Bolton Council
Flooding Investigation Report

Flooding at Riverside Drive and Smiths Road on 9th February 2020 - Storm Ciara

Bolton Council Flood Risk Management Office

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This Flood Investigation Report has been produced by Bolton Council as a Lead Local Flood Authority under Section 19 of the Flood and Water Management Act 2010

Revision History

Revision Ref	Amendments	Issued to:
1.0 Draft Report		Risk Management Authorities
2.0 Final Report	Clarifications by RMA's	Executive Cabinet Member

Copyright Acknowledgement

Executive Summary

This Flood Investigation Report has been completed by Bolton Council, the Lead Local Flood Authority (LLFA) under the duties of Section 19 of the Flood and Water Management Act (FWMA) to publish reports of flood investigations.

The aim of the investigation is to identify the community affected, to determine why the properties flooded, review responses during and post event and to recommend further action for each Risk Management Authority to consider going forward.

Storm Ciara was a powerful and long-lived extratropical cyclone that impacted the whole of the UK over 9th and 10th February 2020.

Flooding at Riverside Drive, Prestolee and Smiths Road occurred on 9th February 2020 at around 1.30 pm, the flooding resulted in the internal flooding of 25 properties and 5 businesses. At Riverside Drive the depth of the flooding was significant at around 1 metre depth in some properties.

Site visits have been made by the LLFA to determine the cause of flooding. The conclusion of the investigation is that flooding was due to significant rainfall across the River Irwell and River Croal catchments falling on saturated ground resulting in fluvial flooding from the Rivers Irwell and Croal.

The report recommends general and community specific actions to help reduce or mitigate the impact of future flooding within the area for each Risk Management Authority to consider. The delivery of these actions will be dependent on the authorities securing funding and other internal priorities. In addition, the authorities will continue to work together with the community affected to identify all potential options to reduce flood risk.

An Environment Agency project to protect the Prestolee community is currently being assessed. They are also investigating whether temporary defence measures can be put in place as an interim measure.

There are upland Natural Flood Management projects in place or in progress within the upstream catchments of the River's Croal and Irwell as an effort to slow the flow within the catchment as a whole.

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1. Introduction

Lead Local Flood Authority Investigation

Bolton Council as the Lead Local Flood Authority (LLFA) has a responsibility to investigate flood incidents and publish the results of its investigation as detailed within Section 19 of the Flood and Water Management Act 2010 (FWMA):

Section 19 Requirements

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.

This report provides a concise review of the duties and responsibilities of all risk management authorities involved, and an outline of their past or proposed actions, if any. It also makes recommendations for a possible way forward.

Bolton Council as the Lead Local Flood Authority (LLFA) has a policy to carry out investigations into flooding incidents and publish the results when 5 or more properties in the same location are flooded.

The LLFA will:

- Identify and explain the likely cause/s of flooding.
- Identify which authorities, communities and individuals have relevant flood risk management powers and responsibilities.
- Review the actions a Risk Management Authority undertook.
- Provide recommendations for each of those authorities, communities and individuals.
- Outline whether those authorities, communities or individuals have or will exercise their powers or responsibilities in response to the flooding incident.

The LLFA:

- Are not responsible for resolving the flooding issues or providing designed solutions.
- Cannot direct a Risk Management Authority to undertake any of the recommended actions.

2. Scope of the report

This Flood Investigation Report is:

- an investigation into the flooding that took place on the 9th February 2020.
- a means of identifying potential recommendations for actions to minimise the risk or impact of future flooding.

This Flood Investigation Report does not:

- interpret observations and measurements resulting from this flooding event.
- provide a complete description of what happens next.

The Flood Investigation Report outlines recommendations and actions that various organisations and authorities can do to minimise flood risk in the affected areas. Once agreed, the report can be used by communities and agencies as the basis for developing future plans to help make areas more resilient to flooding in the future.

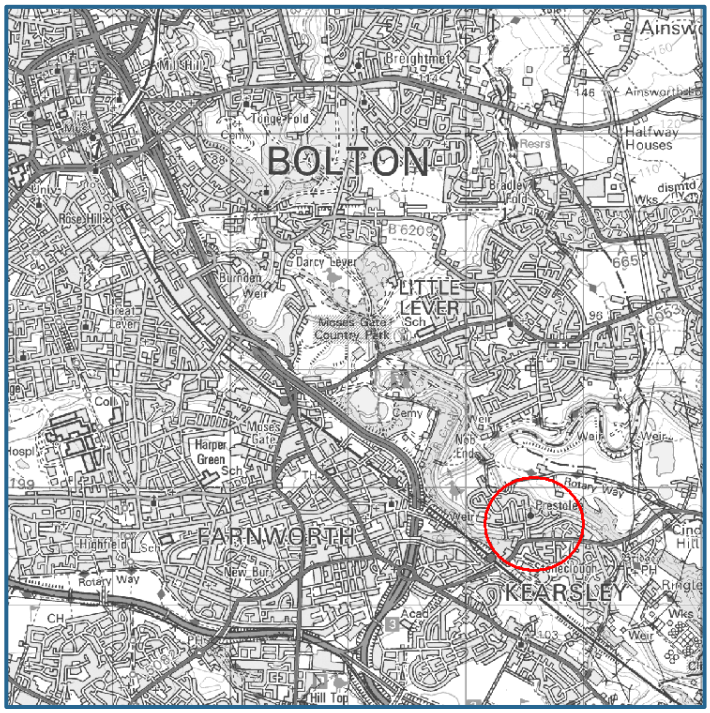
2.1 Flood Locations

The geographic extent of this report is for the two locations below.

2.1.1 Riverside Drive

Riverside Drive is in the suburb of Prestolee, Kearsley Bolton (Grid Reference SD786161); it is a residential area. The location is shown on the plan below

Figure 1: Location of Riverside Drive, circled red.



2.1.2 Smiths Road

Smiths Road is to the south east of Bolton centre (Grid Reference SD786161); it is an area of mixed residential and commercial usage. The location is shown on the plan below.

Figure 2: Location of Smiths Road; circled red.

3 Investigation

3.1 Flood Risk Maps

To meet the requirements of the EU flood directive 2007/60/EC, the government has made available maps showing long term flood risk. These maps are available to the public and can be viewed at: https://flood-warning-information.service.gov.uk/long-term-flood-risk

There are a number of different maps available showing the flood risk from rivers, surface water run-off and from reservoirs.

The following plans show the areas at risk of flooding from rivers for the two locations, which indicate that both have a high risk of flooding.

Figure 3: Plan showing the risk of river flooding at Riverside Drive

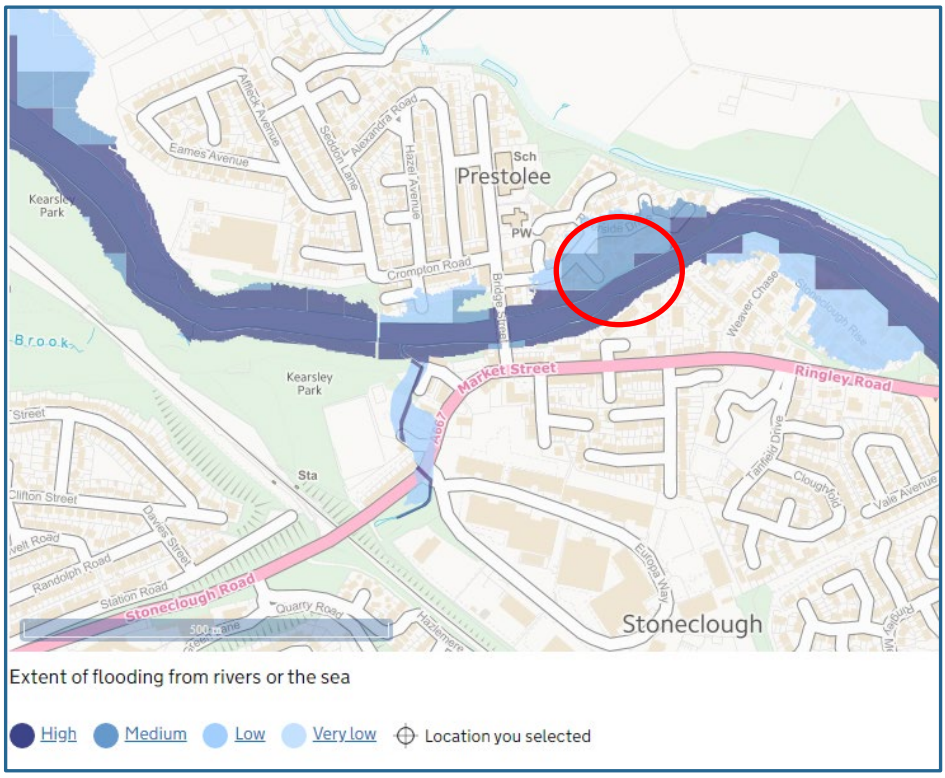
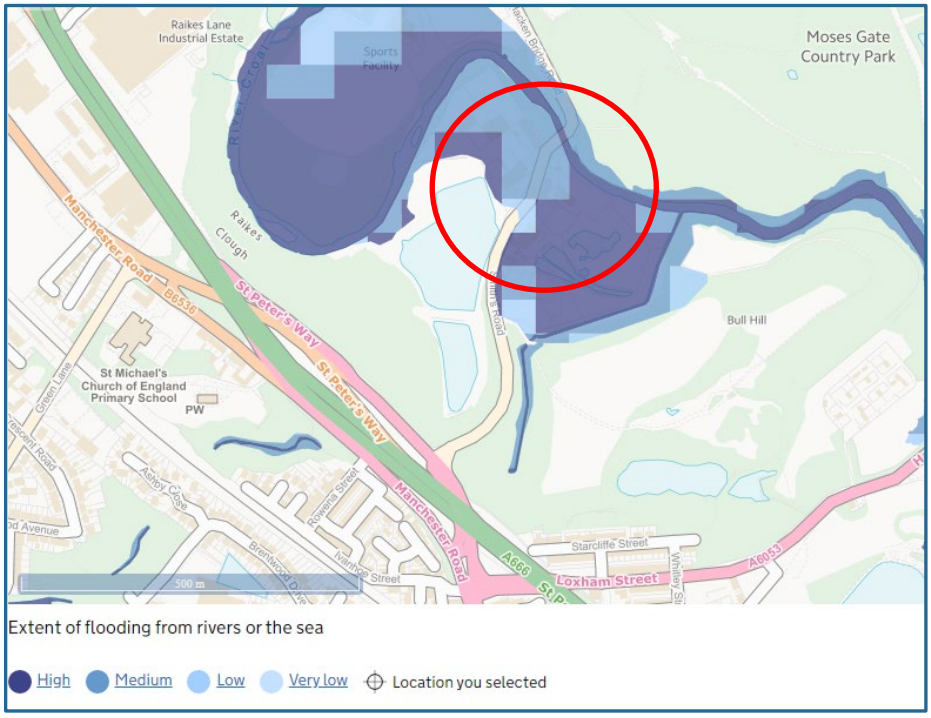


Figure 4: Plan showing the risk of river flooding at Smiths Road



3.2 Rainfall Analysis and Discussion

Storm Ciara was a powerful and long-lived extratropical cyclone that impacted the whole of the UK over the 9th and 10th February 2020 bringing heavy rain and very strong winds. The strongest gust recorded was 97 mph at the Needles, Isle of Wight. However, there were widespread gusts of 70 - 80 mph even in less exposed, inland sites, with a squall band of rain bringing some intense thundery downpours, and strong, squally winds.

The highest rain totals were in parts of north west England and North Wales. Honister Pass, Cumbria recorded 179.8 mm of rain over the weekend, with 177 mm of this coming in the 24 hours up to 4pm on Sunday. There was widespread travel disruption as well as some localised flooding and trees being blown down.[1]

3.2.1 Rainfall Data

There was some variation in rainfall across the river catchments upstream of the flooded areas but generally in the 24-hour period between 9pm on the 8th and 9pm on the 9th February 2020 the local rainfall total was around 56 mm or 70% of the average February monthly total.

The nearest rain gauges to the flood locations are located at Ringley Wastewater Treatment Works and at Sweetloves Water Treatment Works. Rain gauge data was supplied by the EA following a request from Bolton Council.

These rain gauges recorded the following 24-hour totals between 10pm on the 8th February and 10pm on the 9th February.

Ringley WwTW	36.1 mm
Sweetloves Wtw	54.8 mm

Rainfall Data further upstream in the River Irwell catchment at Rossendale indicates much higher rainfall 24-hour totals of around 80mm were experienced.

[1] https://www.metoffice.gov.uk/weather/warnings-and-advice/uk-storm-centre/storm-ciara

Table 1: Recorded Rainfall Totals 8th to 10th February

GM 08/02/2020 to 10/02/2020 Peak Rainfall Accumulation (mm)	Irwell catchment		
	Holden Wood	Bacup	Blackstone edge
6 hour total	44.4	42.8	27.2
12 hour total	73.8	70.4	40.2
18 hour total	78.8	77.4	43
24 hour total	83	80.8	45
36 hour total	87	87.0	45.8

Holden Wood is located approximately 1 km north of Helmshore, approximately 12 miles upstream of Stoneclough. Bacup lies approximately 18 miles upstream close to the head waters of the River Irwell. Blackstone Edge lies 6 miles to the east of Rochdale, close to the head waters of the River Roch, rainfall from this area is within the far easterly part of the upstream catchment of the River Irwell at Stoneclough.

Figure 5: Plan of the river catchment upstream of Riverside Drive (585 sq km)

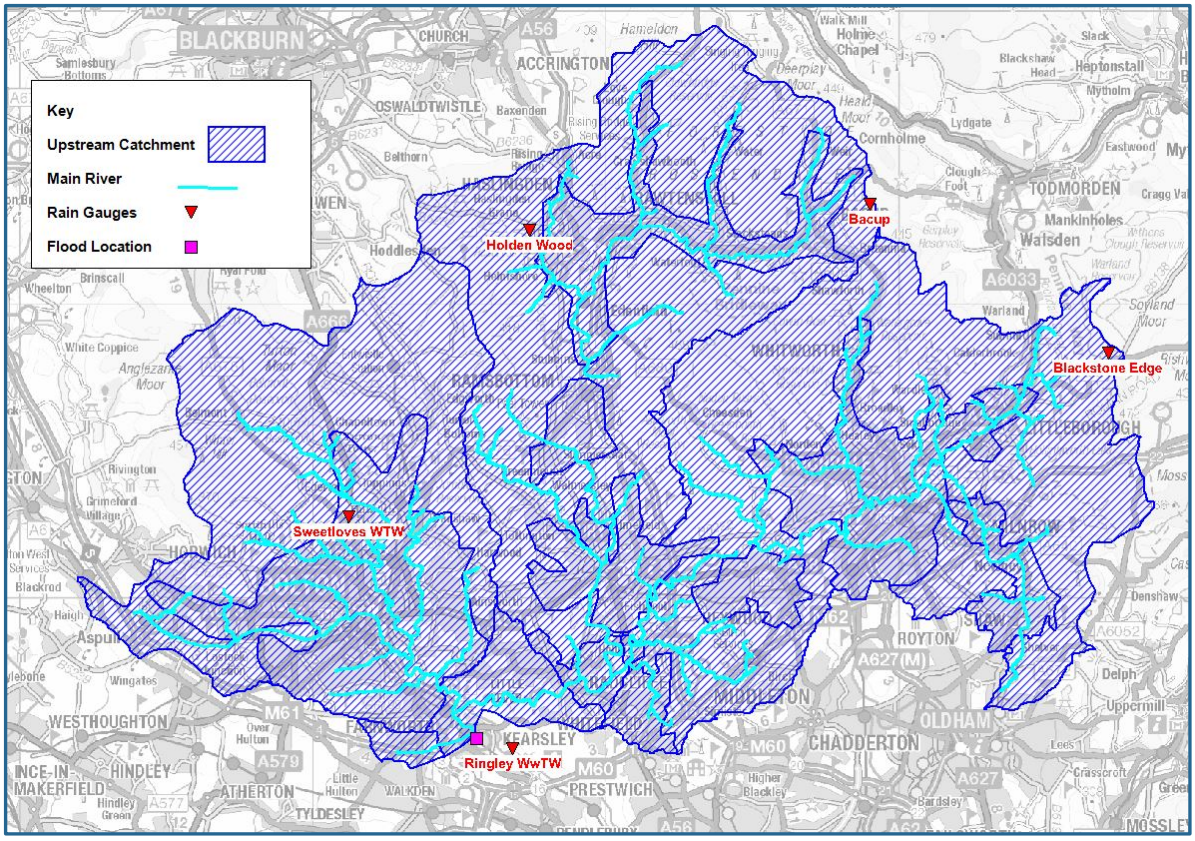
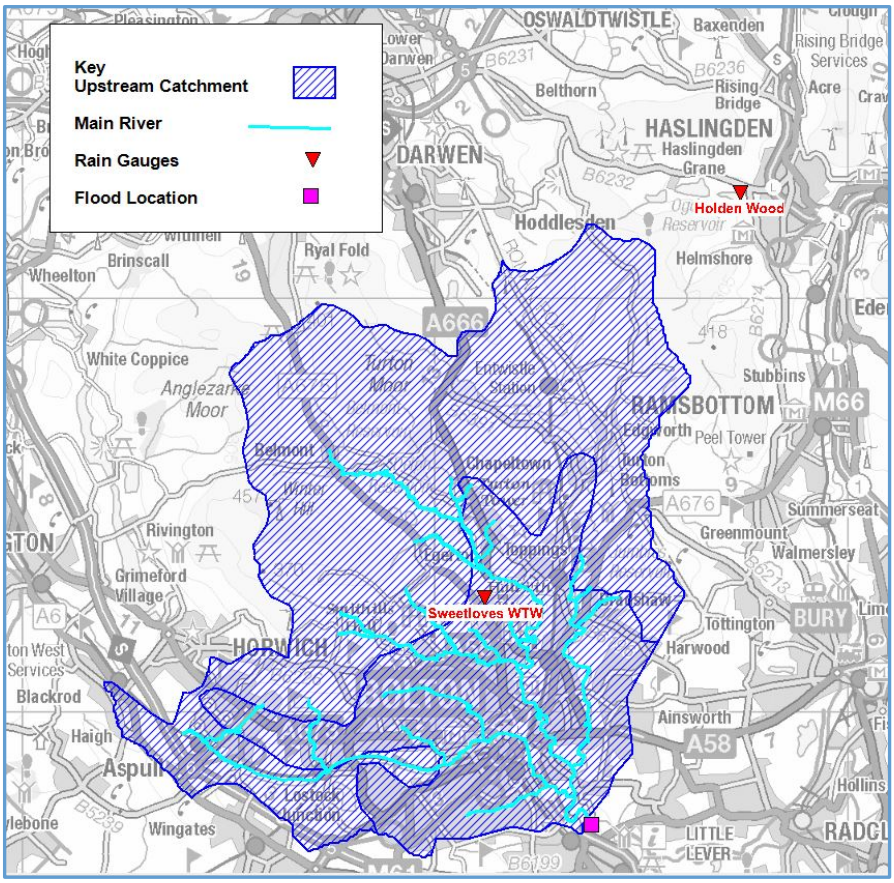


Figure 6: Plan of the River Catchment upstream of Smiths Road (130 sq km)



3.3 Preceding Hydrological Conditions

The National Hydrological Monitoring Programme (NHMP) produces the monthly Hydrological Summary of the UK. This regular report describes the hydrological conditions during the preceding month, using the data holdings of the National River Flow Archive and National Groundwater Level Archive. Focusing on rainfall, river flows, groundwater levels and reservoir stocks, it places the events of each month, and the conditions at the end of the month in a historical context.[2]

Monthly Water Situation Report North West England – January 2020 [3]

The report states that the rainfall in North West England was 99% of January's Long Term Average. So, for the month of January 2020 rainfall was classed as 'Normal'.

The report also states that Soil Moisture Deficit (SMD) SMD levels remained low across all of North West England during January; with soils at, or close to, full saturation throughout the month.

[2] https://nrfa.ceh.ac.uk/monthly-hydrological-summary-uk
[3] http://nora.nerc.ac.uk/id/eprint/526883/

3.4 Recorded River Levels [4]

The Environment Agency maintain a network of river monitoring stations across the country that observe and record river levels. This information is used to inform flood warning decisions, flood risk management, river modelling and catchment monitoring.

There are two relevant stations to the flooding incidents at the River Irwell at Kearsley and the River Croal at Farnworth.

River Irwell at Kearsley - Environment Agency Location ID: **690503**

This monitoring station is located at Prestolee 100 metres upstream of Riverside Drive.

The highest level ever recorded at the River Irwell at Kearsley is 6.33m, reached on Saturday 26th December 2015 at 2.15pm.

On Sunday 9th February 2020 the highest level reached on that day was 5.33 m at 2.45pm. This is the second highest level since recording started in 2012.

River Croal Farnworth - Environment Agency Location ID: **690408**

Monitoring station located at Moses Gate Country Park approximately 1km downstream of flooded properties at Smiths Road.

The highest level ever recorded at the River Croal at Farnworth is 1.41m, reached on Saturday 26th December 2015 at 3.15pm.

On Sunday 9th February 2020 the highest level reached on that day was 1.31m at 1.30pm. This is likely to be the fifth highest level recorded since 1948.

[4] https://nrfa.ceh.ac.uk/

3.5 Flood Warning Information issued prior to the event

The Flood Forecasting Centre issued a Flood Guidance Statement at 10.30am on Friday 7th February 2020 categorising the local impact as yellow (a possibility of a significant impact but with very low likelihood).

Flood Alerts and Warnings were issued by the Environment Agency on 8th and 9th February at the following times:

- Flood Alert Upper Irwell at 19:44 (8th February)
- Flood Alert Lower Irwell at 09:18 (9th February)
- Flood Warning for the River Irwell at Prestolee and Ringley Bridges at 9.05am 9th February (reports of flooding to property occurred from approximately 12.45pm, this information is from the Community Flood Group)

3.6 Previous Flooding Incidents

Riverside Drive, Prestolee, Bolton

The residential properties at Riverside Drive were built in the late 1970's, the site was previously occupied by a large mill owned by the Irwell Bank Spinning Company. There is a record that on 20th September 1946 internal flooding occurred at the Irwell Bank Spinning Company due to the River Irwell overflowing at Prestolee.[5]

Flooding previously occurred to the residential property at this location on Boxing Day, 26th December 2015 due to Storm Eva when 36 properties flooded internally on Riverside Drive along with 9 properties on the opposite riverbank at Stoneclough Rise. On 26th December 2015 the flooding was caused by flooding from River Irwell; a main river. There are no records of internal property flooding at this location between 20th September 1946 and 26th December 2015.

Smiths Road, Bolton

The residential properties at Smiths Road date from the 19th century and the commercial property from the 20th century. Flooding previously occurred at this location on Boxing Day 26th December 2015 due to Storm Eva when 5 residential properties flooded internally along with 2 businesses. There is also a record of flooding at this location on 14th June 2002.

[5] Bolton Evening News (1946), 'Bolton's Heaviest Rainfall for 58 years', *Bolton Evening News,* 20/09/1946

4 Asset Performance

4.1 Public Sewers - United Utilities Assets

Riverside Drive
Surface water from property rooves and the highway are drained via surface water sewers (United Utilities asset). Foul drainage is drained via pumping station (United Utilities asset).

Smith Road
On Smiths Road the highway is drained partly by a highway drain (Bolton Council Asset) at its southern end and by a surface water sewer (United Utilities asset) at its northern end which also drains the residential and commercial properties.

4.1.1 Sewer Operation

Anecdotal evidence at both locations indicates that once the river flooding subsided areas serviced by sewers quickly drained away and no flooded areas remained. This indicates that the surface water sewers at both locations were operational.

Riverside Drive Sewerage Pumping Station

There is a foul drainage pumping station on Riverside Drive which was partially submerged by the flooding. The location of the station within the flood zone, results in it being susceptible to impact by serious flooding which could result in an outage, which in turn can lead to pollution.

United Utilities reported “Riverside Pumping Station performed with no issues on the 9th February except for a short duration when it had an incoming power failure due to an Electricity North West supply interruption. Other than that, the pumps continued to run as they should have during the storm.”

4.2 Highway Drainage – Bolton Council Assets

Bolton Council as the Highway Authority are responsible for the maintenance of road gullies and the piped connection between gullies and the public sewer.

The highway gullies on the following streets were surveyed to establish silt levels, the presence of gulley blockages, whether operational, gulley pot capacity and ironwork conditions.

Riverside Drive

At Riverside Drive highway drainage gullies were cleaned after the flood event, in some locations silt levels within road gullies were found to be high as a result of siltation due to the inundation of material during river flooding. The highway gullies were previously cleaned on 09/12/2019 and 12/07/2017, which is in accordance with our Highway Asset Management Policy.

Smiths Road

At Smiths Road the drainage systems were found to be operational.

4.3 Main River Watercourses – Riparian owners and Environment Agency

5-year maintenance plans by the Environment Agency can be viewed at the website below:
https://www.gov.uk/government/publications/river-and-coastal-maintenance-programme

This includes local assets on the River Croal and Irwell.
Maintenance actions in the catchments are generally:

- Inspection and clearance of debris screens
- Maintenance check of open channel to ensure water conveyance is not impeded.

No operational problems were reported.

5 Observations and Contributing factors

5.1 Public Sewers

Riverside Drive

Following the flood United Utilities undertook a CCTV survey of the local sewer network, no defects or operational issues were identified.

During an inspection following the flooding it was observed that the outfall from the surface water sewer on the River Irwell that serves Riverside Drive had trapped debris in the form of a rolled-up section of chain link fencing. This debris was hindering the discharge of water from the sewer. The debris was moved by United Utilities within 24 hours of notification. It was also observed that the brickwork outfall structure has some structural damage likely as a result of impact from floating debris.

Council officers observed that prior to the river flooding over its banks water was issuing from highway gullies as a result of water back flowing from the sewer outfall. This indicates that as the river level rose it was filling up the surface water sewer system to the point that flooding of the highway occurred before the river water overtopped the riverbank adjacent Riverside Drive.

The installation of a flap valve at the sewer outfall would not prevent fluvial flooding but would provide some additional protection against flooding particularly for events when the river level rises close to but not overtopping the riverbank.

Riverside Drive Pumping Station

Current Design and Construction Guidance for foul pumping stations states that they; ”should not be located where it might be susceptible to flooding at a frequency of mor e than 1 in 30 years. All electrical control equipment should be water resistant or sited above the 1in 200-year flood level.” Clearly at this location the pumping station is susceptible to flooding and is not above the 1 in 200-year flood level. Whilst relocating the station is clearly not feasible, United Utilities following the 2015 flood, made alterations to the station which included raising control equipment within the kiosk. This intervention ensured resilience of the asset on this occasion. Any further interventions by United Utilities will be subject to their regional prioritisation for investment.

5.2 Highway drainage

Smiths Road

Gully gratings need to be reset in a few locations due to the iron work having become proud of the highway surface to improve the ability to intercept water.

There is only a single gully at the sag point in the highway, current design good practice is to install at least two gullies at low points to improve flow capacity and silt collection capacity.

5.3 Watercourses

River Irwell at Riverside Drive

A visual survey of the River Irwell embankments was undertaken to note any land slippage or debris accumulation issues. The river embankment adjoining Riverside Drive has upon it a sandy mix of debris containing a high proportion of man-made material, this does make the embankment marginally stable in areas.

A resident of Riverside Drive observed that the recent flooding followed the removal by the Environment Agency of a weir known as Prestolee Weir a short distance upstream of Riverside Drive in 2013. The question was posed to the Environment Agency as to whether this action could have had a negative impact on the flood risk at Riverside Drive; they reported:

Prestolee Weir removal

Prestolee Weir was assessed as part of the EA's River Restoration Programme and at this point it was in a significant state of disrepair and in danger of collapse (see photo below).

The weir was situated approximately 450m upstream of Prestolee Bridge and approximately 500m from the point at which water begins to spill on to Riverside Drive via the left bank.

Whilst a ‘Do nothing’ scenario was considered feasible at a number of nearby weirs, it was deemed unfeasible at Prestolee, due to the poor structural condition of the weir. When weirs collapse in an uncontrolled manner during high flow events, the collapse can cause significant damage. For instance, the sudden collapse of another River Irwell weir in 2015 further upstream near Ewood Bridge, coincided with a sudden shift in the position of the upstream river channel. In this instance the river shifted approximately 15m, removing a large part of the East Lancashire Railway line embankment.

Flood risk modelling was undertaken as part of the feasibility study prior to the removal of the weir, which demonstrated that changes to water levels downstream of the weir post removal were estimated to be no more than +/- 65mm in the 100 year plus climate change case if all three weirs assessed were removed – this was deemed negligible against the potential risk of a sudden collapse and the environmental benefits gained in removing the weir. We have also compared pre and post weir models (2007 and 2017) and whilst a number of variables may have changed between the two models it suggests no increase in risk is shown to the Riverside Drive community due to the removal of the weir, in the same peak flow conditions.

When the weir was removed in 2013 it was risk assessed, for a number of processes such as erosion, flood risk and sedimentation. The weir removal passed these assessments.

6 Likely Cause of flooding

Flooding occurred on Sunday 9th February 2020 as a result of an intense winter storm named Storm Ciara. Prior to the event, weather warnings were issued by the Flood Forecasting Centre, yellow warnings were issued in the days leading up to the event, but specific locations of the worst impacts were not identified.

Whilst locally rain gauges indicated relatively less intense rainfall, further upstream in the catchments of the Rivers Irwell, Roch and Croal much greater rainfall had fallen, in excess of February's average monthly rainfall in 24 hours. This heavy rainfall resulted in the River Croal at Smiths Road and the River Irwell at Riverside Drive swelling up and flooding into their flood plains and inundating property.

7 Incident Response and Post Event Actions

7.1 Bolton Council - Flood Incident Response

The Bolton Council Civil Contingencies team on receipt of the Flood Warning responded by deploying a Forward Incident Officer to Riverside Drive at approximately 11am on 9th February. Door knocking was undertaken to advise people to evacuate the properties. Whilst some residents did evacuate some remained in their properties and did not evacuate even after flooding occurred.

Over the following day (Monday 10th February) the Council team visiting Riverside Drive included; 10no. Adult Social Care Officers, 2no. Housing Officers, and 2no. Forward Incident Officers. Neighbourhood Services and Waste representatives visited the area to assess needs and respond accordingly. Some families were displaced, and alternative accommodation found.

Neighbourhood Services were on duty from Sunday 9th Feb until Wednesday 12th carrying out a clean-up of external areas, removing debris and river silt. Two additional waste collections took place during week commencing 10th Feb and a further additional collection on 17th Feb.

Highway drainage gullies were cleaned out the following day on 10th February. Some gullies had received heavy input of silt from the river flooding.

In response to the events, the Council, the Environment Agency and United Utilities as Risk Management Authorities (RMAs) have been working together to support affected communities and understand what happened.

7.2 Environment Agency – Flood Incident Response

Flood Warnings

A Flood Alert and Flood Warning were both issued for the River Irwell at Prestolee and Ringley Bridges Flood Warning Area (GM25). A Flood Warning which was specifically targeted at the Prestolee, Stoneclough and Ringley community, was issued at 9.05am with the first Flood Warning threshold being crossed at 10.30am.

A member of the EA's Flood Resilience team was in contact with the flood group (see below) throughout the event providing real time forecasting information. There are 81 properties within GM25 Flood Warning Area. Of these 74 properties potentially received the flood warning. 52 properties were fully registered with the EA's Floodline Service and 22 properties may have received a warning via the Extended Direct Warnings service.

Further notes

The Environment Agency's Flood Resilience team has supported the creation of a community flood action group which we use to share project updates, share real time flood information and flood forecasts. The EA also use this to gather knowledge and experiences to further understand the flood risk and develop project proposals.

The EA used this same group to help organise a community drop-in following the event on the 11th March, to sign up more people to the flood warning service.

Following Storm Eva, the EA Operations team removed sediment from the River Irwell in the area, assessed the viability of temporary defences and sprayed invasive species on the river bank so that the feasibility of construction of any potential flood wall can be assessed.

Running parallel to this, the Environment Agency has been developing an appraisal of options to understand flood risk in Prestolee and Stoneclough and to develop measures that could be put in place to reduce that risk. In doing this they have surveyed and re-modelled the River Irwell around the study area and completed a Strategic Business Case. The next phase for the proposed flood scheme is to identify a preferred option through an Outline Business Case, which was approved and commenced in September 2020.

There is also currently a funding gap to deliver the construction phase of this project, which the project team are working hard with partners, including Bolton Council, to close. Once this is achieved the project team can begin to develop a detailed design, prior to commencing construction.

8 Recommendations

The method for prioritising works on drainage systems and watercourses varies for each RMA involved, dependant on factors such as resources available, operational area, and interpretation of flood risk. It is therefore important that all RMAs are open and honest with the community about what actions will or will not be taken, and why. Bolton Council as the LLFA are in a position to facilitate sharing of information between RMA's, and the community, if required. We also suggest the actions summarised within Table 1 below.

Table 1: Suggested Actions

Flood Risk Management Authority / Body	Suggested Actions
Resilience forum	Review and update plans to enable homes and businesses to be better prepared for flooding and reduce the impact of flooding. E.g. review of evacuation procedure and emergency response. Ensure residents are signed up to receive flood warnings.
Highway Authority (Bolton Council)	Review the frequency of routine maintenance to drainage gullies at Riverside Drive and Smiths Road. Consider reactive cleaning when flood alerts are issued. At Smiths Road From Manchester Road to Hacken Bridge where required replace the existing old gullies and gully gratings with new. The new gullies and gratings should be installed with regard to current relevant design and installation practices. Ensure all existing gully gratings are not proud of the carriageway surface. Consider the installation of additional gully connections or Kerb Drainage at carriageway sag points. Consider increasing Vehicle Access kerb height at entrance to no 3 Smiths Road to improve the channel drainage and reduce the risk of overflow into the property. Install an additional gully prior to the vehicle access crossing to no 3.
Environment Agency	Maintenance Activities to continue based on their prioritised system. Continue to develop a flood defence project for Riverside Drive

Flood Risk Management Authority / Body	Suggested Actions
Environment Agency and Residents	Ensure all properties are registered to receive flood warnings and that all details are up to date
United Utilities	At Riverside Drive and Smiths Road examine the potential for the installation of non-return valves to surface water sewer river outfalls to prevent back flow into the system during flood events. This may offer a degree of flood protection to properties during less severe rainfall events that were experienced during Storm Ciara. <u>At Riverside Drive</u> Consider reconstruction of the surface water outfall which is structurally impaired.
Residents	Report, document and photograph any flooding incidents or near misses. Report fly-tipping in watercourses or debris build up in watercourses. Take measures to protect themselves and their property when they believe flooding may occur. Ensure that any Property Level Protection (PLP) products, such as flood gates, fitted to the property are regularly cleaned inspected for damage and maintained in accordance with the manufacturer's instructions. It is important that residents review any PLP measures within their properties as regards quality and effectiveness, and to determine whether additional measures are required to ensure the property is as resilient as possible. Individuals can consider what actions they can take to mitigate against flooding can access practical and realistic advice at the North Wests Flood Hub at www.thefloodhub.co.uk
Bolton Council - LLFA	Record details of any flooding incidents or near misses.

9 Conclusion

All RMA's must continue to work together, sharing information about the actions being taken.

In the short-term, property owners should be aware of the property level flood resistance and resilience measures available, and how they might be funded.

In the medium term, the EA should examine whether temporary flood risk measures are viable and appropriate at the site.

In the long-term, the EA should continue to develop the business case for permanent flood defences.

10 Disclaimer

This report has been prepared as part of Bolton Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide context and information to support the delivery of the local flood risk management strategy and should not be used for any other purpose.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore may not include all relevant information. As such it should not be considered as a definitive assessment of all factors that may have triggered or contributed to the flood event. Bolton Council expressly disclaim responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and Bolton Council expressly disclaim responsibility for any error in, or omission from this report arising from or in connection with those opinions, conclusions and any recommendations.

The implications for producing Flood Investigation Reports and any consequences of blight have been considered. The process of gaining insurance for a property and/or purchasing/selling a property and any flooding issues identified are considered a separate and legally binding process placed upon property owners and this is independent of and does not relate to the Council highlighting flooding to properties at a street level.

Bolton Council does not accept any liability for the use of this report or its contents by any third party.

Appendix 1: Glossary

Term	Definition
Building Regulations	The UK Building Regulations are rules of a statutory nature to set standards for the design and construction of buildings, primarily to ensure the safety and health for people in or around those buildings, but also for purposes of energy conservation and access to and about other buildings
Catchments	An area that serves a river with rainwater, that is every part of land where the rainfall drains to a single watercourse is in the same catchment.
Climate change	The change in average conditions of the atmosphere near the Earth's surface over a long period of time.
Combined Sewer	Underground pipes which collect both surface water run off and foul wastewater.
Critical Infrastructure	Infrastructure that supplies essential services, for example, water, energy, communications, transport.
Cultural Heritage	Buildings, structures and landscape features that have an historic value.
Culvert	A covered structure under a road, embankment etc, to direct the flow of water.
Defences	A structure that is used to reduce the probability of floodwater affecting a particular area (for example a raised embankment)
Defra	Department for Environment, Food and Rural Affairs
Drainage Authorities	Organisations involved in water level management, including Internal Drainage Boards, local authorities, the Environment Agency, and RFCCs.
External Flooding	The flooding of gardens, detached garages and outbuildings, streets and open spaces.
FCERM	Flood and Coastal Erosion Risk Management
Flood	The temporary covering by water of land not normally covered with water
FWMA	Flood and Water Management Act
Groundwater Flooding	Flooding that occurs when the water table (the water below ground) comes close to and/or above the ground surface levels, typically caused by prolonged periods of above average rainfall over weeks and months.
Internal Flooding	Flooding arising from flood water entering a commercial or residential property. It is usually limited to the flooding of habitable living space and not garages or storage areas.
LLFA	Lead Local Flood Authority. The local authority responsible for taking the lead coordinating role on local flood risk management.
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NFM- Natural Flood Management	Natural Flood Management is the use of natural interventions that reduce the rate of surface water run-off, such as the use of leaky dams and temporary storage ponds.
Ordinary Watercourses	All watercourses that are not designated Main River for which are the Local Drainage Authority has powers.
Reservoir	A natural or artificial lake where water is collected and stored until needed. Reservoirs can be used for irrigation, recreation, providing water supply for municipal needs, hydroelectric power or controlling water flow.
Resilience	The ability of the community, services, area or infrastructure to avoid being flooded or lost to erosion, or to withstand the consequences of flooding or erosion taking place.
RFCC	Regional Flood and Coastal Committee
Riparian Owner	Person who owns land or has property adjacent to a watercourse whether open or culverted running through their property.

Term	Definition
Risk	Measures the significance of a potential event in terms of likelihood and impact. In the context of the Civil Contingencies Act 2004, the events in question are emergencies
Risk Assessment	A structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action.
RMA - Risk Management Authorities	Organisations that have a key role in flood and coastal erosion risk management as defined by the Flood and Water Management Act (2010). These are the Environment Agency, lead local flood authorities, district councils where there is no unitary authority, internal drainage boards, water companies, and highways authorities.
River Flooding	Flooding resulting from river levels exceeding the natural or constructed banks or defence level of a river or stream, typically caused by prolonged and/or heavy rainfall across catchments over days and weeks.
Sewer Flooding	Flooding caused by blockage or overflow of a sewer, or capacity issues or electro- mechanical failure of pumping stations. This includes flooding from storm / surface water and combined sewers.
Standard of protection	The flood event return period above which significant damage and possible failure of the flood defences could occur.
Surface Water Flooding	Sometimes called pluvial or urban flooding. Flooding from intense rainfall falling on impermeable or saturated surfaces and/or exceeding the ability of any drainage system to manage flows, typically caused by short period storms over a matter of hours or less.
Surface water Sewer	Separate underground pipe system designed specifically for transporting excess rain and surface water from houses, commercial buildings and roads for disposal. Usually managed by the local sewerage undertaker United Utilities.
Watercourse	A channel (natural or artificial) along which water flows usually from a natural source. Watercourses include all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages through which water flows.
WTW	Water Treatment Works
WwTW	Waste Water Treatment Works

Appendix 2: Summary of Relevant Legislation and Flood Risk Management Authorities

The Flood Risk Regulations 1999 and the Flood and Water Management Act 2010 (the Act) have established Bolton Council as the Lead Local Flood Authority (LLFA) . This has placed various responsibilities on Bolton Council including Section 19 of the Act which states:

Section 19

(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.

A '*Risk Management Authority' (RMA)* means:

(a) the Environment Agency,

(b) a lead local flood authority,

(c) a district council for an area for which there is no unitary authority,

(d) an internal drainage board,

(e) a water company, and

(f) a highway authority.

The table below summarises the relevant Risk Management Authority and details the various local source of flooding that they will take a lead on.

Flooding Type	Description	Party Responsible for Managing the Risk
Surface Water Flooding	Flooding from intense downpours of rain that result in large volumes of run-off from land or when drainage systems cannot cope with the amount of rainfall.	Bolton Council United Utilities (if from surface water sewers)
Groundwater Flooding	Occurs when the ground water-table rises causing flooding.	Bolton Council
Highway Flooding	Occurs when the highway drainage system or the sewers they discharge to cannot cope with the amount of rainfall entering the system, or when gullies become blocked.	Bolton Council (as Local Highway Authority), United Utilities, and Highways England (on Motorways)
Ordinary Watercourses	Flooding from intense downpours of rain that result in large volumes of run-off from land causes streams and culverts not marked on the main river map to overflow.	Bolton Council
Main River	Flooding from rivers or streams on the main river map	Environment Agency

Flooding Type	Description	Party Responsible for Managing the Risk
Reservoirs	Flooding from reservoirs falling under the provisions of the Reservoirs Act	Environment Agency
Sewer Flooding	Occurs when the amount of water entering the sewer system exceeds its design capacity or when the system becomes blocked.	United Utilities
Water Supply Flooding	Occurs when water mains burst.	United Utilities
Canals	Breaches of embankments supporting canals can result in flooding.	Canal and River Trust
Railways	Flooding from intense downpours of rain that result in large volumes of run-off from land on to the railway or when drainage systems on the rail network cannot cope with the amount of rainfall.	Network Rail

The following information provides a summary of each Risk Management Authority's roles and responsibilities in relation to flood reporting and investigation.

Central Government

Defra develop national policies to form the basis of the Environment Agency's and Local Government's work relating to flood risk.

Environment Agency (EA)

The EA has a strategic overview of all sources of flooding and coastal erosion as defined in the Act. As part of its role concerning flood investigations this requires providing evidence and advice to support other risk management authorities. The EA also collates and reviews assessments, maps and plans for local flood risk management (normally undertaken by the LLFA).

The EA has permissive powers to carry out maintenance work on Main Rivers under Section 165 of the Water Resources Act. However, the frequency of EA maintenance activities is primarily risk based, and for many areas these activities can comprise annual vegetation management, debris screen maintenance and clearance of blockages as and when is required. Any third-party assets on main rivers, such as access structures and pipe bridges, are neither owned nor maintained by the EA. The EA's policy on third party assets is to notify third party owners of their asset forming part of a flood risk system, and assist by inspecting the assets and advising third party owners on their condition. The EA will also encourage third party asset owners to maintain their property in appropriate condition and take enforcement action where it is appropriate. They may consider undertaking maintenance or repair of third-party assets only where it can be justified in order to safeguard the public interest and where other options are not appropriate.

Lead Local Flood Authorities (LLFA's)

Bolton Council is the LLFA. Part of their role requires them to investigate significant local flooding incidents and publish the results of such investigations. LLFAs have a duty to determine which risk management authority has relevant powers to investigate flood incidents to help understand how they happened, and whether those authorities have or intend to exercise their powers. LLFAs work in partnership with communities and flood risk management authorities to maximise knowledge of flood risk to all involved. This function is carried out at Bolton Council by the Local Flood Risk Management Team.

Bolton Council is also the Land Drainage Authority for the area, under the Land Drainage Act Bolton Council has permissive powers to take action against riparian owners for contraventions of the Act and has permissive powers to carry out maintenance work

Riparian landowners are those who own land containing or adjoining a watercourse. As detailed within the EA document 'Living on the Edge', riparian landowners have certain rights and responsibilities, including the following:

- they must maintain the bed and banks of the watercourse, and also the trees and shrubs growing on the banks;
- they must clear any debris, even if it did not originate from their land. This debris may be natural or man-made;
- they must keep any structures that they own clear of debris. These structures include culverts, trash screens, and weirs;
- if they do not carry out their responsibilities, they could face legal action.

As already discussed, riparian landowners must be aware that any works in, over, under or within ordinary watercourse, require formal consent from the LLFA under the Land Drainage Act. They must not carry out work without consent. If they do, the LLFA could reclaim from them the cost of removing, altering or demolishing works. Works in, over or under, or alterations to Main River require the formal consent of the EA under the Water Resources Act.

Water and Sewerage Companies

The local water and sewerage company United Utilities manage the risk of flooding to water supply and sewerage facilities and the risk to others from the failure of their infrastructure. They make sure their systems have the appropriate level of resilience to flooding and where frequent and severe flooding occurs they are required to address this through their capital investment plans.

Sewerage companies own significant and extensive flood risk assets. Nearly every street contains sewers which convey surface water. These sewers are susceptible to collapses on aged infrastructure, their limited capacity coupled with increased demand from new development and climate change can all increase the risk of sewer flooding occurring.

The companies are regulated by the Office for Water Services whose objectives are to ensure that standards of service are met and that bills are affordable whilst meeting investment demands.

Highway Authorities

There are two highway authorities within the administrative area of Bolton; Bolton Council who managed the local roads and Highways England who manage the national strategic roads (M61). Highway Authorities have the lead responsibility for providing and managing highway drainage and certain roadside ditches that they have created under the Highways Act 1980. In some cases, the owners of land adjoining a highway also have a common-law duty to maintain ditches to prevent them causing a nuisance to road users.

Bolton Council has a duty to maintain the highway under Section 41 of the Highway Act 1980. In respect of flood risk this duty primarily includes the maintenance of roadside gulley's, connecting pipework, roadside grips and ditches.

Regional Flood and Coastal Committee

Each Regional Flood & Coastal Committee (RFCC) is a committee established by the Environment Agency under the Flood & Water Management Act 2010. The Environment Agency must consult with RFCCs about flood and coastal risk management (FCRM) work in their region and take their comments into consideration. RFCCs approve the annual programme of FCRM work in their region and set the local levy that funds FCRM activities within the region that are a local priority.

Each RFCC brings together members appointed by Lead Local Flood Authorities (LLFAs) and independent members with relevant experience who are appointed by the Environment Agency. The Committee's chair is appointed by Defra. There are currently 12 RFCCs across England, each covering a distinct regional area based on river catchments

Appendix 3: Useful Contacts and Links

Bolton Council (Lead Local Flood Authority)

General Enquiries	01204 333333 (Mon-Fri, 9am - 5pm)
Out of Hours incidents	01204 336690
Highways Incident Line	01204 336600 (Mon-Fri, 9am - 5pm)

Environment Agency

General Enquiries	03708 506 506 (Mon-Fri, 8am - 6pm)
Floodline	0845 988 1188 (24-hour service) or Type talk 0845 602 6340

http://www.environment-agency.gov.uk/homeandleisure/floods/default.aspx

United Utilities

General Enquiries 0345 672 3732 (24 hour service) http://www.unitedutilities.com/

Legislation

Highways Act 1980: http://www.legislation.gov.uk/ukpga/1980/66/contents

Water Resources Act 1991: http://www.legislation.gov.uk/ukpga/1991/57/contents

Land Drainage Act 1991: http://www.legislation.gov.uk/ukpga/1991/59/contents

Flood and Water Management Act 2010: http://www.legislation.gov.uk/ukpga/2010/29/contents

Government Guidance on Owning a Watercourse: a guide to the rights and responsibilities of riverside occupation:

https://www.gov.uk/guidance/owning-a-watercourse

Government Guidance – "Am I at risk of flooding?" maps of flood risk from main rivers and surface water

https://flood-warning-information.service.gov.uk/long-term-flood-risk

EA - River and Coastal Maintenance Programmes:

http://www.environment-agency.gov.uk/homeandleisure/floods/109548.aspx

Government Guidance - Prepare for Flooding:

What to do.

https://www.gov.uk/prepare-for-flooding

https://www.bolton.gov.uk/flooding-drainage/flooding-advice/1

Flood Risk in Bolton:

https://www.bolton.gov.uk/flooding-drainage/flood-defence

The North West Regional Flood and Coastal Committee have created a website that provides information and resources to support homes businesses and communities across the north west in becoming more flood resilient.

http://www.floodhub.co.uk/

Flood Re

We're also aware that some people are finding it difficult to get insurance that covers flooding, or are facing large increases in premiums when their policies come up for renewal. It's worth taking a look at Flood Re, a national scheme established in the last couple of years to ensure people living in flood risk areas have access to affordable home insurance: https://www.floodre.co.uk/

The Flood Advisory Service provide a step by step guide for homeowners to help them to understand their flood risk and advise how to make homes more resilient.

https://floodadvisoryservice.co.uk/