gralam at the north east of the catchment;
- Combined sewer overflow (CSO) points at Winnington Hill, Lock Street, Castle Street and Chesterway;
- Wastewater pumping stations at Lock Street, Bull Ring, Whalley Road and Barons Quay;

Barons Quay pumping station includes:

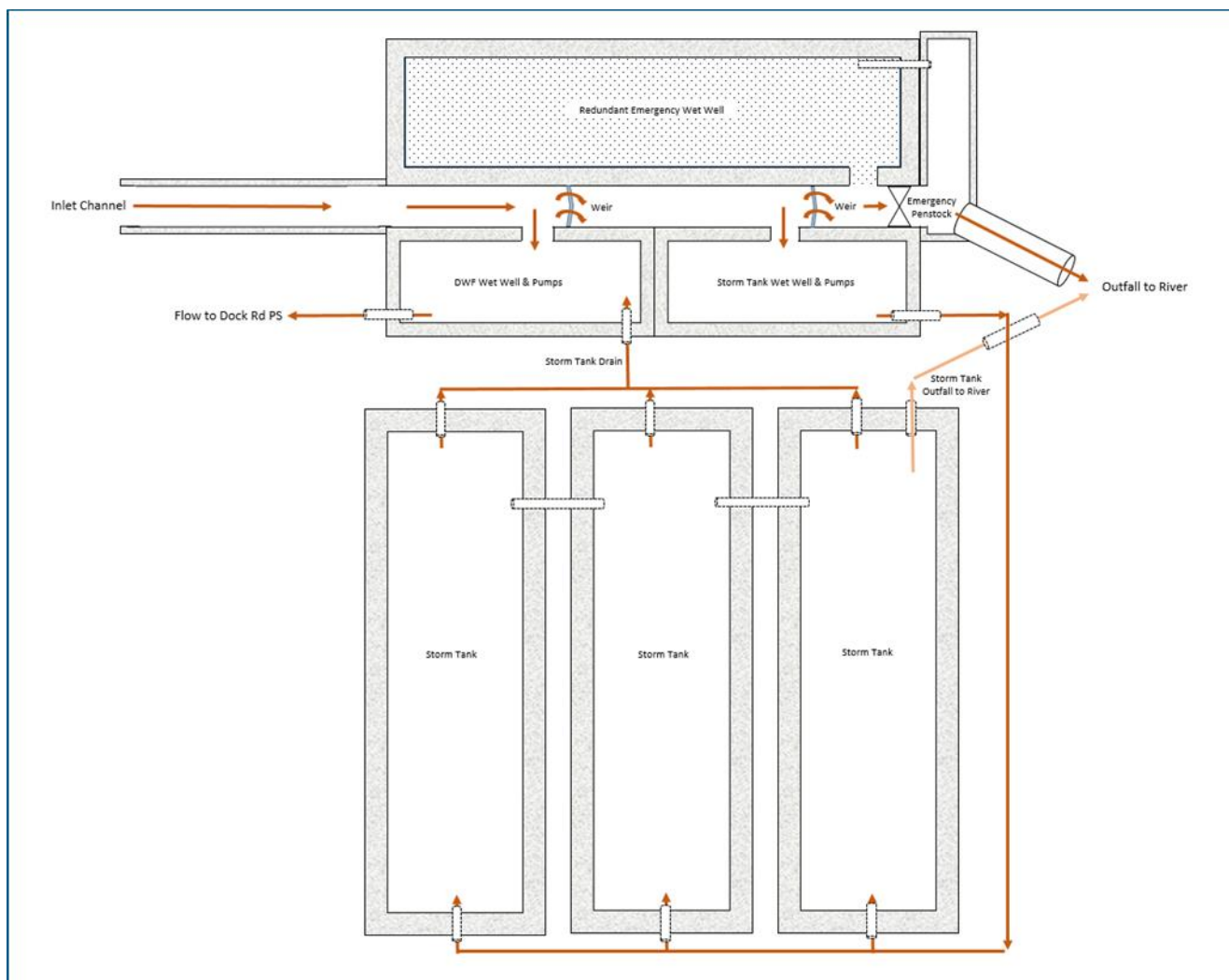
- Five dry weather pumps that operate on a Duty, Assist, Assist, Assist, Assist arrangement (if pumping demand exceeds capacity for the Duty pump, then an Assist pump will be enabled to assist with the delivery. If the demand continues to increase, additional assist pumps will start). Flows (of 10 times dry weather flow) are pumped to Dock Road Pumping Station;
- There are three storm pumps which pump flows in excess of the 10 times dry weather flow to storm tanks located on site;

Barons Quay pumping station's emergency systems:

- There is an emergency penstock which is automatically opened in a storm event to allow excess flow to river, when the outfall is not 'river locked' or blocked by water in the river at a higher level;
- This outfall is at 9.69 metres above ordnance datum (mAOD).

Figure 4-3 shows a plan schematic of the arrangement at Baron's Quay pumping station.

Figure 4-3 - Baron's Quay Pumping Station Arrangement



Source: UU data 2020

4.1.1.2. Dock Road Catchment

Dock road catchment encompasses:

- Pumping stations at Monarch Drive and Dock Road;
- Combined sewer overflow points at Weir St, Dane Nurseries, Carlton Road, Middlewich Road and Marlow Road;
- Rudheath Trunk Sewer which receives sewage from Rudheath area, Lach Dennis and Lostock Green;
- Davenham Trunk sewer which receives flows from South Leftwich, Davenham and Moulton.

Dock Road is a last in line pumping station to Northwich wastewater treatment works and is permitted to pass forward 510l/s. Dock Road Pumping Station has:

- Four sewage transfer pumps that operate on a Duty, Assist, Assist, Standby arrangement (a standby pump is a backup in the event of the duty and assist pumps failing to meet the pumping requirement);
- Pump 3 was replaced in August 2019 by a hire pump to act as a manually operated standby pump.

Dock Road pumping station's emergency systems:

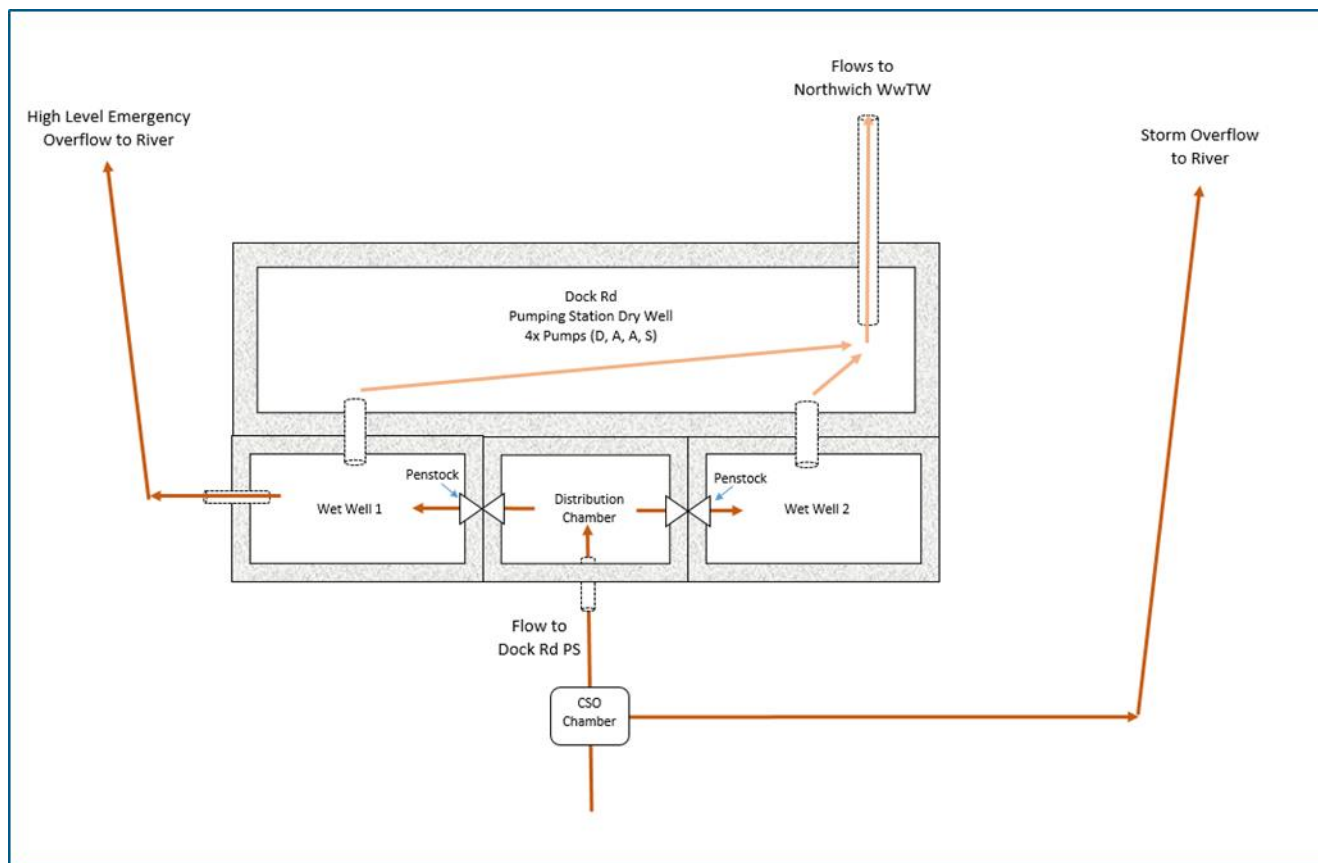
- There is an emergency penstock which opens when the incoming flows are in excess of 510l/s in the rising main;
- When incoming flows to Dock Road exceed the pass forward rate, a network combined sewer overflow upstream (Weir Street CSO, VRY0102) acts to relieve surcharge in the system by discharging to

watercourse. The relief weir crest level is at 10.16mAOD. Levels of protection provided by the CSO can be reduced at lower river levels than this crest level, as the hydraulic gradient in the outfall pipe is forced higher.

- An additional emergency overflow exits directly from the pumping station's wet well in case the emergency penstock fails to open.

Ultrasonic sensors in the wet wells provide signals to the electronic control system which in turn controls the pumps. Figure 4-4 shows an elevation view of this arrangement.

Figure 4-4 - Dock Road Pumping Station Arrangement

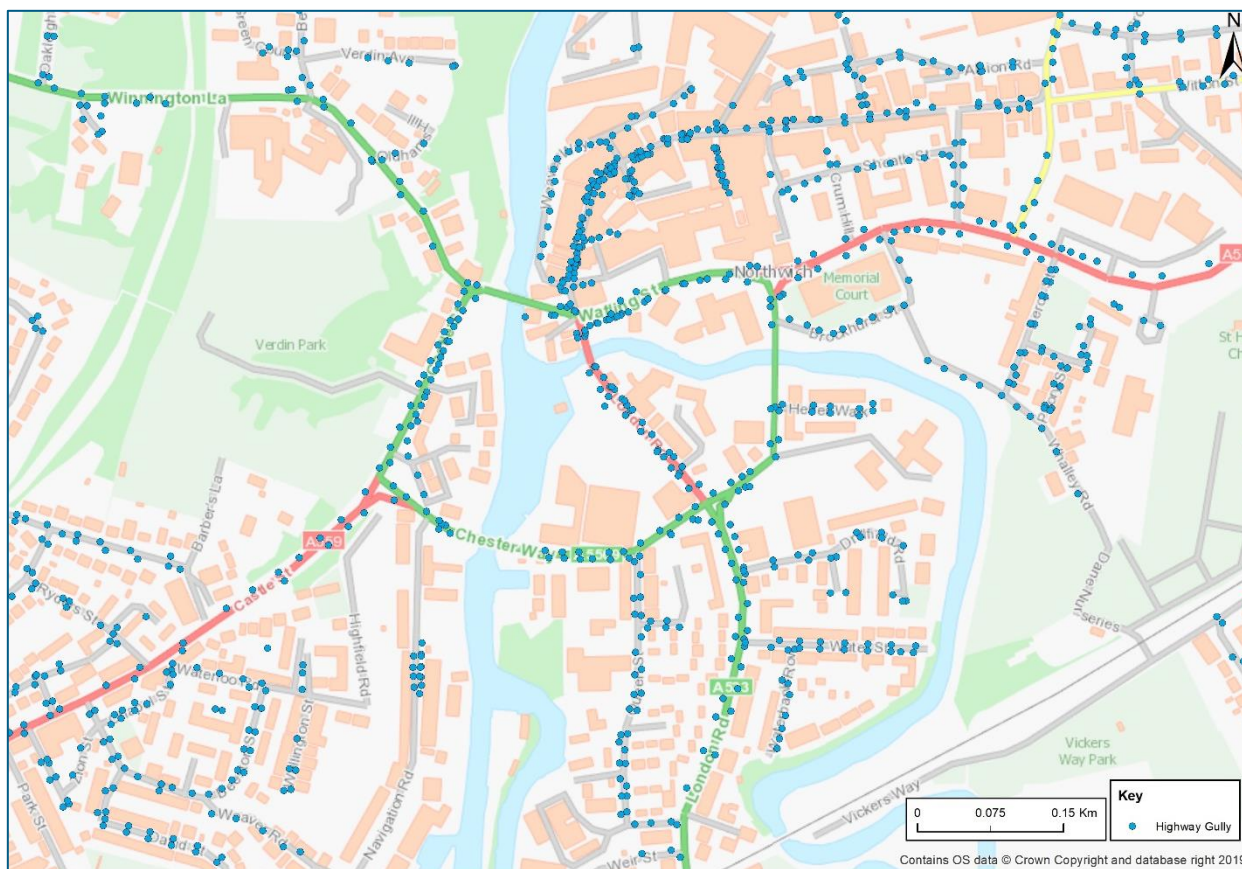


Source: UU data 2020

4.1.2. Highways Drainage

There are a number of highways drainage gullies which provide drainage to the roads in Northwich Town Centre. These are maintained by the Highways Authority, CWaC. Records of the highway drainage network, between gully and discharge point is not available. It is assumed, through consultation with CWaC, that localised networks consisting of small diameter pipes provide conveyance to the River Weaver. The location of these gullies can also be seen in Figure 4-5 below. Please note Figure 4-5 represents gully locations only. A survey to confirm the drainage pathways to river outfall points, and the status of the outfall as to whether it has a working flap valve or not is recommended.

Figure 4-5 - CWaC Highway Gullies

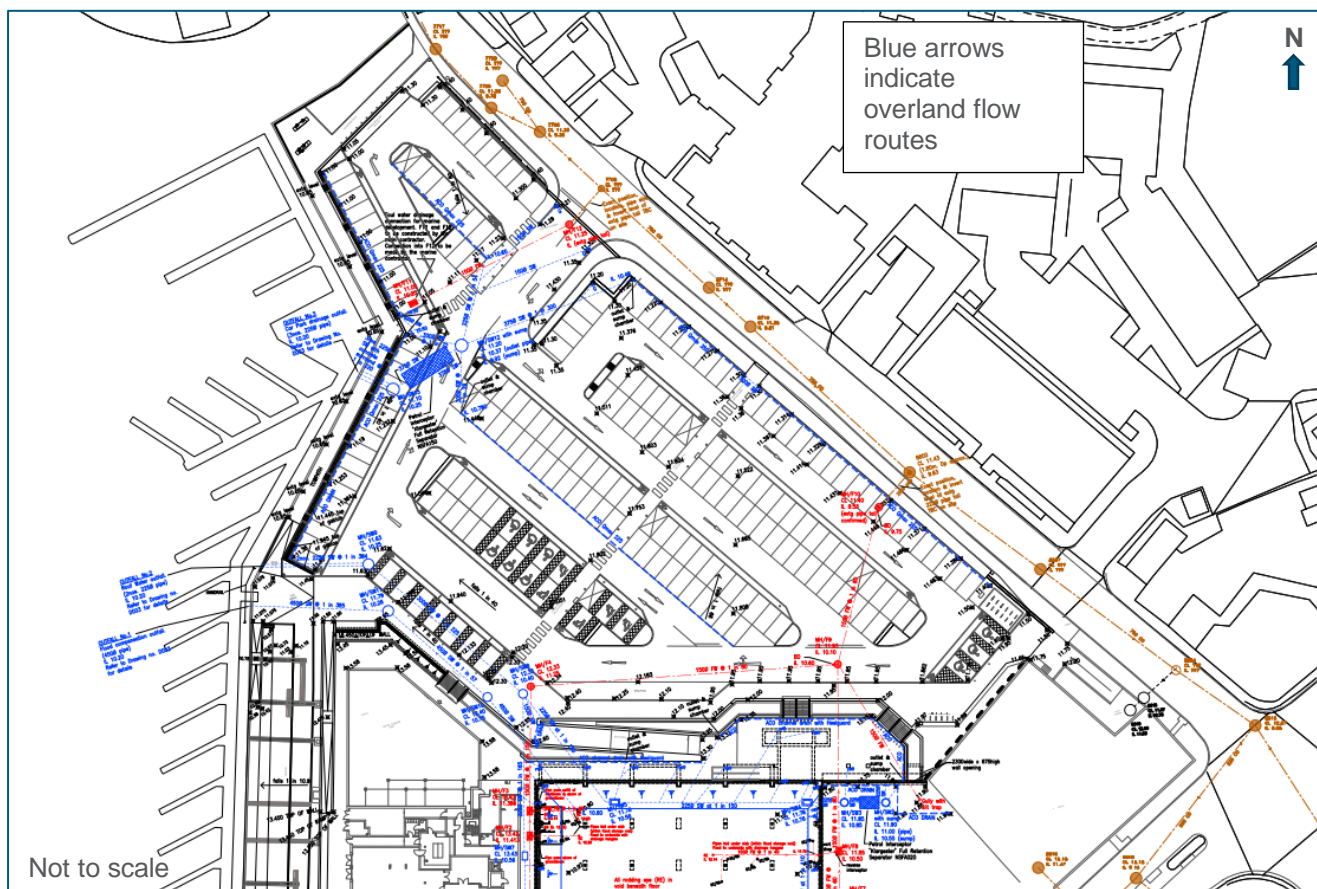


Source: CWaC, 2020

4.1.3. Waitrose Drainage

Detailed records of the privately owned, and operated, drainage within the carpark of Waitrose located at the confluence of the River Dane and River Weaver are not currently available. The drainage proposals submitted as part of the planning application are shown in Figure 4-6. As built records were not available.

Figure 4-6 - Waitrose Drainage Plans



Source: Healey Consulting, 2013

4.1.4. Flood Defences

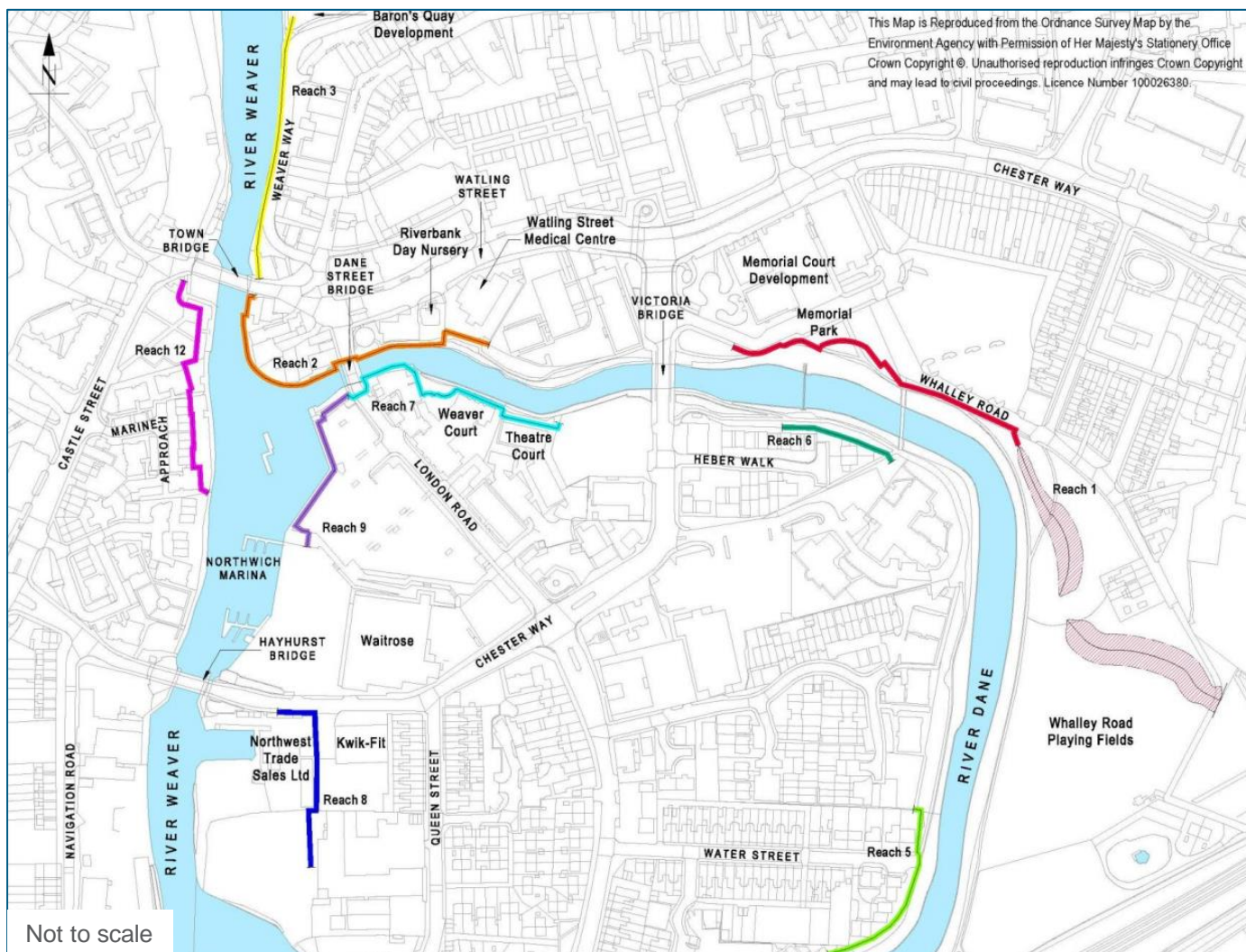
1.7km of raised flood defences consisting of walls, embankments and demountable barriers were constructed in Northwich Town Centre along the River Weaver and Dane. The defences:

- Were built in 2015 and 2016 in response to flooding in 2012, which flooded the lower parts of the town centre including the Bull Ring and the now Waitrose car park;
- Reduced the flood risk for 1,050 people and more than 400 homes, businesses and three development sites in the town centre;
- Were built to a flood defence level (FDL) of 1% annual exceedance probability (AEP)* at the time, plus 300mm of freeboard allowance.

An overview plan of the raised defences showing their alignment in coloured lines is provided in Figure 4-7.

* The probability associated with a return period e.g. an event of return period 100 years ($T=100$), has an AEP of $1/T$ or 0.01 (1%)

Figure 4-7 - Northwich Town Centre Flood Defences



Source: EA, 2016

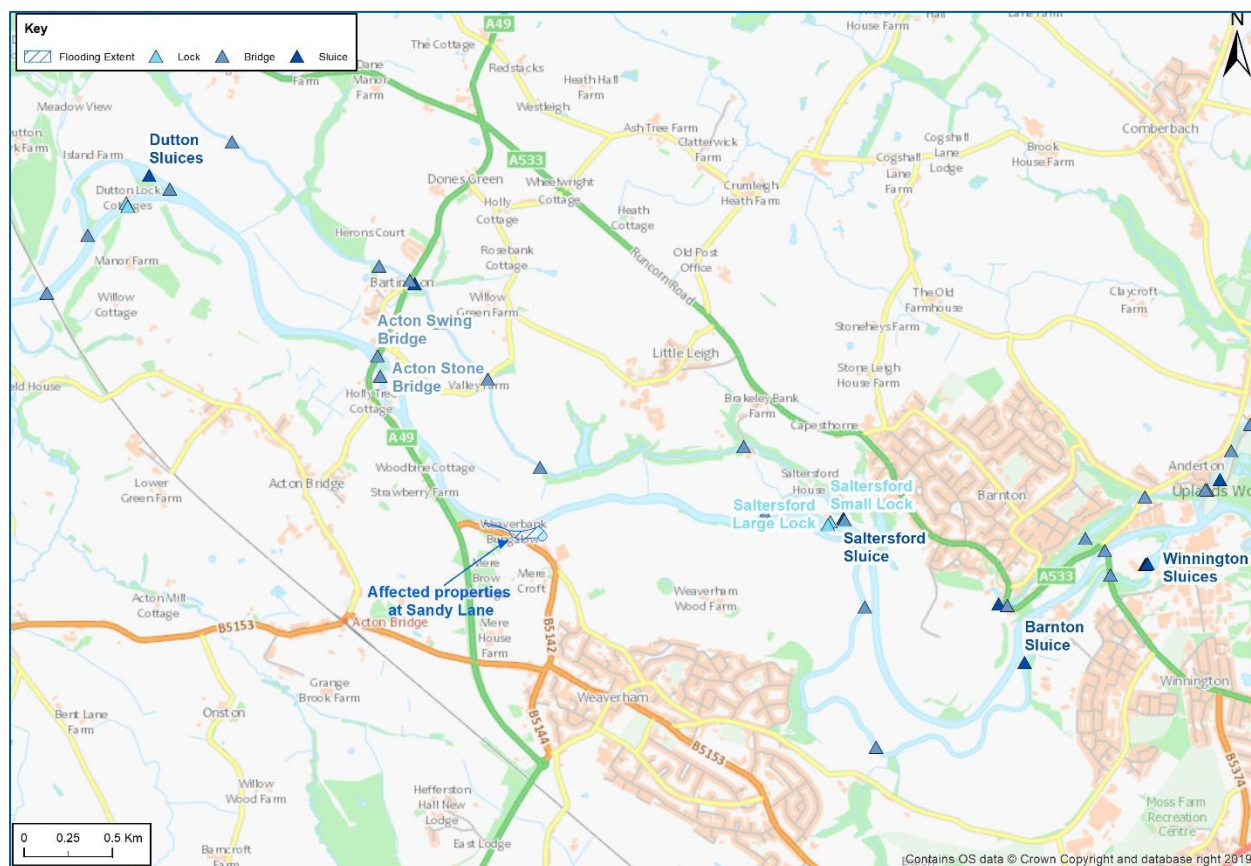
The flood defences were designed to protect 400 properties. Many of these areas benefitted from this flood protection in the flooding that occurred October 2019. The following three areas where flood defences were present were affected by flooding in October 2019:

1. Downstream of Town Bridge – Right Bank River Weaver
 - Demountable flood barriers founded on concrete grounding beam and sheet piles
 - Continuous sheet pile wall with structural glass panels
2. Upstream of Town Bridge to Dane St Bridge – Right Bank River Weaver / Right Bank River Dane
 - Continuous sheet pile wall with structural glass panels
 - Demountable flood barriers across Dane St Bridge
3. Northwich Quay to Dane St Bridge – Right Bank River Weaver / Left Bank River Dane
 - Continuous sheet pile wall with structural glass panels
 - Demountable flood barriers and flood gate between Northwich Quay and Waitrose car park
 - Demountable flood barriers across Dane St Bridge

4.2. Sandy Lane, Acton Bridge Area

Approximately 2km upstream of the properties affected at Sandy Lane is the Saltersford Locks and Sluice Gate owned and operated by CRT. The Acton Stone Bridge and Acton Swing Bridge are located 1.2km downstream of Sandy Lane properties, the Dutton Sluices are a further 2km downstream as shown in Figure 4-8.

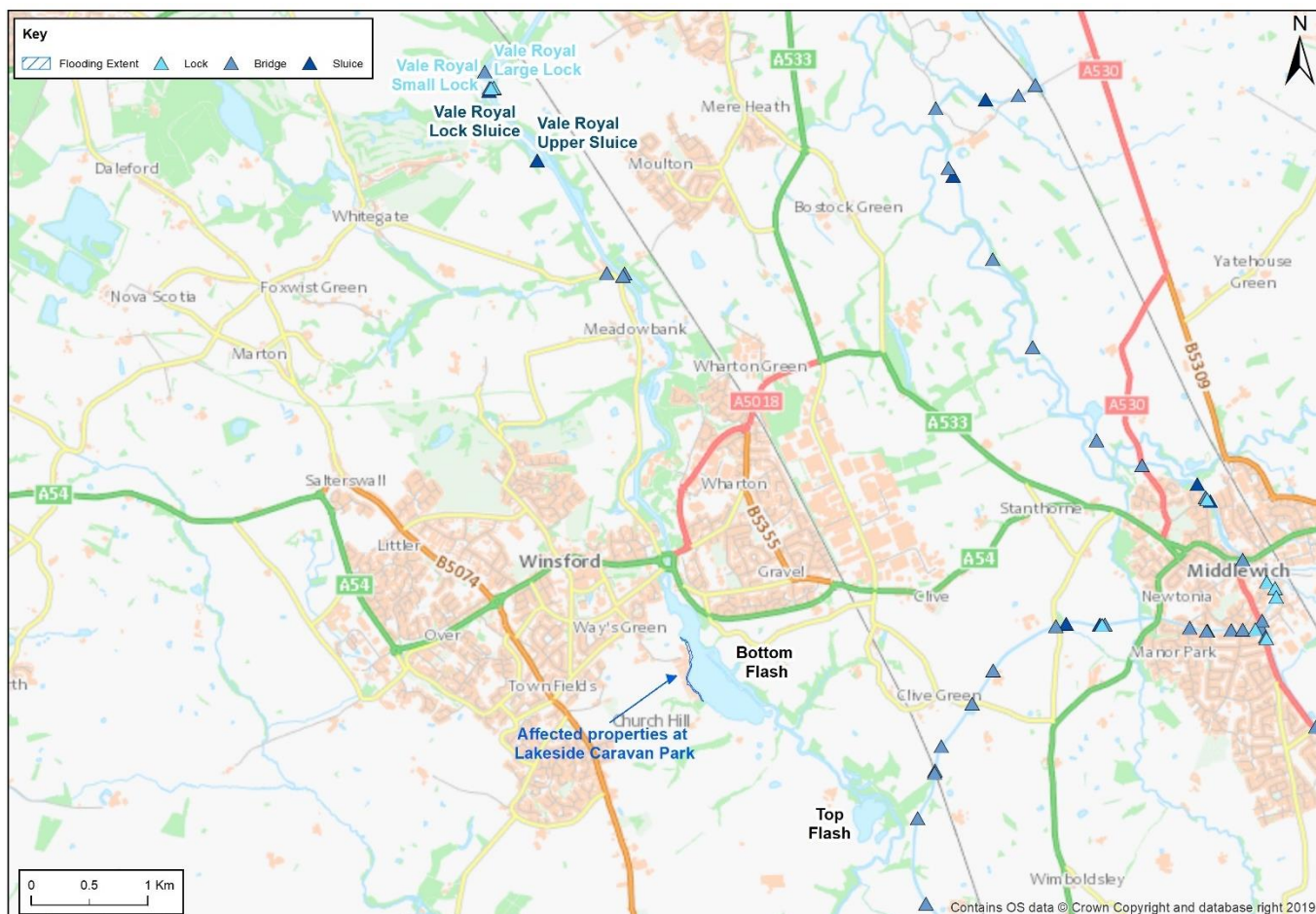
Figure 4-8 - Sandy Lane Area



4.3. Bottom Flash, Winsford Area

Bottom Flash is located downstream of Top Flash and upstream of the A54 Winsford Bridge (westbound and eastbound). The Vale Royal Locks and Sluice Gates are located 5.7km downstream of Bottom Flash, as shown in Figure 4-9 below.

Figure 4-9 - Bottom Flash Area



5. Data Collection Summary

CWaC, as the LLFA, collected data and began consultations with the RMAs, affected property owners and the public upon subsidence of the flooding. The following sections provide an outline to the process followed.

5.1. Consultation

Each of the following parties involved with the flood incident were contacted to provide information. Table 5-1 provides a summary of the information shared with CWaC.

Table 5-1 - Data Provided through Consultation

| Consultee | Information Provided |
|-----------------------------------|--|
| Cheshire West and Chester Council | <ul style="list-style-type: none"> • Emails regarding flooding sent to LLFA • Multi-Agency Flood De-brief Meeting Notes • Photos of flood incidents • Waitrose indicative drainage plan • Highway gully plan • Road closure incidents |
| Environment Agency | <ul style="list-style-type: none"> • Evidence review and flood event timeline including incident response • Rain and river gauge data • Topographic survey, flood defence as built drawings and design report • Flap valve survey • Operations and maintenance plan for Northwich scheme defences |
| United Utilities | <ul style="list-style-type: none"> • Maps of assets • Timeline and performance summary of assets during flood event including incident response • Operation of UU last in line pumping station • Modelling post incident analysis – UU and assumed third party surface water systems • Maintenance records • Drop in session notes • Telemetry data during flood event • Post incident site investigations |
| Canal & River Trust | <ul style="list-style-type: none"> • Timeline and performance summary of assets during flood event • SCADA records |
| MET Office | <ul style="list-style-type: none"> • UK Monthly Climate Summary October 2019 • October 2019 Rainfall |
| Local Residents and Businesses | <ul style="list-style-type: none"> • Photographs, anecdotal evidence • Flood outlines |

5.2. Data Review

Data collected confirmed the extents of flooding at the Lakeside Caravan Park, Winsford, Sandy Lane, Acton Bridge properties and in the Northwich Town Centre. Incidence response and conditions of the weather event have been reviewed as part of this investigation.

Topographic survey and GIS data of the relevant assets were requested in order to map these against the flood outlines of the event.

5.3. Site Investigations

Site investigations were carried out by United Utilities on the 12th November 2019, with surface water connectivity investigations and flap valve operation checks being completed.

A drop-in event was held by CWaC, EA, CRT and UU on 19th November 2019 at the Memorial Court to provide information and advice to affected residents and businesses. Further consultations were undertaken with local residents and businesses, via the phone and at the properties affected, in March 2020 to further inform the understanding of flooding mechanisms.

CWaC and Atkins undertook site investigations in November 2019 to refine the understanding of the area's physical characteristics and to:

- Understand the area's topography and historic flood mechanisms;
- Engage with local residents and businesses to capture local knowledge of the flood event.

Residents and businesses directly affected by flooding were notified in advance of the site visits either verbally in person or through written communications. Local knowledge was captured through site consultations and shared notes, sketches and photographs.

Further network investigations were carried out by UU on 28th November 2019 on the pumping stations and emergency overflow outfalls.

6. Flood Incident Details

This section provides a summary of the environmental conditions that led to flooding in the October 2019 event. The following information has been reviewed:

- Environment Agency Water Situation Reports – a monthly national report
- Met Office October 2019 Rainfall data
- Met Office Monthly UK Climate Summary October 2019
- National Hydrological Monitoring Programme. 2019. Hydrological summary for the United Kingdom: October 2019. Wallingford, UK Centre for Ecology & Hydrology. <http://nora.nerc.ac.uk/id/eprint/525904/>

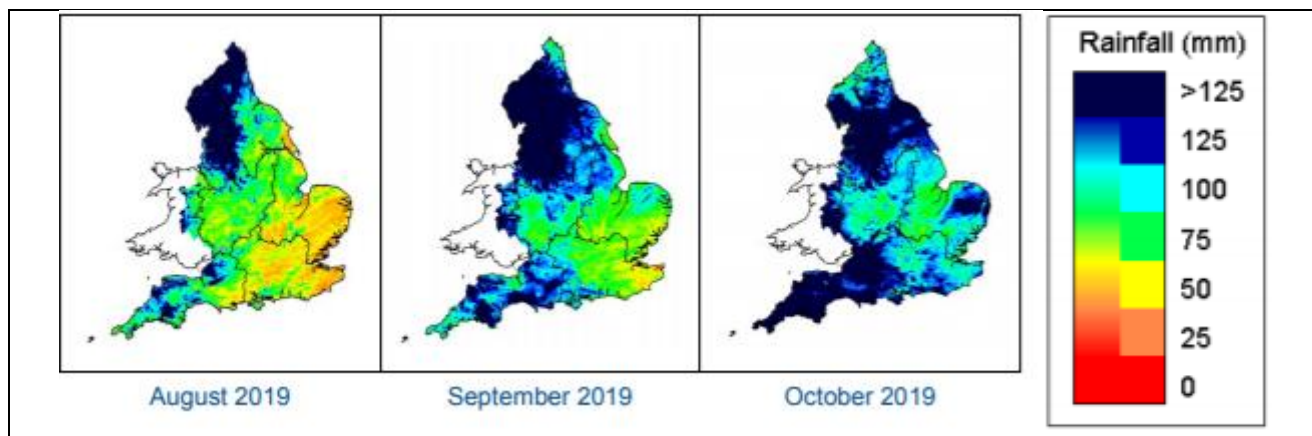
6.1. Rainfall Summary

Above average rainfall fell in October across most catchments in England, with some catchments receiving over double the average monthly total.

- The rainfall total for England was 125mm representing 162% of the 1961 – 1990 long term average (EA Water Situation Report, October 2019).
- Soils were also wetter than average in all regions, with the soil moisture deficit across most of England smaller than average by at least 26mm (EA Water Situation Report, October 2019).
- The summer and autumn of 2019 were exceptionally wet; for England and Wales, in the last 50 years only 2012 was wetter over the June – October timeframe (CEH October hydrology report).

From the beginning of October until the 20th, the weather was unsettled with rain belts crossing the country. The 21st to the 23rd were quiet but rain fell between the 24th and 27th. The weather was cold, dry and sunny for most of the country from the 27th to the 30th (Met Office, October 2019 Climate Summary).

Figure 6-1 - Monthly rainfall across England and Wales



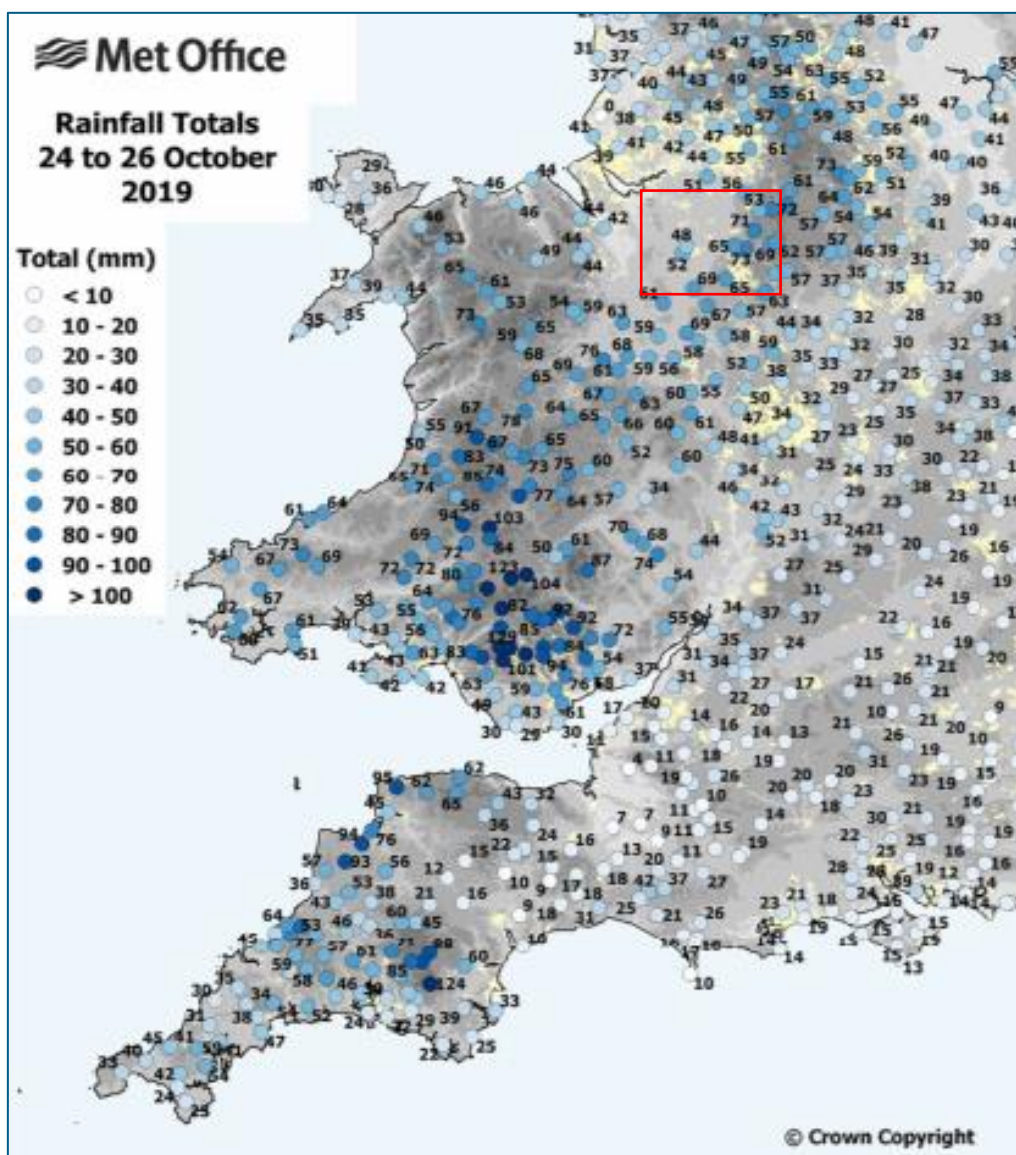
Source: UKPP radar data, Met Office

Persistent heavy rainfall, as a result of a slow-moving front fell from 26th – 27th October 2019.

- Some locations across Wales and Northern England received 75% or more of the monthly average rainfall during this period (Met Office October 2019 rainfall report).
- The front was associated with a large temperature gradient (Met Office October 2019 rainfall report). On the 26th October, the daily maximum temperature was 7 degrees Celsius in Birmingham, and 17 degrees Celsius in London (Met Office October 2019 rainfall report).

Figure 6-2 illustrates the rainfall over the period immediately prior to, and during, the flood event. It shows that high rainfall fell in the River Dane's upper catchment in the Peak District.

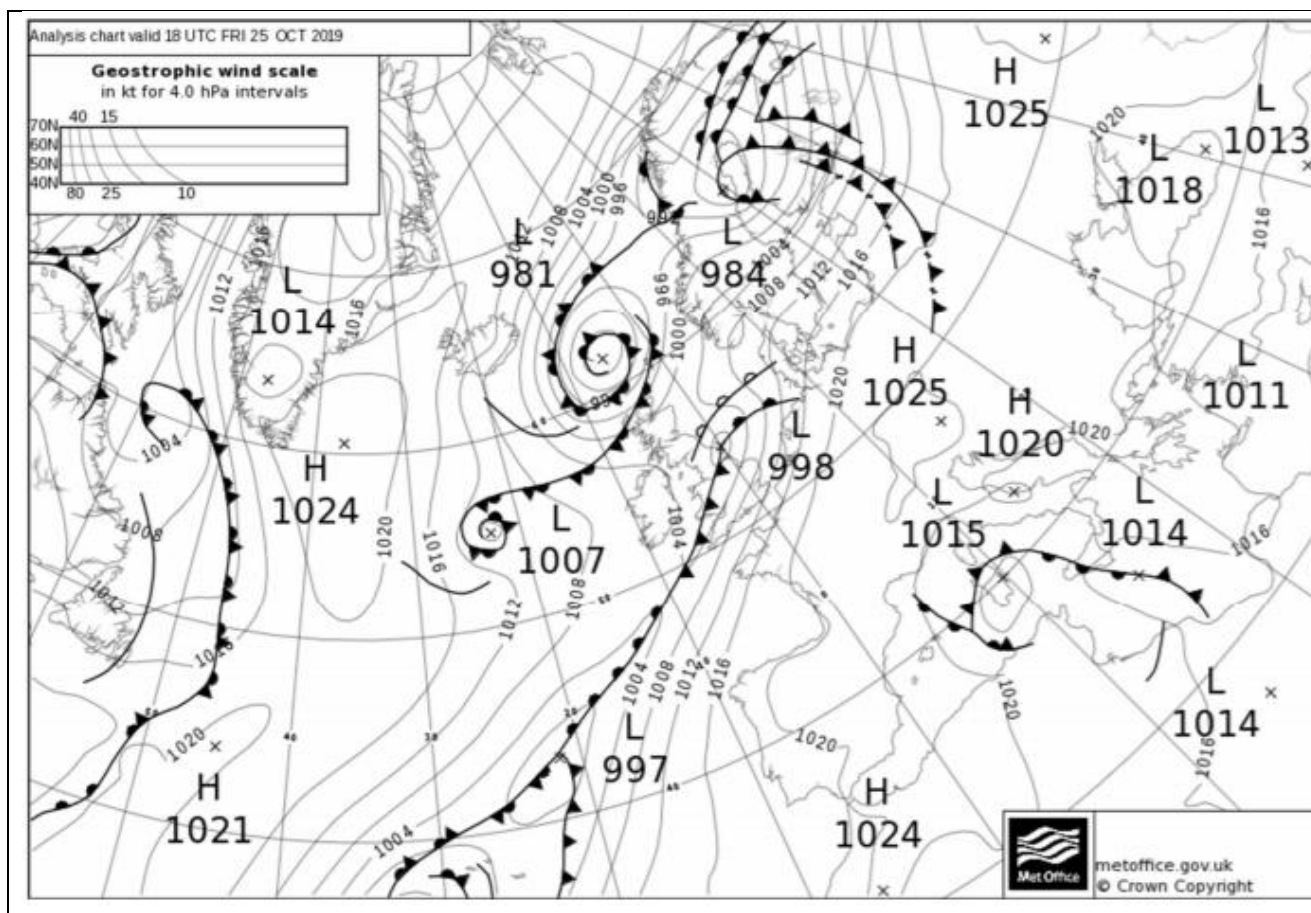
Figure 6-2 - Rainfall totals 9am 24 Oct to 9am 27 Oct 2019



Source: Met Office October Rainfall 2019 Report

Figure 6-3 illustrates the slow-moving front stretching from South Wales to Lincolnshire on 25 October 2019.

Figure 6-3 - UK Weather Summary 24-26 October 2019



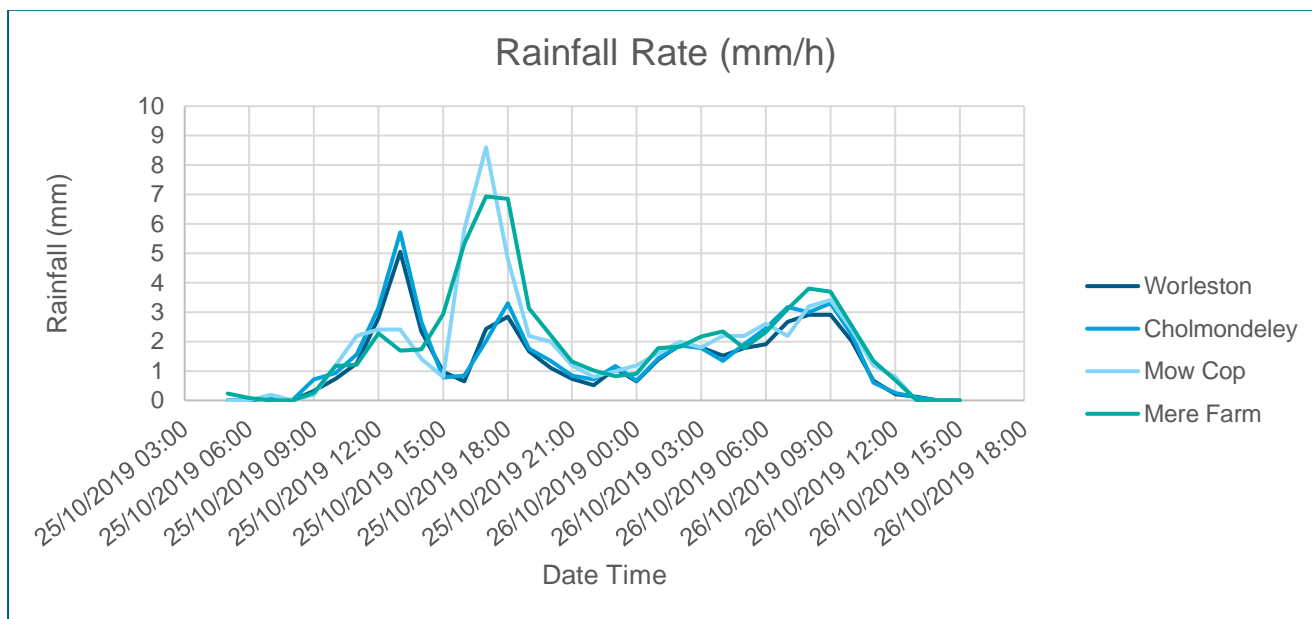
Met Office Weather Summary: 21st to 26th of October

A ridge of high pressure led to a cold night overnight 20th/21st with some frost locally, followed by a dry sunny day for most but it turned cloudier from the north-west. The 22nd was a generally cloudy day, but with some brighter spells in the north-west, and on the 23rd a band of rain, heavy at times, spread east to all parts during the afternoon. The 24th was a day of sunshine and showers, then the 25th was cloudy and cold with persistent rain in the south, and a high of only 4.9 °C at Lough Fea (County Londonderry). The 26th was another day of sunshine and showers.

Source: Met Office October Rainfall 2019 Report

Figure 6-4 presents graphs of the Environment Agency rain gauge data recorded during this period. Table 6-1 presents rainfall totals from the rain gauge data for this event. Figure 6-5 provides a location plan of these gauges in relation to Northwich.

Figure 6-4 - Rain Gauge Data

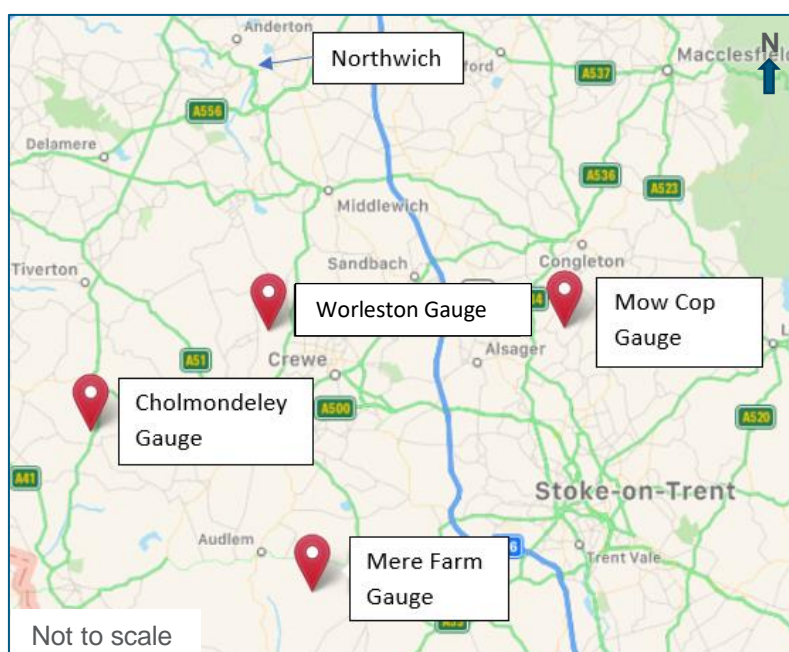


Source: Environment Agency, 2020

Table 6-1 – Rainfall Summary

| Station | Event Rainfall Total (mm) from 25/10/2019 0:00 to 26/10/2019 23:59 |
|--------------|--|
| Worleston | 47.03 |
| Cholmondeley | 51.71 |
| Mow Cop | 64 |
| Mere Farm | 67.53 |

Figure 6-5 - Rain Gauge Location Map



6.2. Watercourse Data

River flows were substantially above average in October 2019, monthly mean river flows being classed as exceptionally high at just over a third indicator sites. These sites are constantly monitored by the EA to gauge river flows across the country (Water report, EA).

Table 6-2 provides details of the river gauges which have hydraulic connectivity and relevance to the areas affected by flooding. Figure 6-6 shows the location of these gauges, and Figure 6-7 indicates the river level at the gauge locations over the period of October flooding.

Table 6-2 - River Gauge Stations

| Station | Comment |
|--|--|
| Rudheath River Dane Station No. 681210 366757, 371787 | Typical levels for October 2019 – 13 – 15mAOD Incident date: the water levels exceeded the above range. Flooding was reported in the nearby areas of the River Dane and Weaver confluence. |
| Ashbrook River Weaver Station No. 680504 367172, 263508 | Typical levels for October 2019 – 17 – 18mAOD Incident date: the water levels exceeded the typical range. Flooding was reported at the Lakeside Caravan Park |
| Hayhurst Bridge River Weaver Station No. 680525 365682, 373589 | Typical levels for October 2019 – 9.5 – 11mAOD Incident date: the water levels exceeded the typical range. Flooding was reported in the nearby areas of the River Dane and Weaver confluence. |
| Pickerings Cut River Weaver Station No. 682223 357573, 376266 * No absolute levels available | Typical levels for October 2019 – 4.5 – 5.5mAOD Incident date: the water levels exceeded the typical range. Flooding was reported at Sandy Lane near Acton Bridge. |

Figure 6-6 - River Gauge Map

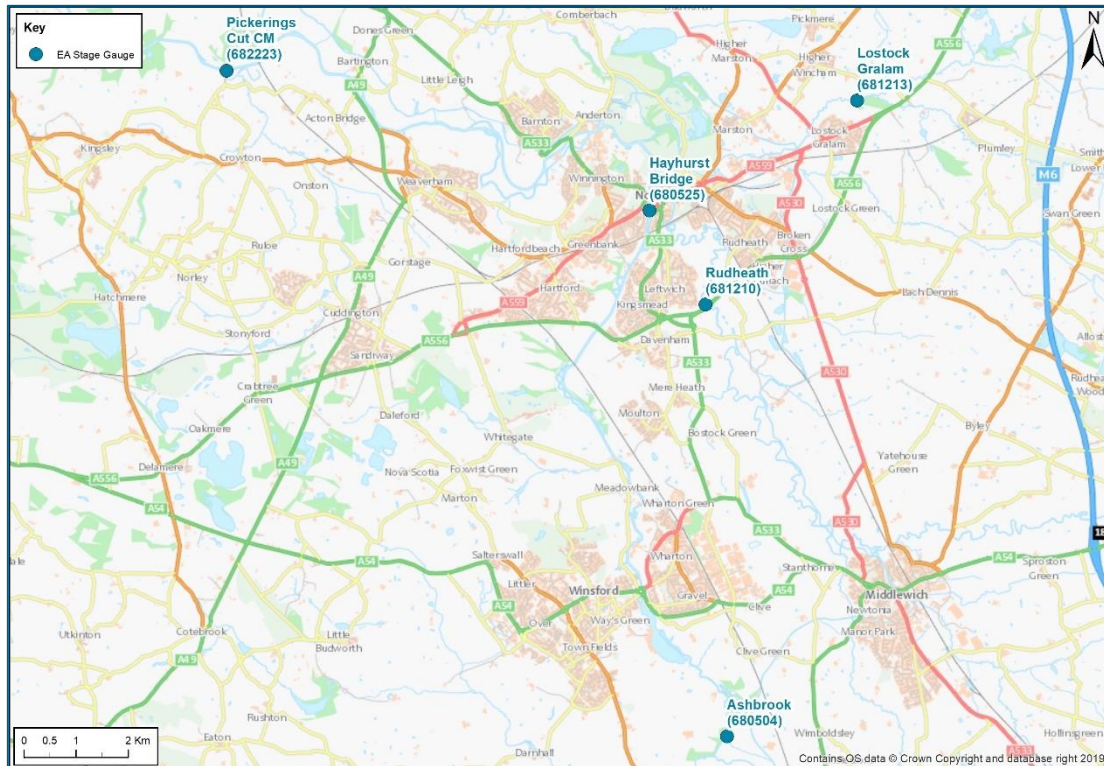
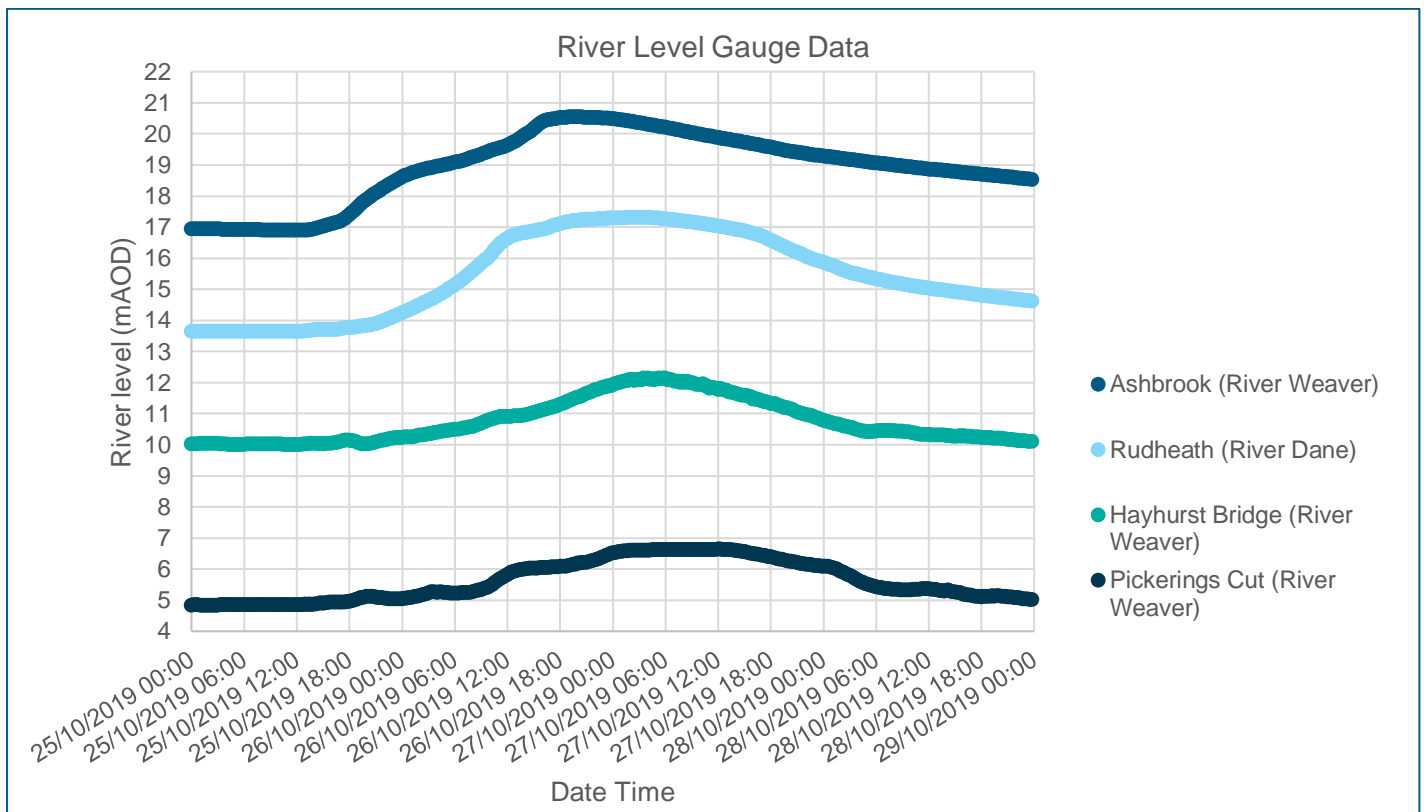


Figure 6-7 - River Level Gauge Data



Source: EA River Level Gauge Data

6.3. Weather/Flood Warning

The FWMA (2010) dictates that the EA has permissive powers, but not a statutory duty, to issue flood warnings to communities at risk of flooding. Northwich and surrounding areas are covered by the EA's Flood Warning service and Flood Alert Areas. The Flood Warning Area is applicable to all Main Rivers. Flood Alert Areas are applicable to all Main Rivers and some adjacent discrete watercourses.

The table below shows the warnings and alerts that were issued by the EA in the area from the 26th October 2019 to 27th October 2019.

Table 6-3 - EA Flood Alerts and Warning Summary

| Alert/Warning | Code | Name | Date | Time |
|---------------|------------|--|------------|-------|
| Alert | 013WAFWE | Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich | 26/10/2019 | 07:37 |
| Alert | 013WAFDEE | The River Dee Catchment in England from Whitchurch to Chester | 26/10/2019 | 07:40 |
| Alert | 013WAFGO | River Gowy catchment including areas around Frodsham | 26/10/2019 | 10:27 |
| Warning | 013FWFCH34 | Weaver Navigation at Winsford | 26/10/2019 | 11:23 |
| Warning | 013FWFCH40 | River Weaver at Anderton | 26/10/2019 | 15:30 |
| Warning | 013FWFCH37 | River Weaver at Pickerings Bridge | 26/10/2019 | 22:16 |
| Warning | 013FWFCH41 | River Weaver at Acton Bridge and Weaverham | 26/10/2019 | 22:21 |
| Warning | 013FWFCH48 | Weaver Navigation at Sutton Dock | 26/10/2019 | 22:21 |

There are three flood warning codes depending on the severity of flooding expected. They are also issued at different intervals in advance of flooding, based on level thresholds set at warning gauges:

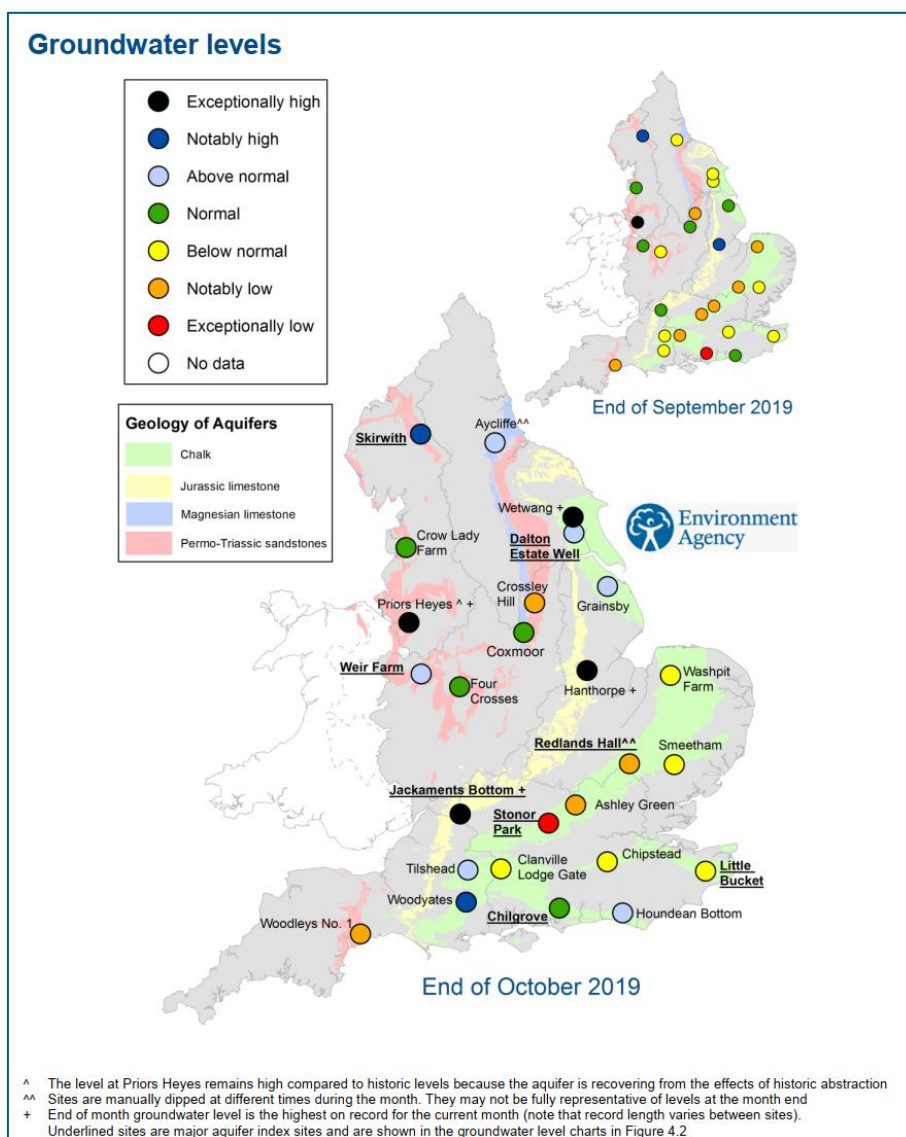
- A Flood Alert might be issued two hours to two days in advance of flooding and means that flooding is possible and to tell recipients to be prepared;
- Flood Warnings mean that flooding is expected, and immediate action is required, these are often issued half an hour to two hours in advance of flooding;
- Severe flood warning means that there is a risk of severe flooding and there is a danger to life. It is used when flooding poses a significant risk to life or significant disruption to communities.

*Flood Warnings for Northwich Town Centre (013FWFCH24 River Weaver at Northwich Marina, 013FWFCH25 River Weaver at Weaver Way, 013FWFCH26 River Weaver at Marina Approach and Chester Way and 013FWFCH27 Rivers Weaver and Dane at Northwich) were not issued as these are triggered at a level where the defences are expected to be overtopped.

6.4. Groundwater Conditions

Groundwater levels throughout England were classed as above normal or higher for the time of year. Although Figure 6-8 shows groundwater levels nearest Northwich from the EA report in October were recorded as 'Exceptionally High', it should be noted that these levels are considered high compared to historic levels because the aquifer is recovering from the effects of historic abstraction (Water Report, EA).

Figure 6-8 - Groundwater levels October 2019



Source: EA, Water Situation report October 2019

There are several groundwater monitoring stations on the outskirts of the area, as shown in Figure 6-9. The groundwater monitoring stations are operated by the Environment Agency.

Figure 6-9 - Location map of groundwater monitors near Northwich

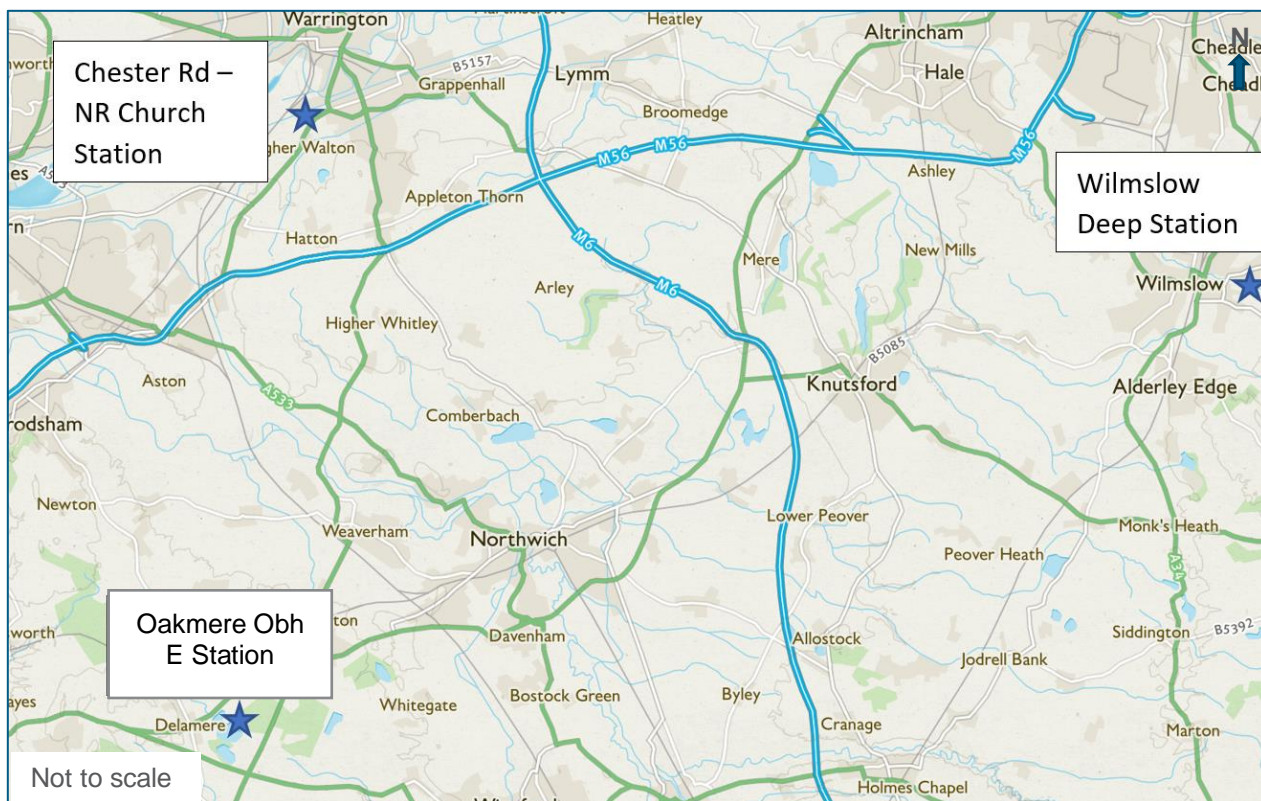
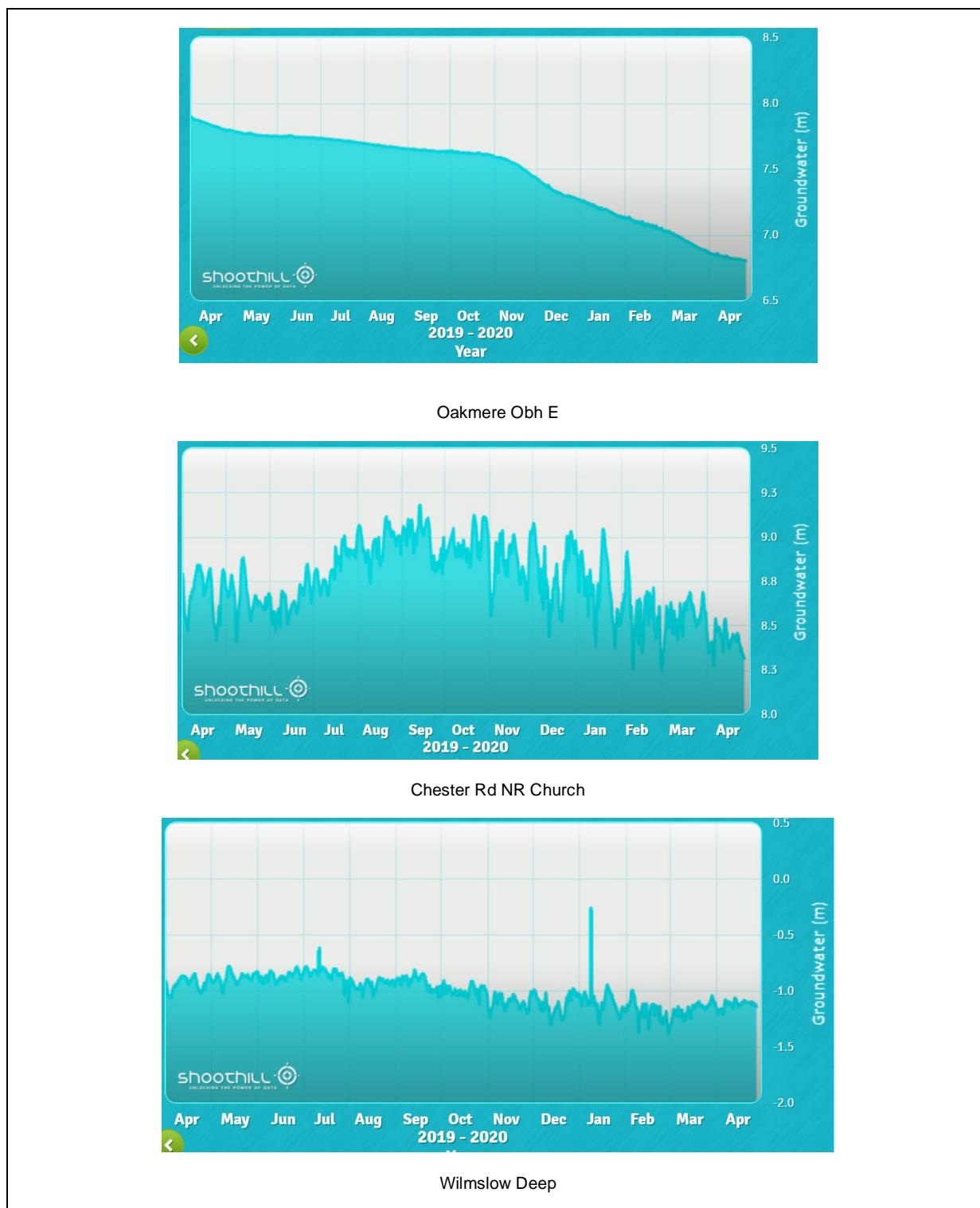


Figure 6-10 illustrates the groundwater levels nearby Northwich over the 2019 to 2020 period.

Figure 6-10 - Groundwater monitoring data



Source: Flood Assist, 2020

The results above indicate that the groundwater levels at the time of the flood event were not significantly higher than average, at Wilmslow Deep and Oakmere Obh E stations, and only slightly above average at Chester Rd NR Church station.

7. Flooding Review

Key statistics are summarised in Table 7-1. Three separate locations in Northwich and surrounding areas are reported to have been affected by the flooding in October 2019. A detailed timeline of the flood event can be found in Appendix C.

Table 7-1 - Flood Impact Summary

| Area | Sub Area | Internal | External | Highway | Comment |
|----------------------------------|----------------------------|----------|----------|---------|---|
| Winsford – Lakeside Caravan Park | - | 6 | 1 | - | 6 caravans were flooded internally |
| Acton Bridge – Sandy Lane | - | 4 | 7 | 3 | Warrington Road, Acton Lane, Sandy Lane closed. |
| Northwich Town Centre | London Road | 2 | 1 | 1 | |
| | Weaver Way and High Street | 9 | - | 2 | |
| | Bull Ring | 2 | - | 2 | |
| | North Quay | - | - | - | 19 residents evacuated, 5 chose to remain |
| Total | | 23 | 9 | 8 | |

CWaC established a Council Recovery Co-ordination Group and multi-agency Strategic Recovery Co-ordination Group. This group met multiple times after the event to coordinate the response, which included:

- Meeting affected residents and businesses to provide any support;
- Recovery actions by various Council Services and all partners;
- Clean up operations;
- Multi agency drop- in session on 19th November 2019 to provide information, advice and support to affected residents and businesses.

7.1. Affected Areas

Flood outline maps that detail the extent of the flooding have been developed in consultation with CWaC and affected property owners, these can be found in Appendix B.

7.1.1. Northwich Town Centre

Multiple locations in Northwich were affected by the flooding. This area has been split into four separate areas as shown on Figure 7-1.

Figure 7-1 - Location map of sub areas in Northwich Town Centre

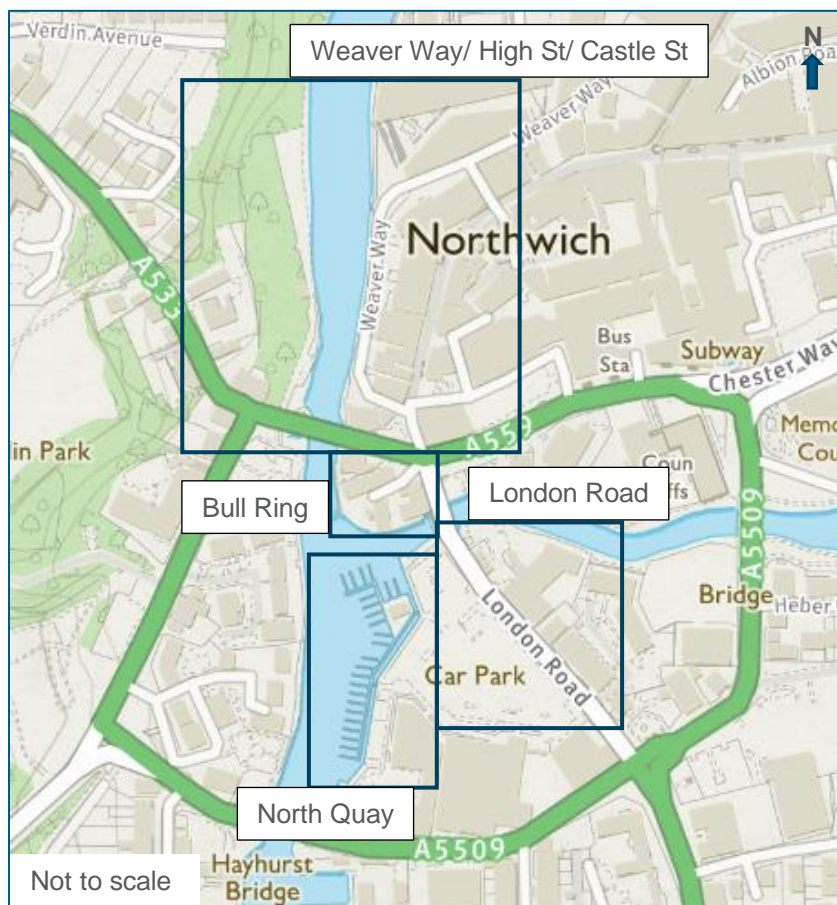
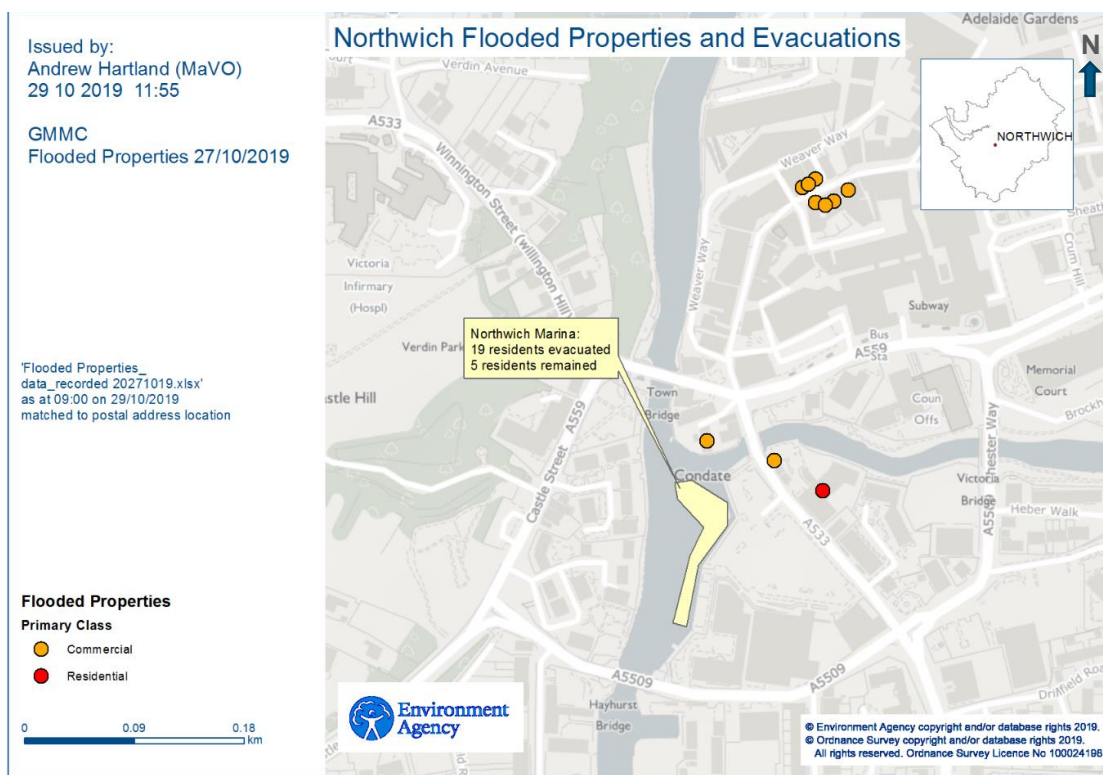


Figure 7-2 illustrates the location of the properties flooded in the Northwich Town Centre as recorded by the Environment Agency after the flood event in October 2019.

Figure 7-2 - Northwich Town Centre Flooded Properties Location Plan



Source: EA, 2020

Table 7-2 provides a brief summary of the flood event, impact and response at the London Road area in the Northwich town centre.

Table 7-2 - London Road Flooding

| London Road | |
|-----------------------------------|---|
| Date | <ul style="list-style-type: none"> • Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> • London Road |
| Description | <ul style="list-style-type: none"> • Topography falls west towards the River Weaver, area benefits from both permanent and demountable flood defences west and across Dane Bridge that were deployed during this event. • Low spots are along London Road by the entrance into Weaver Court and in the Waitrose carpark. |
| Flood Zone | <ul style="list-style-type: none"> • In an area benefitting from flood defences protecting against river flooding |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> • Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich- Flood Alert Issued 26/10/2019 07:37 • Flood Warnings for Northwich Town Centre (013FWFCH26 River Weaver at Marina Approach and Chester Way and 013FWFCH27 Rivers Weaver and Dane at Northwich) were not issued as these are triggered at a level where the defences are expected to be overtopped. |
| Flooding Incident Information | <ul style="list-style-type: none"> • London Road flooded– from Chester Way to Dane Bridge • Butcher and Barlow and the Weaver residential home were flooded – water coming up through drains, gulleys, tarmac and concrete. |
| Flooding Impacts and Observations | <p>Total numbers</p> <ul style="list-style-type: none"> • Highway Flooding – x1 (London Road) Disruption to traffic during peak time on main road. Main access route. • External Flooding – 1 (Waitrose car park) |

Summary of Flooding Incident Response During Event

For detailed account of flooding response refer to Appendix C

- Internal Flooding – x 2 (1 commercial property and 1 residential home)
- EA on site to deploy Phase 1 and Phase 2 demountable flood defences.
- CWaC implemented Northwich Traffic Management emergency plan in conjunction with EA.
- EA supported Weaver residential home to secure entrance via demountable flood barriers, provided pumps to pump ponding water on dry side back to river.
- EA operations/ Fire service evacuated members of residential care home.
- UU attended site upon receipt of high-level alarm and reports of foul flooding and EA escalation. 3rd pump (pump 4) restarted in manual.

Photographs that illustrate the extents of the flood event at London Road, provided by the Environment Agency, can be seen in Figure 7-3.

Figure 7-3 - Photograph evidence flooding at London Road

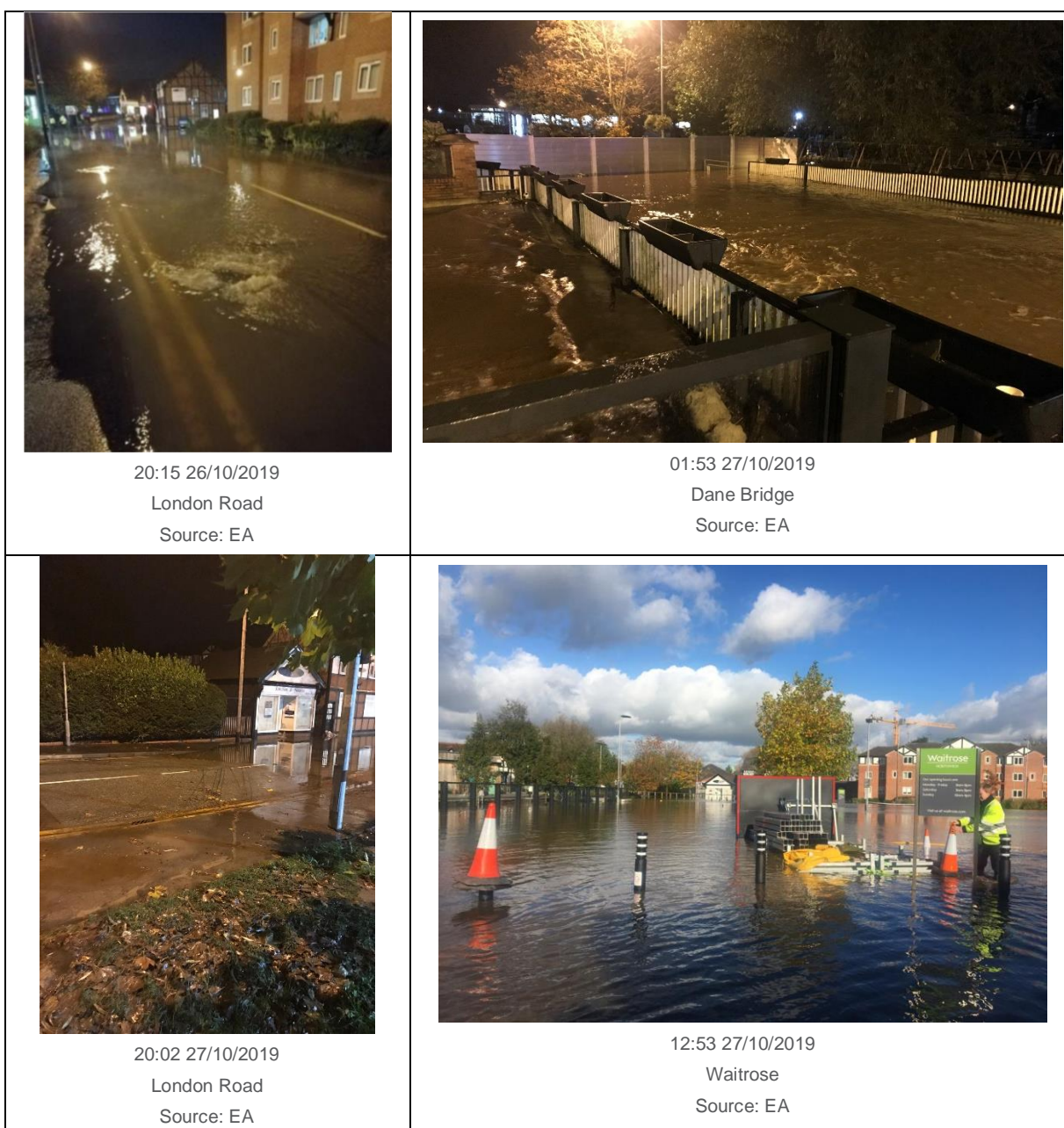


Table 7-3 provides a brief summary of the flood event, impact and response at the North Quay area in the Northwich town centre.

Table 7-3 - North Quay Flooding

| North Quay | |
|---|---|
| Date | <ul style="list-style-type: none"> Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> N/A |
| Description | <ul style="list-style-type: none"> There is a floating pontoon dock attached to dolphin piles, which is a docking point for boats. |
| Flood Zone | <ul style="list-style-type: none"> Zone 3 |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich Flood Alert Issued 26/10/2019 07:37 013FWFCH24 River Weaver at Northwich Marina was not issued as this is triggered at a level where the defences are expected to be overtopped. |
| Flooding Incident Information | <ul style="list-style-type: none"> 4pm 26/10/2019 river level started to rise in Marina and at Dane Bridge. EA advised marina residents to get out or stay put. Phase 1 closed completely. Narrow boats were evacuated at 4am due to risk of the floating pontoon capsizing – 19 people evacuated, 5 chose to remain. |
| Flooding Impacts and Observations | <ul style="list-style-type: none"> Total numbers N/A 19 people evacuated, potential risk of dock floating above dolphin piles identified. |
| Summary of Flooding Incident Response During Event For detailed account of flooding response refer to Appendix C | <ul style="list-style-type: none"> Evacuation of marina by Fire Brigade and communications by police and risk identification by EA on river levels. CWaC staff opened up Emergency Rest Centres at Rudheath Leisure Centre and Northwich Memorial Court receiving displaced residents from the Marina in Northwich. Displaced residents were also accommodated at hotels in the Northwich area. |

Photographs that show the extent of the flooding at North Quay and response, can be seen in Figure 7-4.

Figure 7-4 - Photograph anecdote of flooding at North Quay



Table 7-4 provides a brief summary of the flood event, impact and response at the Bull Ring area in the Northwich town centre.

Table 7-4 – Bull Ring Flooding

| Bull Ring | |
|---|---|
| Date | <ul style="list-style-type: none"> • Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> • Watling St, Dane St, Weaver Way |
| Description | <ul style="list-style-type: none"> • Ground falls away more steeply towards River Weaver and River Dane confluence. Permanent flood defences built up along the river edges. Low spots occur just behind the flood defences. |
| Flood Zone | <ul style="list-style-type: none"> • In an area benefitting from flood defences protecting against river flooding |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> • Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich Flood Alert Issued 26/10/2019 07:37 • Flood Warnings for Northwich Town Centre (013FWFCH25 River Weaver at Weaver Way, 013FWFCH26 River Weaver at Marina Approach and Chester Way) were not issued as these are triggered at a level where the defences are expected to be overtopped |
| Flooding Incident Information | <ul style="list-style-type: none"> • Northwich Fireplace Centre, CRS Consultants Ltd flooded. <ul style="list-style-type: none"> ○ Seepage through flood wall and around defence under Dane Bride observed. |
| Flooding Impacts and Observations | <ul style="list-style-type: none"> • Total numbers <ul style="list-style-type: none"> ○ Highway Flooding – x 2 (Watling St, Dane St/Weaver Way) Disruption to traffic during peak time on main road. Main access route. ○ External Flooding – 0 ○ Internal Flooding – x 2 (2 commercial properties) |
| Summary of Flooding Incident Response During Event For detailed account of flooding response refer to Appendix C | <ul style="list-style-type: none"> • Sump pump provided by EA to pump water over into the River. • UU engineer dispatched to check all pumps working upon receipt of high-level alarm. |

Table 7-5 provides a brief summary of the flood event, impact and response at the Weaver Way and High Street in the Northwich town centre.

Table 7-5 - Weaver Way/ High Street/ Castle St Flooding

| Weaver Way/ High Street/Castle St | |
|---|--|
| Date | <ul style="list-style-type: none"> • Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> • Weaver Way, High St/ Witton St, Castle St |
| Description | <ul style="list-style-type: none"> • Witton St rises towards Bull Ring, land slopes towards Weaver Way/ River Weaver. |
| Flood Zone | <ul style="list-style-type: none"> • In an area benefitting from flood defences |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> • Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich Flood Alert Issued 26/10/2019 07:37 • Flood Warnings for Northwich Town Centre (013FWFCH25 River Weaver at Weaver Way, 013FWFCH26 River Weaver at Marina Approach and Chester Way and 013FWFCH27 Rivers Weaver and Dane at Northwich) were not issued as these are triggered at a level where the defences are expected to be overtopped |
| Flooding Incident Information | <ul style="list-style-type: none"> • Significant flooding on Witton Street and behind Wildwood at Barons Quay – from rising drains • U-Mobile, Holland and Barrett, Bratts, Cash Generator, Admiral, Salty Dog (Water ingress into cellars), Bella Boutique (possibly water ingress into cellars) <ul style="list-style-type: none"> ○ Reports of water backing up through manholes and coming from the streets, as opposed to from the river. • Relish Tandoori on Castle St reports of 4-6ft of flooding from Saturday night to Sunday night in cellar through hole in floor. Moss Haselhurst on Castle St. |
| Flooding Impacts and Observations | <ul style="list-style-type: none"> • Total numbers <ul style="list-style-type: none"> ○ Highway Flooding – x 2 (Weaver Way, High St/ Witton St) ○ External Flooding – 0 ○ Internal Flooding – x 9 reported commercial properties flooded |
| Summary of Flooding Incident Response During Event For detailed account of flooding response refer to Appendix C | <ul style="list-style-type: none"> • EA deployed flood defences. • LLFA officer attended day after flooding. Sandbags provided after some time on request. |

Figure 7-5 shows evidence of the flooding that occurred on Weaver Way and the High Street in Northwich town centre.

Figure 7-5 - Photograph evidence of flooding at Weaver Way/ High St



01:08 27/10/2019
Baron's Quay
Source: EA



11.00 27/10/2019
High St
Source: EA

7.1.2. Sandy Lane, Acton Bridge

Figure 7-6 outlines the area affected by the flooding at Sandy Lane.

Figure 7-6 - Sandy Lane location plan

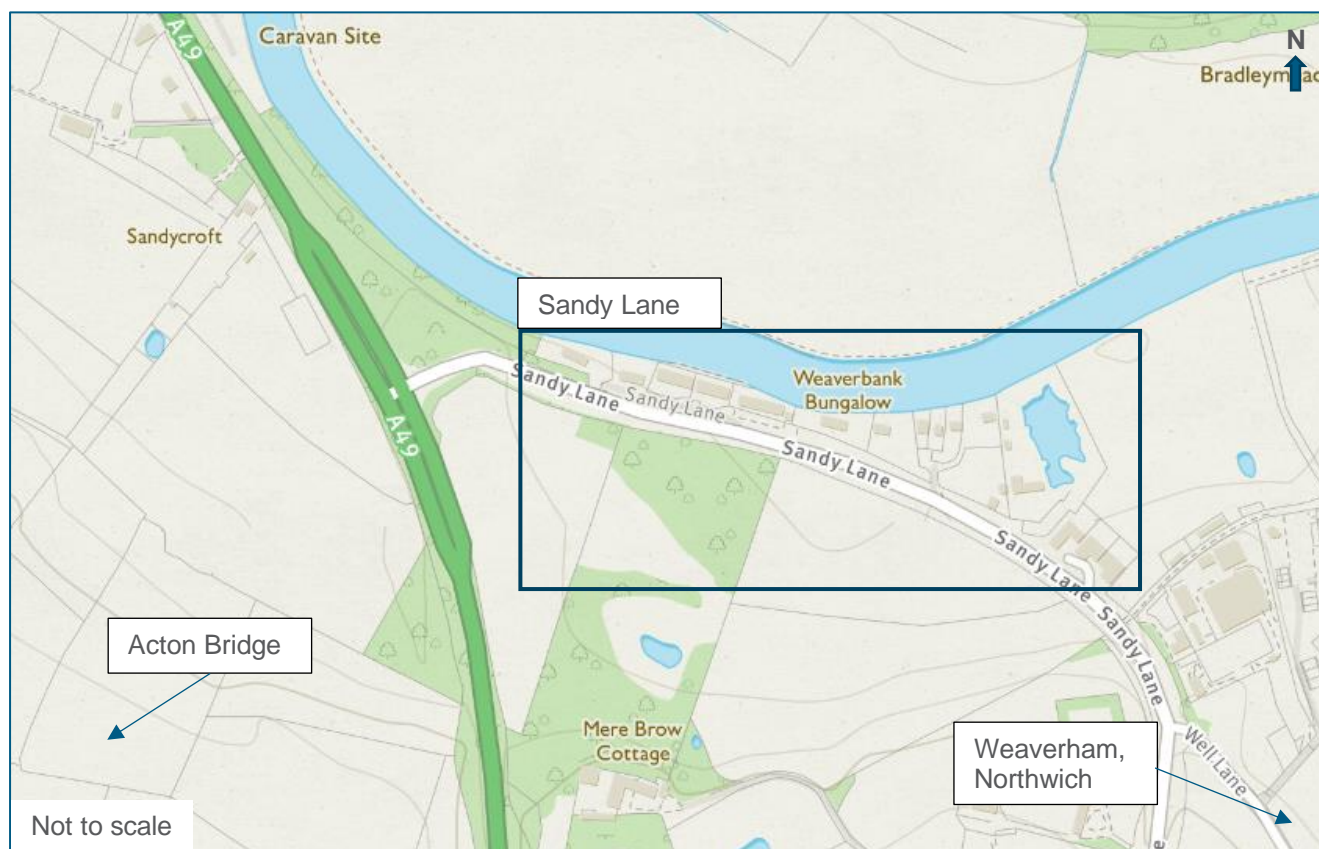


Table 7-6 provides a brief summary of the flood event, impact and response at the Sandy Lane area.

Table 7-6 - Sandy Lane Flooding

| Sandy Lane | |
|---|---|
| Date | <ul style="list-style-type: none"> Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> Sandy Lane, Acton Lane |
| Description | <ul style="list-style-type: none"> Residential properties backing on to the River Weaver just east of the A49. Some properties have docks with boats, no confirmed protection from flooding. |
| Flood Zone | <ul style="list-style-type: none"> Mostly Flood Zone 3 (few properties in zone 2, zone 1) |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> Weaverham Area Flood Warning Issued 26/10/2019 22:21 |
| Flooding Incident Information | <ul style="list-style-type: none"> Sandy Lane - Road flooding, 4 properties flooded internally and 7 properties experienced external, flooding. Water flowed in from the River Weaver behind properties. Acton Lane – Highway flooding. |
| Flooding Impacts and Observations | <ul style="list-style-type: none"> Total numbers <ul style="list-style-type: none"> Highway Flooding – x 2 (Sandy Lane, Acton Lane) External Flooding – x 7 Internal Flooding – x 4 reported residential properties flooded |
| Summary of Flooding Incident Response During Event For detailed account of flooding response refer to Appendix C | <ul style="list-style-type: none"> Flood warning issued to Sandy Lane residents. Residents monitored water levels and moved/ tied boats as needed. Residents attempted to contact CRT to understand sluice gate positions downstream. CWaC provided sandbags to one property on request. |

Figure 7-7 depicts the flooding that occurred at Sandy lane properties.

Figure 7-7 - Photograph evidence of flooding at Sandy Lane



27/10/2019

Sandy Lane property

Source: Leaders of the local flood action group



27/10/2019

Sandy Lane property

Source: Leaders of the local flood action group

7.1.3. Winsford Area - Lakeside Caravan Park

Figure 7-8 outlines the area affected by flooding at Lakeside Caravan Park.

Figure 7-8 - Lakeside Caravan Park location plan



Table 7-7 provides a brief summary of the flood event, impact and response at the Lakeside Caravan Park area.

Table 7-7 - Lakeside Caravan Park Flooding

| Lakeside Caravan Park | |
|---|---|
| Date | <ul style="list-style-type: none"> • Saturday 26th – Sunday 27th October, 2019 |
| Affected Roads | <ul style="list-style-type: none"> • N/A |
| Description | <ul style="list-style-type: none"> • Topography falls east towards Bottom Flash |
| Flood Zone | <ul style="list-style-type: none"> • Mostly Zone 1 though closest row of caravans to water in Zone 3 |
| Flood Alert / warning issued? | <ul style="list-style-type: none"> • Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich Flood Alert Issued 26/10/2019 07:37 |
| Flooding Incident Information | <ul style="list-style-type: none"> • Reported flooding of the Ark Pub. • Flooding to Lakeside Caravan Park occurred on Saturday as water rose from Bottom flash over the docks and up the banks. Boats were stranded on the banks in front of the caravans. The electric was tripped for the park, and some residents woke up in the middle of the night in ankle deep water. |
| Flooding Impacts and Observations | <ul style="list-style-type: none"> • Total numbers: <ul style="list-style-type: none"> ○ External Flooding – x 1 commercial property ○ Internal Flooding – x 6 caravan units |
| Summary of Flooding Incident Response During Event For detailed account of flooding response refer to Appendix C | <ul style="list-style-type: none"> • Flood warnings/ alerts were not registered for at this point. Manager of Holiday Park was in touch with CRT who confirmed all gates were open downstream. |

Figure 7-9 provides evidence of the flooding that occurred at Lakeside Caravan Park.

Figure 7-9 - Photograph evidence of flooding at Lakeside Caravan Park



26/10/2019

Lakeside Caravan Park

Source: Business manager of the Lakeside Caravan Park



27/10/2019

Lakeside Caravan Park

Source: Owner of the Lakeside Caravan Park



27/10/2019

Lakeside Caravan Park

Source: Owner of the Lakeside Caravan Park

8. Next Steps

This interim report has set out the site background and conditions that resulted in the flooding in October 2019 in Northwich and surrounding areas. However, some brief recommendations can be made without further investigation:

- CWaC Council to survey Northwich town centre highway gully drains in the affected areas to confirm discharge points, identify blockages and any sections in poor repair;
- UU to review condition, including flood resilience, of all telemetry systems, sensors and water sensitive equipment;
- Environment Agency to extend the current flood warning area at Weaver Navigation at Winsford to cover Lakeside Caravan Park and owners to sign up to flood warnings/alerts;
- RMAs to review collective incidence response plan, lines of communication and availability during severe flood events;
- RMAs to review response plan during severe flooding to maintain good lines of communication with affected property owners and businesses. For example, coordinating delivery of sandbags and disseminating information;
- All RMAs to review response plan for more vulnerable residents, for example at the Weaver residential home, to ensure specific residents needs are considered during flood response;
- North Quay marina residents to be advised about the risks during flood events and the reasons why they may be asked to evacuate, which include for their own safety and the safety of emergency responders;
- Given the nature of CRT's assets, which potentially affect flood risk in the Northwich area, review how CRT is integrated within current emergency response;
- In Northwich town centre, outfalls with flap valves should be inspected and where not present, flap valves added to outfalls by respective owners.

Some post event actions have already been undertaken. A seal has been installed between Dane bridge and the flood wall, as well as repair to the area of minor seepage through the wall. All the cladding in the area where seepage was observed was taken off so the wall could be inspected, and it was confirmed that all defects were addressed. Additionally, at Sandy Lane, two members of the community have been nominated to lead the flood action group and have been leading liaison with the RMAs. Dual level instruments for the pumps at Dock Road PS have been installed so that if one should fail, the other one provides dual validation and resilience. The levels of the instruments at Dock Road PS have been raised to prevent flood damage. Further comments to the alarm telemetry system for both the Dock Road PS and Barons Quay PS have been added so they are monitored more intensively with enhanced instruction on specific events.

A full Section 19 investigation report will follow the Interim Report and will include a strategic overview of the RMA response, flooding mechanisms, flood infrastructure performance and a full list of recommended actions. This full investigation report is scheduled to be produced by end of 2020, for publication early 2021.

Bibliography

1M DTM LiDAR Data, Main River Map, Flood Zone Definitions, Flood Risk Map, Surface Water Flood Risk Map – Environment Agency, Open Source, 2020.

Flood Defences Location Plan, Rain and River Gauge Data, Water Situation Report October 2019, Flooded Properties Location Plan- Environment Agency, 2019.

Soil Type Characteristics and Map - National Water Council, 1981.

Navigable Waterway Maps - Canal and River Trust, Open Source, 2020.

Surface Water Flood Map – Northwich Town Centre, Pumping Station Location Plan, Outfall Location Plan, Baron’s Quay Pumping Station Arrangement, Dock Road Pumping Station Arrangement - United Utilities, 2020.

CWaC Highway Gully Location Plan – Cheshire West and Chester Council, 2020.

Waitrose Drainage Plans – Healey Consulting, 2013.

Monthly Rainfall across England and Wales, UKPP Radar Data – Met Office, 2019.

Rainfall totals 9am 24 Oct to 9am 27 Oct 2019, October Rainfall 2019 Report – Met Office, 2019.

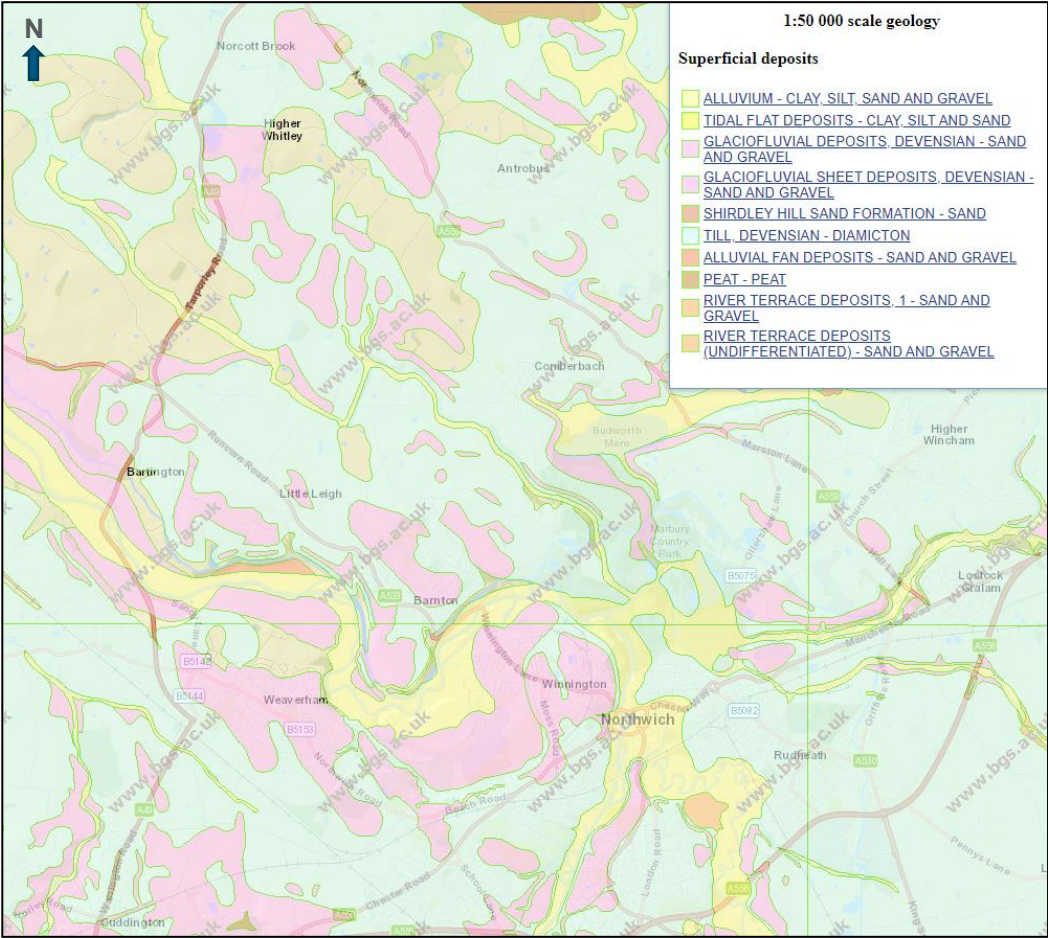
Groundwater levels data – Flood Assist, 2020.

Appendices



Appendix A. Geology and Soils Maps

A.1. Superficial Deposits Map



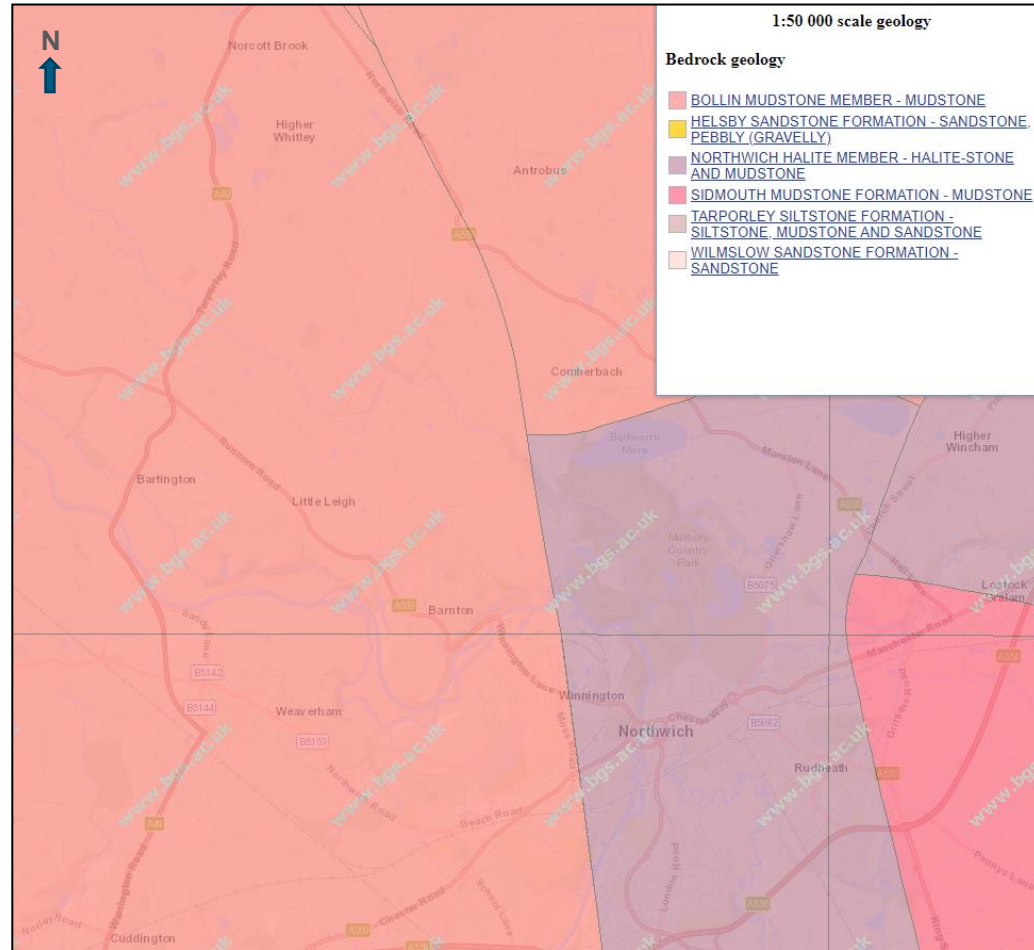
Source: GeolIndex Onshore Data Sources (www.bgs.co.uk)

A.2. Parent Material



Source: GeoIndex Onshore Data Sources (www.bgs.co.uk)

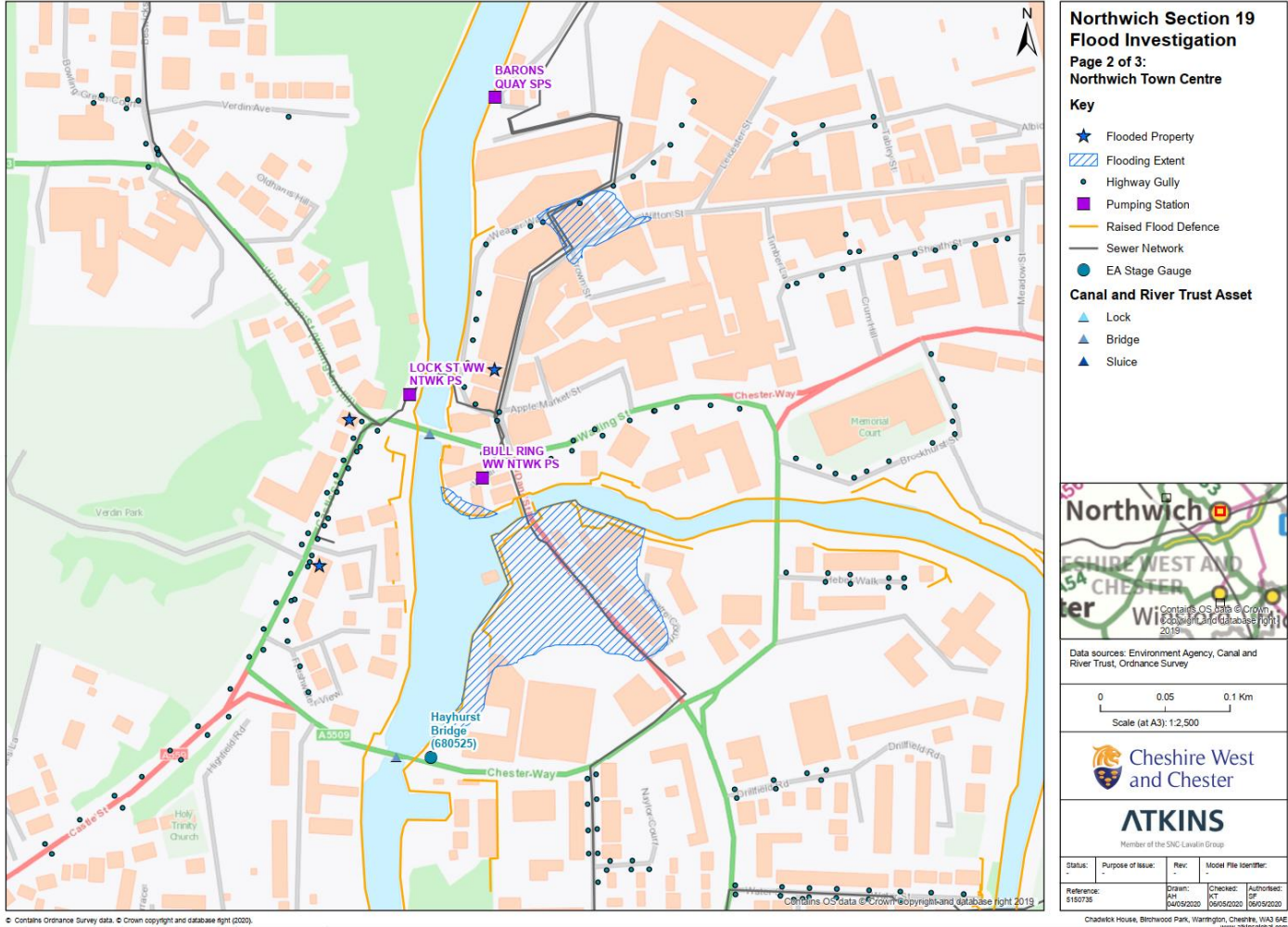
A.3. Bedrock Map



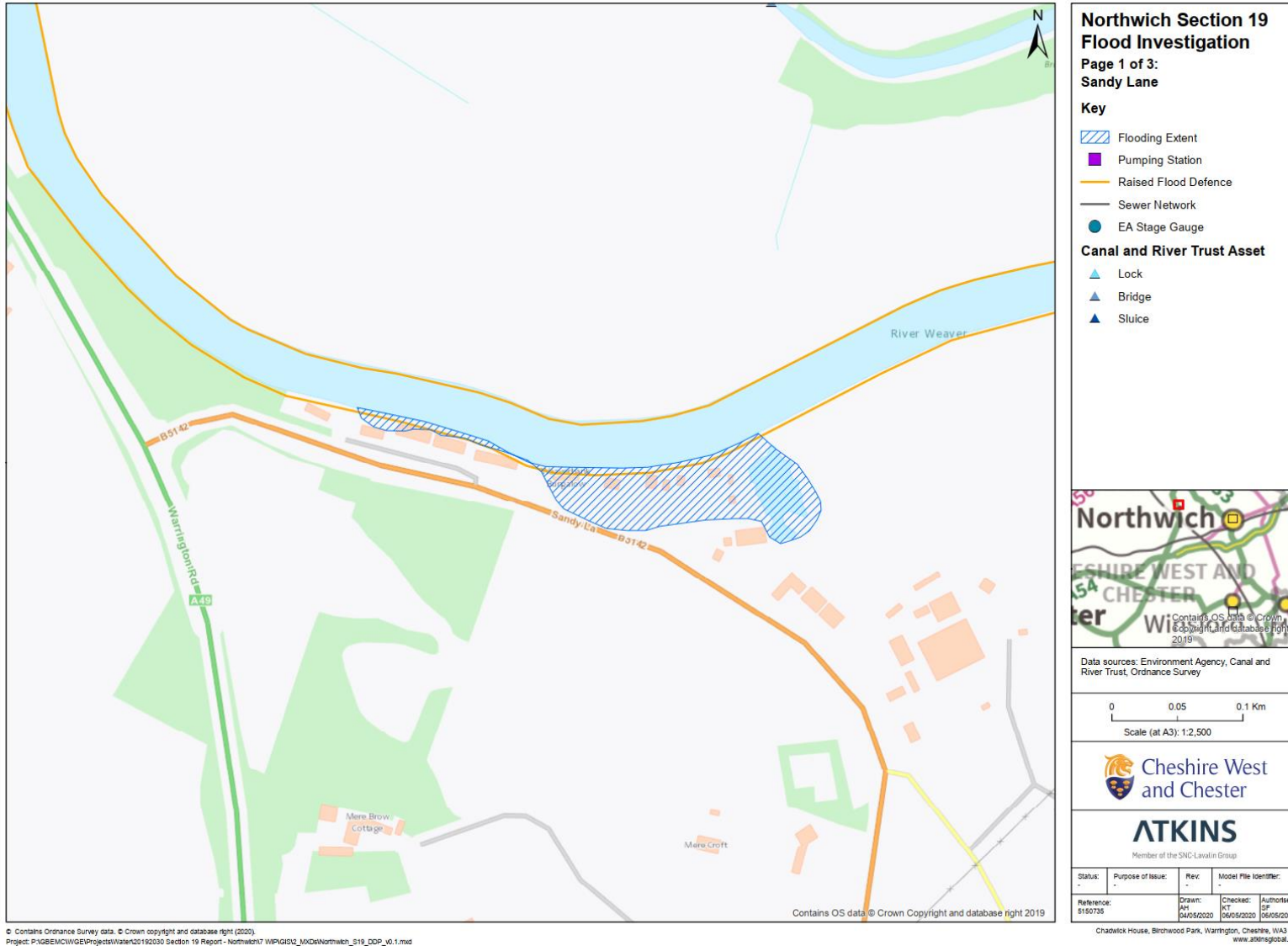
Source: GeolIndex Onshore Data Sources (www.bgs.co.uk)

Appendix B. Flood Outline Maps

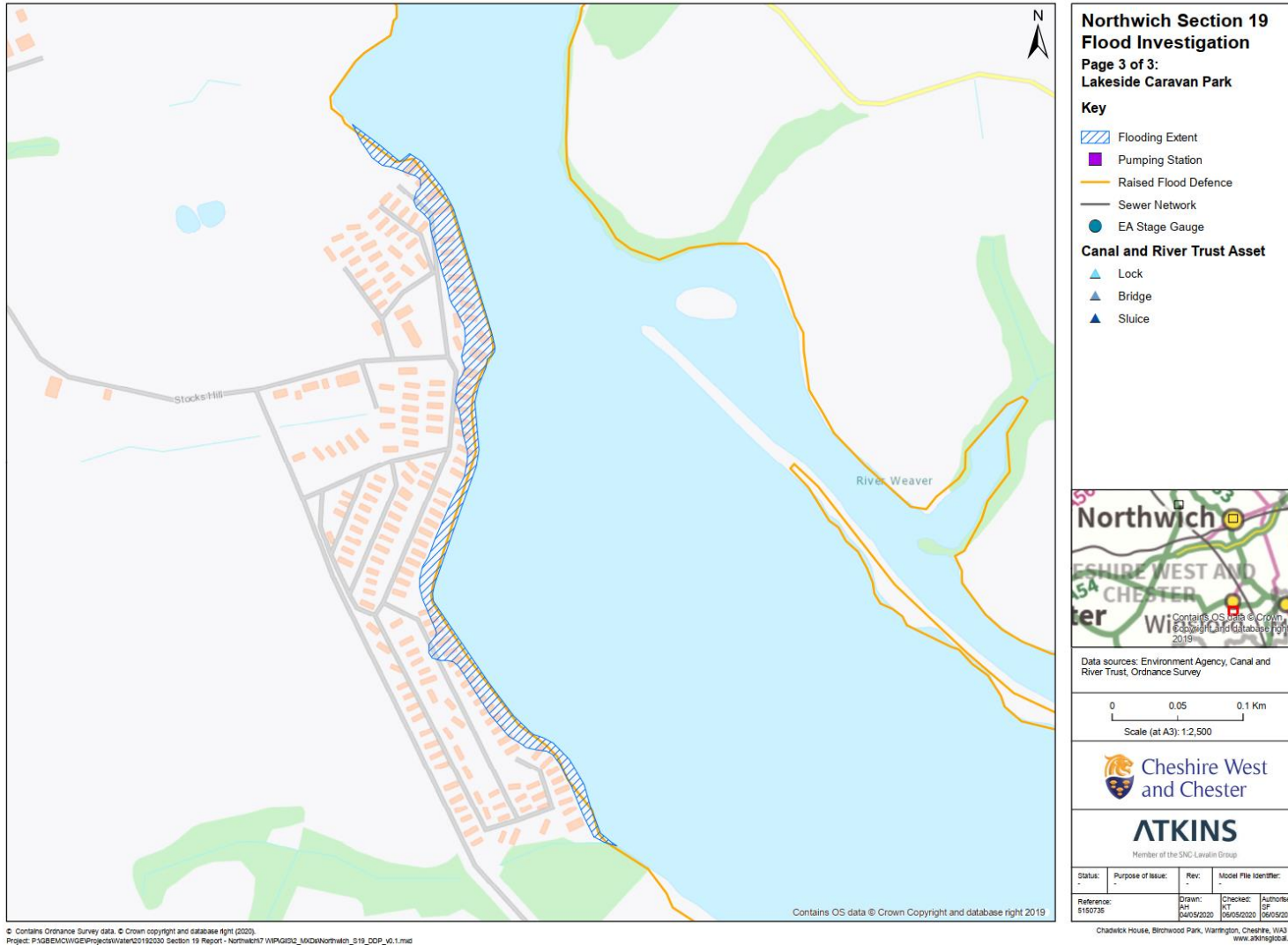
B.1. Flood Outline Map - Northwich Town Centre



B.2. Flood Outline Map - Sandy Lane Acton Bridge Area



B.3. Flood Outline Map - Lakeside Caravan Park Winsford Area



Appendix C. Detailed Timeline

© SNC-Lavalin except where stated otherwise

| | | | | | | Flood Warnings | |
|------------------|--------------|---|----|--|---|-------------------|--|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warning | Name |
| 24/10/2019 12:00 | | | | | | | |
| 25/10/2019 12:00 | | | | | | | |
| 25/10/2019 19:30 | | | | | Winnington sluices starts to open, reacting to increasing flow. | | |
| 25/10/2019 20:20 | | | | | Hunts sluices starts to open, reacting to increasing flow. | | |
| 25/10/2019 20:40 | | | | | Vale Royal starts to open reacting to increasing flow. | | |
| 25/10/2019 21:50 | | | | | Dutton sluices start to open reacting to increasing flow. | | |
| 25/10/2019 22:00 | Sandy Lane | | | Flood warning issued to Sandy Lane residents | | | |
| 26/10/2019 01:50 | Dock Road PS | WW process high level alarm received for Dock Road PS | | | | | |
| 26/10/2019 04:45 | | | | | Barnton sluice start to open reacting to increasing flow. High alarm raised at Winnington (10.33mAOD), acknowledged at 04:47. | | |
| 26/10/2019 05:15 | Sandy Lane | | | Water continued to rise around Sandy Lane | | | |
| 26/10/2019 07:37 | | | | | | Alert | Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich |
| 26/10/2019 07:40 | | | | | | Alert | The River Dee Catchment in England from Whitchurch to Chester |
| 26/10/2019 09:10 | | | | | High high alarm raised at Winnington (10.48mAOD) acknowledged at 09:12 | | |
| 26/10/2019 09:30 | | | | | Winnington sluices fully open. Barnton Sluice above water level and tracks level. | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 24/10/2019 12:00 | 13.664 | 4.871 | 10.037 | 16.927 | | | | | | |
| 25/10/2019 12:00 | 13.651 | 4.864 | 10.008 | 16.903 | | | | | | |
| 25/10/2019 19:30 | 13.824 | 5.095 | 10.035 | 17.788 | 10.08 | 10.08 | 12.77 | 16.33 | | |
| 25/10/2019 20:20 | | | | | | | | | | |
| 25/10/2019 20:40 | | | | | | | | | | |
| 25/10/2019 21:50 | | | | | | | | | | |
| 25/10/2019 22:00 | 14.003 | 5.072 | 10.16 | 18.282 | | | | | | |
| 26/10/2019 01:50 | | | | | | | | | | |
| 26/10/2019 04:45 | 14.915 | 5.26 | 10.446 | 19.007 | | | | | | |
| 26/10/2019 05:15 | 15.004 | 5.246 | 10.467 | 19.038 | 10.54 | 10.54 | 13.67 | 16.39 | | |
| 26/10/2019 07:37 | | | | | | | | | | |
| 26/10/2019 07:40 | | | | | | | | | | |
| 26/10/2019 09:10 | | | | | | | | | | |
| 26/10/2019 09:30 | 15.955 | 5.396 | 10.754 | 19.4 | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 24/10/2019 12:00 | | | | | | | | | |
| 25/10/2019 12:00 | | | | | | | | | |
| 25/10/2019 19:30 | 19.2 | 0 | 88.1 | 0 | 0 | 30.7 | 0 | 0 | 7.89 |
| 25/10/2019 20:20 | | | | | | | | | |
| 25/10/2019 20:40 | | | | | | | | | |
| 25/10/2019 21:50 | | | | | | | | | |
| 25/10/2019 22:00 | | | | | | | | | |
| 26/10/2019 01:50 | | | | | | | | | |
| 26/10/2019 04:45 | | | | | | | | | |
| 26/10/2019 05:15 | 89.4 | 0 | 146.3 | 0 | 0 | 89.5 | 0 | 0 | 7.78 |
| 26/10/2019 07:37 | | | | | | | | | |
| 26/10/2019 07:40 | | | | | | | | | |
| 26/10/2019 09:10 | | | | | | | | | |
| 26/10/2019 09:30 | | | | | | | | | |

| | | | | | | Flood Warnings | |
|------------------|------------|----|---|-------------------------------|---|-----------------------|--|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warnin g | Name |
| 26/10/2019 10:00 | | | Phase 1 of flood defences mostly in place. One section open to allow foot traffic on the marina | | | | |
| 26/10/2019 10:27 | | | | | | Alert | River Gowy catchment including areas around Frodsham |
| 26/10/2019 10:30 | | | | | Hayhurst level reached 10.95mAOD. From EA data this is when minor flooding is possible. | | |
| 26/10/2019 11:23 | | | | | | Warnin g | Weaver Navigation at Winsford |
| 26/10/2019 12:00 | Waitrose | | Water started collecting on London Road south of Dane Bridge at Waitrose entrance. | | | | |
| 26/10/2019 13:30 | | | | | Saltersford sluice fully open. | | |
| 26/10/2019 14:30 | Waitrose | | Dry side ponding in Waitrose car park. Ponding on London Road was severe, deep and spreading. River level readings was 1.61m at Hayhurst Bridge and 3.64m at Rudheath | | | | |
| 26/10/2019 15:30 | | | | | | Warnin g | River Weaver at Anderton |
| 26/10/2019 16:00 | | | Water level started to rise in Marina and at Dane Bridge. EA advised marina residents to get out or stay put. Phase 1 closed completely. | | | | |
| 26/10/2019 17:00 | | | EA Site Controller spoke to FIDO advising to contact UU to discuss their assets on site and get an Engineer to attend and confirm systems are operational. Further requested Police to escalate a call to UU for the same reason. | | | | |
| | | | | | Vale Royal fully open, upstream level still at desired level but now starts to climb. | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 26/10/2019 10:00 | 16.094 | 5.456 | 10.815 | 19.453 | | | | | | |
| 26/10/2019 10:27 | | | | | | | | | | |
| 26/10/2019 10:30 | 16.262 | 5.558 | 10.858 | 19.496 | 10.95 | 10.95 | 14.34 | 16.39 | 6.16 | 10.45 |
| 26/10/2019 11:23 | | | | | | | | | | |
| 26/10/2019 12:00 | 16.638 | 5.824 | 10.919 | 19.643 | 11 | 11 | 14.57 | 16.39 | 7.83 | 10.31 |
| 26/10/2019 13:30 | 16.801 | 5.99 | 10.939 | 19.878 | 11 | 11 | 14.79 | 16.39 | 9.62 | 10.18 |
| 26/10/2019 14:30 | 16.855 | 6.034 | 10.99 | 20.059 | | | | | | |
| 26/10/2019 15:30 | 16.901 | 6.043 | 11.085 | 20.285 | | | | | | |
| 26/10/2019 16:00 | 16.935 | 6.048 | 11.118 | 20.394 | | | | | | |
| 26/10/2019 17:00 | 17.022 | 6.066 | 11.198 | 20.477 | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 26/10/2019 10:00 | | | | | | | | | |
| 26/10/2019 10:27 | | | | | | | | | |
| 26/10/2019 10:30 | 89.5 | 0 | 312.6 | 0 | 0 | 89.5 | 0 | 0 | 7.78 |
| 26/10/2019 11:23 | | | | | | | | | |
| 26/10/2019 12:00 | 89.5 | 0 | 357.9 | 0 | 0 | 150.8 | 0 | 0 | 7.91 |
| 26/10/2019 13:30 | 89.4 | 0 | 357.9 | 0 | 0 | 305.5 | 0 | 0 | 7.9 |
| 26/10/2019 14:30 | | | | | | | | | |
| 26/10/2019 15:30 | | | | | | | | | |
| 26/10/2019 16:00 | | | | | | | | | |
| 26/10/2019 17:00 | | | | | | | | | |

| | | | | | | Flood Warnings | |
|------------------|-----------------------|----|--|--|-----|--|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warning | Name |
| 26/10/2019 17:14 | | | | | | | |
| 26/10/2019 17:30 | | | Flood depths in Waitrose car park 0.5m higher than river level | | | | |
| 26/10/2019 18:00 | Lakeside Caravan Park | | | Water starting to get noticeably higher at the downstream end of the park – Caravan No. 35. Electric was lost for that caravan | | | |
| 26/10/2019 18:00 | Sandy Lane | | | Water level couple inches below deck level - boats loosened as a precaution | | | |
| 26/10/2019 18:15 | Waitrose | | Significant ponding dry side Waitrose | | | | |
| 26/10/2019 18:27 | | | | | | | |
| 26/10/2019 18:27 | | | | | | High high alarm raised at Vale Royal (16.785mAOD) acknowledged at 18:28. | |
| 26/10/2019 18:30 | Lakeside Caravan Park | | | Were informed all sluice gates were open | | Available sluices at Hunts Fully Open, upstream level still at desired level but now starts to climb. | |
| 26/10/2019 19:00 | Lakeside Caravan Park | | | Water reached lighting columns and tripped the electric for the park. | | Level upstream of Vale Royal goes beyond the instruments current range 17.00mAOD | |
| 26/10/2019 19:05 | Bullring | | Seepage through flood wall at Bullring | | | | |
| 26/10/2019 19:30 | | | Phase 2 defences set up. | | | | |
| 26/10/2019 19:50 | | | | | | Available sluices at Dutton Fully Open, upstream level still at desired level but now starts to climb. | |
| 26/10/2019 20:15 | London Rd | | London road flooded | | | | |
| 26/10/2019 20:30 | Weaver Court | | Water 6m from line of barrier in car park. River Dane is 400mm from flowing out of bank. | | | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 26/10/2019 17:14 | | | | | | | | | | |
| 26/10/2019 17:30 | 17.068 | 6.076 | 11.238 | 20.498 | | | | | | |
| 26/10/2019 18:00 | 17.115 | 6.089 | 11.301 | 20.524 | 11 | 11 | 16 | 16.71 | 9.61 | 10.34 |
| 26/10/2019 18:00 | 17.115 | 6.089 | 11.301 | 20.524 | 11 | 11 | 16 | 16.71 | 9.61 | 10.34 |
| 26/10/2019 18:15 | 17.137 | 6.098 | 11.337 | 20.527 | | | | | | |
| 26/10/2019 18:27 | | | | | | | | | | |
| 26/10/2019 18:30 | 17.156 | 6.104 | 11.358 | 20.54 | | | | | | |
| 26/10/2019 19:00 | 17.186 | 6.122 | 11.416 | 20.545 | | | | | | |
| 26/10/2019 19:05 | | | | | | | | | | |
| 26/10/2019 19:30 | 17.21 | 6.148 | 11.479 | 20.55 | 11 | 11 | 16 | 17 | 9.61 | 10.45 |
| 26/10/2019 19:50 | | | | | | | | | | |
| 26/10/2019 20:15 | 17.232 | 6.197 | 11.55 | 20.548 | 11 | 11 | 16 | 17 | 9.61 | 10.5 |
| 26/10/2019 20:30 | 17.238 | 6.21 | 11.584 | 20.547 | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 26/10/2019 17:14 | | | | | | | | | |
| 26/10/2019 17:30 | | | | | | | | | |
| 26/10/2019 18:00 | 151 | 0 | 358 | 0 | 0 | 367.4 | 0 | 0 | 7.83 |
| 26/10/2019 18:00 | 151 | 0 | 358 | 0 | 0 | 367.4 | 0 | 0 | 7.83 |
| 26/10/2019 18:15 | | | | | | | | | |
| 26/10/2019 18:27 | | | | | | | | | |
| 26/10/2019 18:30 | | | | | | | | | |
| 26/10/2019 19:00 | | | | | | | | | |
| 26/10/2019 19:05 | | | | | | | | | |
| 26/10/2019 19:30 | 250.7 | 0 | 358.1 | 0 | 0 | 367.5 | 0 | 0 | 7.91 |
| 26/10/2019 19:50 | | | | | | | | | |
| 26/10/2019 20:15 | 358.6 | 0 | 358.1 | 0 | 0 | 367.5 | 0 | 0 | 7.95 |
| 26/10/2019 20:30 | | | | | | | | | |

| | | | | | | Flood Warnings | |
|------------------|-----------------------|----|---|---|---|----------------|--|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/Warning | Name |
| 26/10/2019 21:00 | Sandy Lane | | | Water over decking – Using wellies to go into the water to loosen the boats more. | | | |
| 26/10/2019 21:00 | Lakeside Caravan Park | | | Power back on after going to the substation to restart it. Stayed on for 1 hour before tripping again. Was rising roughly taking 2 foot of land every 10 minutes. Tracked using rocks at water level. | | | |
| 26/10/2019 21:00 | Waitrose | | Phase 2 not completed in car park due to risk of submerged electrical boxes. Water level 0.6m - 0.7m in Waitrose car park. Marina entrance flood gate 1.2m. | | | | |
| 26/10/2019 21:17 | | | | | High alarm raised at Dutton (7.95mAOD) acknowledged at 17:18 | | |
| 26/10/2019 21:43 | Waitrose | | Waitrose car park flooded | | | | |
| 26/10/2019 22:16 | | | | | | Warning | River Weaver at Pickerings Bridge |
| 26/10/2019 22:21 | | | | | | Warning | River Weaver at Acton Bridge and Weaverham |
| 26/10/2019 22:21 | | | | | | Warning | Weaver Navigation at Sutton Dock |
| 26/10/2019 22:36 | | | | | High high alarm raised at Dutton (8.16mAOD) acknowledged at 22:27 | | |
| 26/10/2019 22:30 | Lakeside Caravan Park | | | Still rising Water ingress to caravans | | | |
| 26/10/2019 22:34 | | | | | Mains failure at Dutton | | |
| 26/10/2019 22:45 | | | Water observed to be seeping rapidly. Water moves faster into the Bullring. River level at soffit of bridge beam. | | | | |
| 26/10/2019 23:15 | | | Bridge deck overtops. Phase 2 in place. | | | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 26/10/2019 21:00 | 17.25 | 6.226 | 11.648 | 20.543 | 11 | 11 | 16 | 17 | 9.61 | 10.55 |
| 26/10/2019 21:00 | 17.25 | 6.226 | 11.648 | 20.543 | 11 | 11 | 16 | 17 | 9.61 | 10.55 |
| 26/10/2019 21:00 | 17.25 | 6.226 | 11.648 | 20.543 | 11 | 11 | 16 | 17 | 9.61 | 10.55 |
| 26/10/2019 21:17 | | | | | | | | | | |
| 26/10/2019 21:43 | | | | | | | | | | |
| 26/10/2019 22:16 | | | | | | | | | | |
| 26/10/2019 22:21 | | | | | | | | | | |
| 26/10/2019 22:21 | | | | | | | | | | |
| 26/10/2019 22:36 | | | | | | | | | | |
| 26/10/2019 22:30 | 17.274 | 6.344 | 11.8 | 20.528 | 11 | 11 | 16 | 17 | 9.61 | 10.65 |
| 26/10/2019 22:34 | | | | | | | | | | |
| 26/10/2019 22:45 | 17.279 | 6.375 | 11.833 | 20.521 | | | | | | |
| 26/10/2019 23:15 | 17.286 | 6.436 | 11.872 | 20.515 | 11 | 11 | 16 | 17 | 9.61 | 10.69 |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 26/10/2019 21:00 | 358.7 | 0 | 358.1 | 0 | 0 | 367.5 | 0 | 0 | 8.03 |
| 26/10/2019 21:00 | 358.7 | 0 | 358.1 | 0 | 0 | 367.5 | 0 | 0 | 8.03 |
| 26/10/2019 21:00 | 358.7 | 0 | 358.1 | 0 | 0 | 367.5 | 0 | 0 | 8.03 |
| 26/10/2019 21:17 | | | | | | | | | |
| 26/10/2019 21:43 | | | | | | | | | |
| 26/10/2019 22:16 | | | | | | | | | |
| 26/10/2019 22:21 | | | | | | | | | |
| 26/10/2019 22:21 | | | | | | | | | |
| 26/10/2019 22:36 | | | | | | | | | |
| 26/10/2019 22:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.17 |
| 26/10/2019 22:34 | | | | | | | | | |
| 26/10/2019 22:45 | | | | | | | | | |
| 26/10/2019 23:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.27 |

| | | | | | | Flood Warnings | |
|------------------|--------------|--|---|---|--|-------------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warning | Name |
| 26/10/2019 23:30 | | | Water bubbling up on building side of defence at Weaver Court and Waitrose car park drains, gulleys, tarmac and concrete. | | | | |
| 27/10/2019 01:08 | Baron's Quay | | Baron's quay dry side flooding (Odeon) | | | | |
| 27/10/2019 01:53 | Bridge | | Water still on bridge deck, 100mm | | | | |
| 27/10/2019 02:00 | Sandy Lane | | | Boats floating on to mooring. Flooding into property upstream | | | |
| 27/10/2019 02:45 | | | Fire Brigade rescue 4 ladies from CareHome | | | | |
| 27/10/2019 03:26 | | | Evacuation of marina | | | | |
| 27/10/2019 03:30 | Sandy Lane | | | Observed peak height of water | | | |
| 27/10/2019 05:15 | | | | | From EA Data Winnington Pound reaches maximum height of 12.28mAOD. Highest ever water level on EA records. | | |
| 27/10/2019 06:51 | Bullring PS | WW Network Non Infrastructure standby received high level alarm for Bull Ring PS. Dispatched to engineer- all pumps operational but high level remained, escalated to manager | | | | | |
| 27/10/2019 07:30 | | | | | Mains returns to normal | | |
| 27/10/2019 09:00 | Waitrose | Ww Network Infrastructure standby were notified on the morning of Sunday 27th to investigate reports of foul flooding in the Waitrose car park on London Road. SLA of 2 days provided, EA escalated for in day response. | | | | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 26/10/2019 23:30 | 17.291 | 6.471 | 11.904 | 20.506 | | | | | | |
| 27/10/2019 01:08 | | | | | | | | | | |
| 27/10/2019 01:53 | | | | | | | | | | |
| 27/10/2019 02:00 | 17.315 | 6.601 | 12.106 | 20.416 | | | | | | |
| 27/10/2019 02:45 | 17.318 | 6.608 | 12.118 | 20.376 | | | | | | |
| 27/10/2019 03:26 | | | | | | | | | | |
| 27/10/2019 03:30 | 17.318 | 6.616 | 12.151 | 20.34 | | | | | | |
| 27/10/2019 05:15 | 17.292 | 6.625 | 12.151 | 20.254 | | | 16 | 17 | 9.61 | 10.89 |
| 27/10/2019 06:51 | | | | | | | | | | |
| 27/10/2019 07:30 | 17.224 | 6.633 | 12.053 | 20.133 | 11 | 11 | 16 | 17 | 9.61 | 10.87 |
| 27/10/2019 09:00 | 17.168 | 6.637 | 12.015 | 20.045 | 11 | 11 | 16 | 17 | 9.62 | 10.83 |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 26/10/2019 23:30 | | | | | | | | | |
| 27/10/2019 01:08 | | | | | | | | | |
| 27/10/2019 01:53 | | | | | | | | | |
| 27/10/2019 02:00 | | | | | | | | | |
| 27/10/2019 02:45 | | | | | | | | | |
| 27/10/2019 03:26 | | | | | | | | | |
| 27/10/2019 03:30 | | | | | | | | | |
| 27/10/2019 05:15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.52 |
| 27/10/2019 06:51 | | | | | | | | | |
| 27/10/2019 07:30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8.53 |
| 27/10/2019 09:00 | 358.7 | 0 | 356.3 | 0 | 0 | 366.9 | 21.8 | 0 | 8.53 |

| | | | | | | Flood Warnings | |
|------------------|-----------------|----|--|-------------------------------|--|-------------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warning | Name |
| 27/10/2019 09:00 | Dock Road PS | | EA representative - Dock Road PS quiet and not working, no UU staff | | | | |
| 27/10/2019 09:44 | | | | | Level upstream of Dutton reaches maximum level of 8.53mAOD | | |
| 27/10/2019 10:50 | | | FIDO contacted UU emergency number | | | | |
| 27/10/2019 11:00 | High St | | Vision express, U Mobile High st flooding | | | | |
| 27/10/2019 11:10 | | | Contacted UU | | | | |
| 27/10/2019 11:20 | | | FIDO escalated UU response via UU representatives. | | | | |
| 27/10/2019 12:00 | | | One small section of the demountables were removed to allow gravity discharge from Waitrose car park due to the river level being lower than the water held in the car park. This combined with the use of a pump saw a decrease in water levels in Waitrose adjacent to the opening over the course of 3-4 hours. The majority of the car park and London Road was still under water after this time. | | | | |
| 27/10/2019 12:51 | | | Water released from dry side to river | | | | |
| 27/10/2019 12:53 | Waitrose | | Water behind defences still | | | | |
| 27/10/2019 13:30 | | | FIDO contacted UU engineer who said they would be on site within the hour. | | Level upstream of Vale Royal comes back into instrument range and continues to drop. | | |
| 27/10/2019 14:00 | Sandy Lane | | | Water starting to recede | | | |
| 27/10/2019 14:00 | Waitrose | | Water still behind defences | | | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 27/10/2019 09:00 | 17.168 | 6.637 | 12.015 | 20.045 | 11 | 11 | 16 | 17 | 9.62 | 10.83 |
| 27/10/2019 09:44 | | | | | | | | | | |
| 27/10/2019 10:50 | | | | | | | | | | |
| 27/10/2019 11:00 | 17.085 | 6.63 | 11.828 | 19.94 | | | | | | |
| 27/10/2019 11:10 | | | | | | | | | | |
| 27/10/2019 11:20 | | | | | | | | | | |
| 27/10/2019 12:00 | | | | | | | | | | |
| 27/10/2019 12:51 | | | | | | | | | | |
| 27/10/2019 12:53 | | | | | | | | | | |
| 27/10/2019 13:30 | 16.966 | 6.627 | 11.689 | 19.811 | 11 | 11 | 16 | 17 | 9.59 | 10.66 |
| 27/10/2019 14:00 | 16.938 | 6.606 | 11.663 | 19.786 | | | | | | |
| 27/10/2019 14:00 | 16.938 | 6.606 | 11.663 | 19.786 | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 27/10/2019 09:00 | 358.7 | 0 | 356.3 | 0 | 0 | 366.9 | 21.8 | 0 | 8.53 |
| 27/10/2019 09:44 | | | | | | | | | |
| 27/10/2019 10:50 | | | | | | | | | |
| 27/10/2019 11:00 | | | | | | | | | |
| 27/10/2019 11:10 | | | | | | | | | |
| 27/10/2019 11:20 | | | | | | | | | |
| 27/10/2019 12:00 | | | | | | | | | |
| 27/10/2019 12:51 | | | | | | | | | |
| 27/10/2019 12:53 | | | | | | | | | |
| 27/10/2019 13:30 | 357.8 | 0 | 356.5 | 0 | 0 | 366.5 | 21.9 | 0 | 8.42 |
| 27/10/2019 14:00 | | | | | | | | | |
| 27/10/2019 14:00 | | | | | | | | | |

| | | | | | | Flood Warnings | |
|------------------|------------|---|---|-------------------------------|-----|----------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/Warning | Name |
| 27/10/2019 14:40 | Waitrose | <p>Network technician attended Waitrose car park at 14:40 and found the network to be surcharged down to the last in line pumping station, Dock Road. Technician believed no pumps were running due to the stagnant network, surcharged wells and lack of any noise from pumps. Arrived to find 4 premises to potentially have internally flooded - deep flood water meant that this was not fully investigated immediately.</p> <p>Discovering that Mh8615, Mh8618 and Mh7209 were surcharged, including the CSO Mh were surcharged, a process controller was called out to check on Dock Road PS.</p> <p>Witnessed Weaver Navigation in extremely high flow and no pollution visible.</p> | | | | | |
| 27/10/2019 14:51 | | | UU arrive on site. | | | | |
| 27/10/2019 15:00 | | | At tactical command group, EA representative had contact with Joint UU duty manager | | | | |
| 27/10/2019 15:30 | | | EA representative contacted UU duty manager. Informed surface water management is by them. It was indicated there may be an issue with the pumping station. | | | | |

| | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| Date / Time | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 27/10/2019 14:40 | | | | | | | | | | |
| 27/10/2019 14:51 | | | | | | | | | | |
| 27/10/2019 15:00 | | | | | | | | | | |
| 27/10/2019 15:30 | | | | | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 27/10/2019 14:40 | | | | | | | | | |
| 27/10/2019 14:51 | | | | | | | | | |
| 27/10/2019 15:00 | | | | | | | | | |
| 27/10/2019 15:30 | | | | | | | | | |

| | | | | | | Flood Warnings | |
|------------------|--------------|---|---|-------------------------------|-----|----------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/Warning | Name |
| 27/10/2019 16:00 | Dock Road PS | Process standby called to Dock Road to assist network. 2 pumps were found to be operational. Found Pump 4 was not running on arrival. Pump restarted in manual whilst repairs were made to flooded ultrasonic level instrument. | | | | | |
| 27/10/2019 17:00 | | | UU engineer confirmed to site controller that the pumps weren't working. Showing no issues apart from a penstock issue. UU engineer focussed on the network infrastructure not process with regards to the last in lines. | | | | |
| 27/10/2019 17:47 | Dock Road PS | Job raised by process site controller for further technical support. | | | | | |
| 27/10/2019 18:01 | Dock Road PS | 3rd pump turned on in manual | | | | | |
| 27/10/2019 18:05 | Waitrose | Network technician was informed that Dock Road was fully operational at 6.05pm and on site teams witnessed flood levels begin to drop at Waitrose car park. | | | | | |
| 27/10/2019 18:10 | | By 18:10, process operatives managed to restore flow in the pump not passing flow forward. | Pumps advised as operational, they had malfunctioned and since been repaired. | | | | |
| 27/10/2019 19:00 | Waitrose | | One pump had malfunctioned and was repaired and turned on at 19:00. It was observed that within 30 mins, the area of inundation with water on London Road was reduced. The majority of the water was cleared by 21:00. | | | | |
| 27/10/2019 21:00 | Waitrose | | Water for the most part gone | | | | |

| Date / Time | River Level Gauge Data | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|
| | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 27/10/2019 16:00 | 16.813 | 6.502 | 11.474 | 19.684 | | | | | | |
| 27/10/2019 17:00 | 16.713 | 6.447 | 11.416 | 19.628 | | | | | | |
| 27/10/2019 17:47 | | | | | | | | | | |
| 27/10/2019 18:01 | | | | | | | | | | |
| 27/10/2019 18:05 | | | | | | | | | | |
| 27/10/2019 18:10 | | | | | | | | | | |
| 27/10/2019 19:00 | 16.455 | 6.33 | 11.263 | 19.516 | | | | | | |
| 27/10/2019 21:00 | 16.201 | 6.216 | 11.068 | 19.413 | 11 | 11 | 16 | 16.53 | 9.6 | 10.27 |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 27/10/2019 16:00 | | | | | | | | | |
| 27/10/2019 17:00 | | | | | | | | | |
| 27/10/2019 17:47 | | | | | | | | | |
| 27/10/2019 18:01 | | | | | | | | | |
| 27/10/2019 18:05 | | | | | | | | | |
| 27/10/2019 18:10 | | | | | | | | | |
| 27/10/2019 19:00 | | | | | | | | | |
| 27/10/2019 21:00 | 359.1 | 0 | 357.4 | 0 | 0 | 367.4 | 22.3 | 0 | 7.82 |

| | | | | | | Flood Warnings | |
|------------------|--------------|---|----|-------------------------------|-----|-----------------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/ Warnin g | Name |
| 27/10/2019 23:00 | Waitrose | Levels remained high in wet well until approximately 11pm 2x road sweepers sourced by UU at 19:30 and on site at 21:30, assisting in clearing blocked highways gullies that aided in receding flood water. Throughout this period the small drain towards the corner of the carpark continued to allow the ingress of river flow to continue flooding the car park. | | | | | |
| 27/10/2019 23:16 | Dock Road PS | Job closed down. Comments as follows: Pumped Wells down and cleaned heads and emptied junction boxes of water ingress. Monitored until healthy levels and watched auto working correctly. left working correctly. Process operatives job was closed at 23:15 but network operatives didn't leave London Road until approx 01:30 - 01:40 by the time the clean up around bridge was completed and signed paperworks for sweepers checked EA were happy ETC. | | | | | |
| 28/10/2019 00:00 | | | | | | | |

| | River Level Gauge Data | | | | | | | | | | |
|------------------|------------------------|---|---------------------------------|--------------------------|--|--|--|--|---|---|--|
| Date / Time | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) | |
| 27/10/2019 23:00 | 15.966 | 6.123 | 10.904 | 19.328 | | | | | | | |
| 27/10/2019 23:16 | | | | | | | | | | | |
| 28/10/2019 00:00 | 15.872 | 6.094 | 10.789 | 19.29 | 10.91 | 10.92 | 16 | 16.29 | 9.6 | 10.06 | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 27/10/2019 23:00 | | | | | | | | | |
| 27/10/2019 23:16 | | | | | | | | | |
| 28/10/2019 00:00 | 234.3 | 0 | 352 | 0 | 0 | 367.6 | 0 | 0 | 7.63 |

| | | | | | | Flood Warnings | |
|------------------|------------|--|----|-------------------------------|-----|----------------|------|
| Date / Time | Flood Area | UU | EA | Residents and Property Owners | CRT | Alert/Warning | Name |
| 28/10/2019 01:40 | | Ww Network teams remained on site through to 1:40am on Monday 28th assisting the EA with clean up. During this time Cityflex suction was used to remove excess flood water. Following the suction, additional flooding continued to collect in the corner of the Waitrose carpark, this appeared to be coming from the Aeco drain and not UU assets. | | | | | |
| 29/10/2019 00:15 | | | | | | | |
| 30/10/2019 00:00 | | | | | | | |
| 30/10/2019 23:45 | | | | | | | |

| | River Level Gauge Data | | | | | | | | | |
|------------------|---------------------------|--|---------------------------------------|--------------------------------|--|--|--|--|---|---|
| Date / Time | Dane (Rudheath) (mAOD) | Weaver (Pickerings Cut) *Data not available in mAOD - data in m | Weaver (Hayhurst Bridge) (mAOD) | Weaver (Ashbrook) (mAOD) | Hayhurst Swing Bridge Upstream River Level 1 mAOD (All Data) (Value) | Hayhurst Swing Bridge Upstream River Level 2 mAOD (All Data) (Value) | Vale Royal Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Vale Royal Sluice Upstream Controlling Level mAOD (All Data) (Value) | Saltersford Sluice Sluice 1 Position (Height AOD) mAOD (All Data) (Value) | Saltersford Sluice Upstream Controlling Level mAOD (All Data) (Value) |
| 28/10/2019 01:40 | 15.655 | 5.937 | 10.647 | 19.217 | | | | | | |
| 29/10/2019 00:15 | 14.616 | 5.038 | 10.066 | 18.53 | | | | | | |
| 30/10/2019 00:00 | 14.102 | 4.901 | 10.081 | 17.999 | | | | | | |
| 30/10/2019 23:45 | 13.883 | 4.983 | 10.06 | 17.694 | | | | | | |

| CRT SCADA Data | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|---|
| Date / Time | Dutton Sluice Sluice 1 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 2 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 3 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 4 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 5 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 6 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 7 Open Height cm (All Data) (Value) | Dutton Sluice Sluice 8 Open Height cm (All Data) (Value) | Dutton Sluice Average River Level mAOD (All Data) (Value) |
| 28/10/2019 01:40 | | | | | | | | | |
| 29/10/2019 00:15 | | | | | | | | | |
| 30/10/2019 00:00 | | | | | | | | | |
| 30/10/2019 23:45 | | | | | | | | | |