

Essex County Council Flood Investigation Report

Bromley Road
Frating

Rev	Date	Details	Author	Checked and Approved By
01	August 2021	Draft report for stakeholder consultation	Charlotte Smith Flood Investigation Engineer	Lucy Shepherd Lead Local Flood Authority Manager
02	August 2021	Final revisions based on consultation response	Charlotte Smith Flood Investigation Engineer	Lucy Shepherd Lead Local Flood Authority Manager

Introduction

Purpose and Requirements of the Flood Investigation Report

Essex County Council as the Lead Local Flood Authority (LLFA) has a responsibility to record and report flood incidents as detailed within Section 19 of the Flood and Water Management Act (FWMA) 2010:

Section 19

(1) On becoming aware of a flood in its areas, 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.

Essex County Council has established criteria for Section 19 Flood Investigation Reports as follows:

- The internal flooding* of a property on more than one occasion
- OR**
- The internal flooding* of five or more properties in a single event

AND

- An ambiguity surrounding the source or responsibility of a flood incident.

*Internal flooding does not include the flooding of gardens and garages; only properties where internal flooding is above threshold level.

Site Information

Site Location and Flood Risk Bromley Road, Frating (Grid Ref: 609079, 223505)

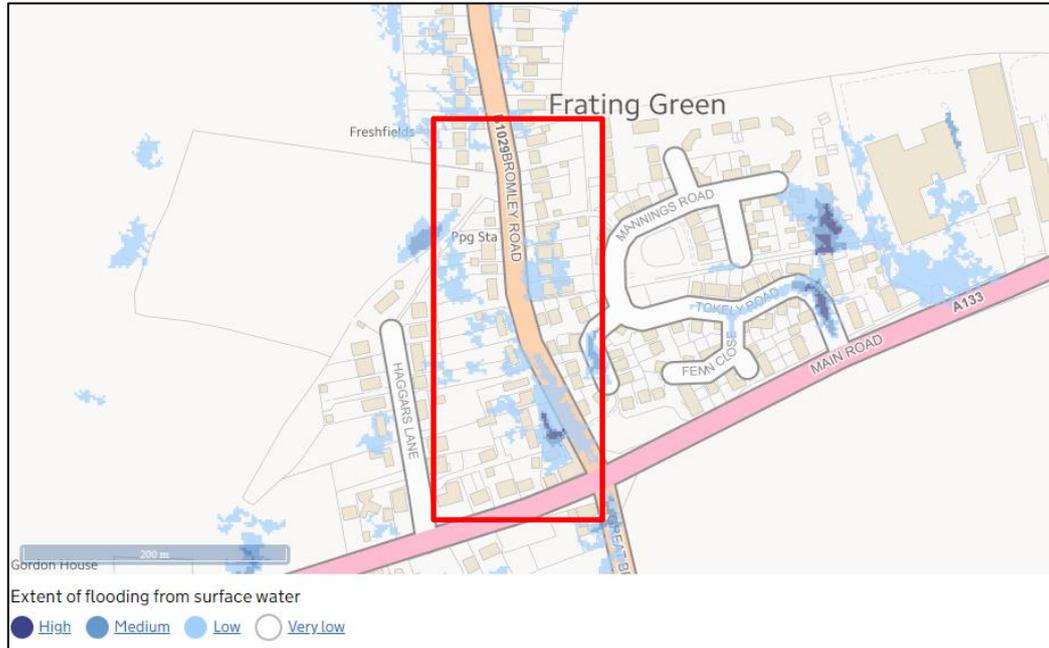


Figure 1 – Flood Investigation Area shown in red and Risk of Flooding Surface Water (Base Map: Ordnance Survey, 2014; Flood Map: Environment Agency, 2021).

Properties have flooded internally along Bromley Road, Frating. Figure 1 shows that most of the investigation area has a very low of risk of flooding from surface water; very low risk means that each year this area has a chance of flooding of less than 0.1% (fig.1).

The highway is shown as having little to no flood risk with isolated areas of high risk flooding occurring in localised areas of gardens and fields. High risk means that each year this area has a chance of flooding of greater than 3.3%. The flood depth in some locations during this event is predicted to be between 300-900mm in places. The surface water flood risk can be viewed [here](#).

Whilst the mapping in figure 1 is a good indicator of risk, due to lack of specific detail on the local drainage system and permeability it is not suitable for a detailed assessment of individual properties. Risk of flooding from surface water is hard to predict as rainfall location and volume are difficult to forecast. In addition, local topography, ground conditions, soil type and the type and location of drainage features can greatly affect the chance and severity of flooding.

Flood History

Approximately 19 properties in the village of Frating, Tendring suffered from flooding (a mixture of internal and external) during January and February 2021 all of which are centered around the junction of Bromley Road and Main Road. There are two sources of water; ground water and surface water. This is not the first-time flooding has occurred in the area. Approximately 10 years ago internal property flooding occurred on a similar scale due to high groundwater table in conjunction with heavy rainfall.

Flooding was first reported by the residents of properties named Fieldfare and Kingsway, east of Bromley Road. Fieldfare suffered from electrical damage to their shed and swimming pool to the region of £1000 alongside damage to the walls of their garage. Water was reported to flow from the highway into their driveway with the highway gully outside the properties appeared to be full of water during the event. The fire service were called and reportedly pumped 90,000 litres of water from the area surrounding the properties. The neighboring property named Kingsway was also surrounded by water which was approximately 3 brick courses deep and penetrating the damp course. It should be noted that both of these properties are lower than the highway.

On the 4th February 2021 a second flood incident was reported to have occurred with the fire service pumping out properties. This time properties on the west of Bromley Road were also affected. It was reported that the sewerage system was surcharging from manholes and toilets, flooding both gardens and internal property. Residents reported that surface water covered large parts of the village and came up through the drains both in the highway and private property.

During site visits on 28th January 2021, it was reported that the Anglian Water foul pumping station located along Bromley Road had ground and surface water ‘tankered’ all day, every day for over 6 weeks. The amount of surface water entering the Anglian Water system was not allowing residents to use their washing and toilet facilities.

Frating Parish Council have confirmed that the flooding experienced in early 2021 is a repeat of the situation the village experienced between 2001 and 2009 but the flooding this time has affected a lot more properties than during the previous events. The properties that the Parish Council are aware of that have suffered flooding are listed below-

Road Name	Type of flooding	Number of properties
Main Road	Groundwater/ Surface Water and sewerage	3
Great Bentley Road	Groundwater/ Surface Water	1
Haggars Lane	Sewerage	3
Bromley Road	Groundwater/ Surface Water and sewerage	11
Tokely Road	Groundwater/ Surface Water and sewerage	1
Total		19

Drainage System

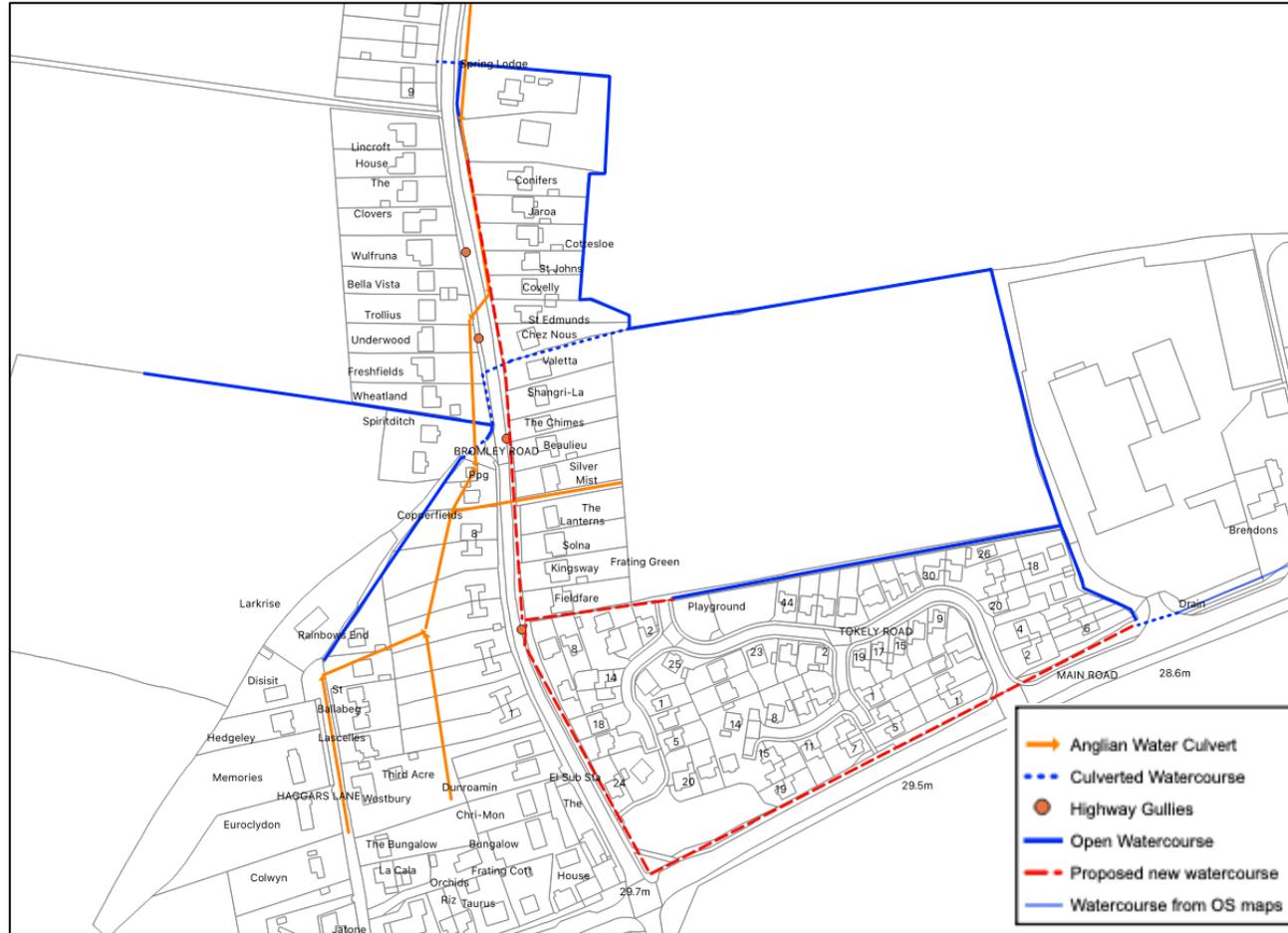


Figure 2 – Indicative Drainage Layout (Ordnance Survey, 2021).

Figure 2 shows the indicative layout of the primary drainage infrastructure in the area, the information was obtained from Environment Agency (EA) Detailed River Network (DRN) Mapping, EH, Anglian Water and site observations.

Much of the drainage infrastructure in the area consists of open watercourses, with sections of culvert on private land, alongside an Anglian Water maintained sewerage system. Frating is sited at the top of a catchment boundary with minimal topographic changes producing slow flowing drainage in the area.

During the site inspection in February 2021 open watercourses were noted to exist either side of Bromley Road. Water is believed to drain east towards Bentley Brook which is classed as main river and under the jurisdiction of the Environment Agency. Open watercourses on the eastern side of the Bromley Road behind properties called Spring Lodge along to Chez Nous appeared to be well maintained. Those to the rear of the Tokely Road development appeared to be in poor condition and overgrown, minimal viewing was available from Main Road. Watercourses along Main Road also appeared to be overgrown although of good proportions. These sections would be riparian maintained and have been passed onto the Watercourse Regulation Engineer to review and take possible enforcement. Open watercourses to the east of Bromley Road appeared to be in a fair condition and not a cause for concern.

There is a culverted section of ordinary watercourse underneath Bromley Road and through the garden of a property called Valetta, this section connects the open watercourse to the rear of Chez Nous to the east of Bromley Road.

Highway drainage exists intermittently along Bromley Road, three gullies were CCTV surveyed after the event. Silt traps on all were found to be clear however one of the gully runs was blocked where it out falls into a nearby watercourse outside a property called 'Spirit Ditch'. This has been passed over to highways for enforcement in line with their protocol.

The Anglian Water system as published on their database shows there to be a pumping station adjacent to the property called 'Spirit Ditch' to the west of Bromley Road. There is also a second pumping station within the Tokely Road development. The water from this pumping station is passed on to the one long Bromley Road.

The direction of flood flows during both events is difficult to pinpoint as the topography at this location is so flat. Water emanated from the saturated ground throughout the village as well as flowing from the highway (Bromley Road) towards property. Sewerage also came up out of drains within private property. Water pooled around the affected properties and due to the lack of flow on the water took several weeks to subside even with the help of 24/7 tankering at the Anglian Water pumping station along Bromley Road.

Proposed new watercourse based on historic maps, further explained in possible causes section below under 'Development'.

Possible Causes

Culvert Conditions

The majority of the watercourses within the area are privately maintained with several culverted sections of watercourse around Bromley Road. Since the event in January 2021 a CCTV survey of the culverted sections has been arranged, the results of which showed that the majority of the systems in the area are in fair condition. Key things to note from the survey include-

- Blocked highway gully outlet near to the property called 'Spirit Ditch'.
- Tree root penetration within the boundary of the property called 'Valetta' furthermore, the levels of the culvert within this property cause a backflow.
- Culvert outlet downstream of Valetta was blocked with soil, this was cleared after the event in contact with the relevant landowners.

ECC will undertake enforcement action in line with their protocol to ensure ordinary watercourses are maintained. This restrictions and inaccuracies in levels to the watercourse would have caused water flows to slow reducing the volume of water able to get away from the centre of the village. It should be noted that private culverts ultimately remain the responsibility of riparian landowners who are accountable for defects and any direct consequence.

Open Watercourse Conditions

The majority of the open watercourses observed during the site visit were in average condition. Sections of the upstream watercourse were overgrown but appeared to be of appropriate dimensions to convey flow at the time of inspection February 2021.

Watercourses downstream of the affected properties located to the rear of Culley Close, appeared to be overgrown and were unable to be properly inspected. This watercourse connects into the roadside watercourse in front of a business called A Smith which further connects into the downstream section of Main River (Bentley Brook). The roadside watercourse also appeared to be overgrown but of adequate dimensions, this said the condition of culverts under the vehicle access points in unknown.

It would be reasonable to assume that the poorly maintained watercourses downstream of the affected properties would have reduced the flow of the water able to reach Bentley Brook. This said the area is susceptible to groundwater flooding therefore there are wider factors to consider.

During times of heavy rainfall it is particularly important that all watercourses are functioning at full capacity to provide as much flow and storage capacity as possible, and prevent flow from surcharging and continuing uncontrolled as overland flow. Private culverts remain ultimately the responsibility of riparian landowners who are accountable for defects and any direct consequences

Anglian Water Systems

Anglian Water have been contacted for comment stating that their pumping stations are designed to pump foul water only, however during the flood event the pumping station was also taking surface water which meant that they were unable to cope with the extra water. In 'normal' conditions the wet wells are pumped out twice however, during the flood event they were tankering 24/7 for 8 weeks to keep up with the amount of water entering the pumping station.

The additional water entering the pumping station did not just come from the land immediately surrounding the pumping station it would have come from every property connected into the sewer network. Any water pooling over manholes which are unsealed in the highway or in property have the possibility to allow water to enter the AW system. For example many residents lift manholes to allow water to drain away into the foul system. Anglian Water plan to survey their system in this area once the flood has receded.

System Capacity

The watercourse system appears to have been overwhelmed during the flood event with watercourses overflowing and adjacent land saturated due to high groundwater tables. Upstream in the area around the Anglian Water pumping station watercourses were reported to be full with fields, highway and gardens covered in surface water.

Both due to the historic infilling of watercourses along field boundaries (mentioned below) as well as blockages in the culverted sections (Valetta area). It should be noted that there is no evidence that the culvert continues along the front of the properties west of Bromley Road, road gullies that were surveyed in the area cross the highway and outfall into the watercourse outside of 'Spirit Ditch'.

From the evidence provided by the residents the highway gullies were overtopping during the event and unable to cope with the volume of water, there is however no evidence that the silt traps were full. After the event CCTV surveys show that the highway culvert at one of the surveyed locations was blocked and could not outfall into the watercourse. This said during the event as the watercourses were full and groundwater table was high this would not have increased flood risk as water could not have got away into the watercourse as it was full. The watercourse that the highway system outfalls into was in good condition however the culvert downstream was blocked with tree roots and therefore not working at full capacity.

Development

Comparing the historic mapping to current mapping it is noticeable that there are several historical field boundaries. It is possible these are an indication of historic watercourses and due to the change in land use these may no longer exist. With a potential decrease in watercourses and the addition of areas of impermeable hardstanding associated with development it is likely to have exacerbated the speed and volume of flows. This would also marry with local knowledge stating that there was historically a watercourse along the eastern edge of the highway. It would therefore be recommended to create new watercourses as mapped in the section above.



(OS 25 Inch 1892-1914)

Essex Highways

An Essex highway survey of the drainage in the area conducted in 2018 states-

The 300mm outfall pipe that runs through Valetta needs some attention – it would be good to get rid of the step up in level at the Camber B just in front of Valetta. Likewise, the large tap root growing inside of the pipe should be removed. However the responsibility for the maintenance of this drain rests with the land owner. There could be a

problem with the step up in invert levels, as the new plastic pipe isn't that old and would probably need relaying over it's 20m length.

Flooding in Frating is known to Essex Highways as they in recent years installed a new system and soakaway further away from the crossroads opposite a property called 'Summer Breeze'.

When Essex Highways arrived at the location on 11th February 2021 their operatives noted that the ditch adjacent to a property called 'Spirit Ditch' (west side of road) was low suggesting that the culvert leading to Valetta not blocked. The crew drew off full tanker of water but it was backfilling from the private pipe through Valetta. Whilst out on site several residents spoke to the crew and said the ditch to the rear of the properties to the east of the highway, where the new development is has been filled in. this verifies what was found during the site visit undertaken by the ECC Floods Team after the event.

Rainfall Conditions

Rainfall data was obtained from the Environment Agency's records for events on 29th January 2021 and 9th February 2021, the nearest gauge is at Horsley Cross approximately four miles north east of the affected area. The data was analysed to establish an event rarity for both events.

Rainfall data from 28th and 29th January 2021 showed that rainfall occurred from 23:15 (28/1/21) until 02:15 (29/1/21) with a total of 7.6mm over these 3 hours. The flooding which was reported on 9th February was thought to have occurred between 11:00 and 13:30 based on data from the nearest rain gauge in Horsley Cross with a total of 2.6mm over the 2.5 hours. Both of these events have been analysed using the Flood Estimation Handbook (FEH) to establish an Annual Exceedance Probability (AEP), both have come back as commonplace and having a return period which was could not be calculated as it was below 1.

The level of rainfall during both flood events is not exceptional suggesting that there may have been an extremely localised event; It is worth noting that the nearest rain gauge was four miles away from the affected area.

Met office data shows that the soil moisture deficit for end of January 2021 in Essex was at 1mm, this would have undoubtedly had an effect on the ability of the water from the events of the 29th January and 9th February to be absorbed.

Responsibilities and Recommendations

Lead Local Flood Authority

- To ensure that the owners of land on which a culvert, watercourse or drainage system are present are aware of their responsibility to keep the feature clear and functioning effectively.
- Facilitate sharing of information and collaboration between RMAs and the local community.
- Consider using enforcement powers under Section 25 of the Land Drainage Act 1991 should landowners fail to maintain watercourses effectively.
- Consider using enforcement powers under Section 24 of the Land Drainage Act 1991 should landowners fail to apply for consent to pipe a watercourse.
- Record and inspect any significant drainage features identified on the site as part of the Flood Risk Asset Register required under Section 21 of the Flood and Water Management Act 2010.

Tendring District Council

- Support LLFA in raising awareness of riparian landowner responsibilities.
- Continue to share information held on drainage layouts with all RMAs.
- Continue to support local communities utilising available resources including LLFA grants.
- Investigate possible funding to develop flood wardens and potentially to install a weather station to ensure increased accuracy of rainfall data.

Riparian Landowners

- Ensure that watercourses or culverts on, or adjacent to, their land are kept clear and free flowing.
- Provide information to the LLFA on surface water drainage systems which may contribute to/from the infrastructure identified in this report.
- Explore possibility of re-opening historic watercourses and creating new ones to provide storage for flows before reaching affected properties specifically those noted in the map in the drainage section of this report.

Residents/Business Owners

- Take measures to protect themselves and their property when flooding is imminent. The affected properties could install Property Flood Resilience (PFR) using the grant issued by ECC.
- Document and photograph flood incidents where possible, report flooding to TDC or the LLFA.

Essex Highways

- Consider use of powers under Section 100 of The Highways Act 1980 to prevent surface water flowing onto the public highway and/or to properly drain the highway.
-

- Continue to work in partnership with other RMAs, providing information and comments and funding when appropriate and to support hydraulic modelling work, the recommendations of which should address/consider the flood risk on the public highway.
- Inspect and clear highway drainage in the area on a regular basis to reduce flood risk specifically those assets along Bromley Road.
- Consider improvements to the highway drainage system, either by installing additional drainage infrastructure or improving the capacity of existing infrastructure.

Anglian Water

- Check and clear the adopted sections of sewer where necessary and where appropriate add to a planned preventative maintenance regime.
- Inspect assets after the flood event to ensure no damage has been caused.
- Look to reduce flood risk to those properties on their DG5 flood risk register.

Conclusion

We have investigated which Risk Management Authorities have relevant Flood Risk Management Functions in accordance with the FWMA as part of this study. Those RMAs and relevant functions are referenced above within the recommendations section.

It is the conclusion of this report that the flooding events experienced in January and February 2021 were due to a high ground water level and prolonged rainfall in conjunction with blocked and historically infilled watercourses.

The existing system was likely to have been overwhelmed due to a decrease in drainage capacity caused by the historic infilled watercourses to the east of Bromley Road. These flows would historically have been stored within the watercourse and ponds instead, water continued to follow this natural path. In the case of the first flooding event water ponded around properties called Fieldfare and Kingsway, where there was historically a natural pond.

Highway drainage located near to the affected properties captured excess water and discharged into the nearby watercourse system adjacent to Bromley Road. However, three highway gullies were checked during the CCTV survey with one found to have a fully blocked gully outlet. There are however several more gullies along this stretch of highway and so therefore it is possible that others could have a similar maintenance issues. It should be noted that the highway drainage system is only designed to capture water which falls on the highway and so would never have been able to take the flows of an ordinary watercourse even if the system was clear and running.

Riparian maintenance issues were also found which would have only increase flood risk to the affected area by reducing the ability of water to eventually reach Bentley Brook (Main River). However the key issue and primary contributory factor is the high groundwater table alongside repeated prolonged rainfall events (surface water) in the months running up to the flood events. This caused an increase in out of bank flows which in turn increased water entering the Anglian Water pumping station.

It is recommended that education of riparian landowners in the area of the importance of the ditch network and keeping watercourses clear. This is key to preventing this issue reoccurring in the future and should involve a collaborative approach with all risk management authorities mentioned in this report. Furthermore, it is recommended that Essex Highways survey all their assets along Bromley Road to ensure they are all working at full capacity and Anglian Water also survey their pumping station and make improvement/ repairs where deemed necessary. More long term solutions would be to look at the wider catchment land management and work with landowners to reduce run off during the times of increased rainfall.

These conclusions are based on the evidence available at the time of investigation and may change with further works or study.

Acronyms

AW	Anglian Water
TDC	Tendring District Council
EA	Environment Agency
ECC	Essex County Council
EH	Essex Highways
FIR	Flood Investigation Report
FWMA	Flood and Water Management Act 2010
LDA	Land Drainage Act
LLFA	Lead Local Flood Authority
LHA	Local Highway Authority
RMA	Risk Management Authority

Glossary of Terms

Term	Definition
Culvert	Covered channel/pipeline
Main River	All watercourses shown as such on the statutory main river maps held by the Agency and DEFRA or Welsh Office, as appropriate.
Ordinary Watercourse	All rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewers) and other passages through which water flows that are not designated as main rivers.
Surface Water	Rainwater which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.

Useful Contacts and Links

Essex County Council

Highways Incident Line	0345 603 7631 (24hrs)
Flood Investigation Engineer	0345 743 0430 (Mon-Fri, 9am - 5pm)
All calls may be charged	

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>
 Flood and Water Management Act 2010:
<http://www.legislation.gov.uk/ukpga/2010/29/contents>
 Land Drainage Act 1991: <http://www.legislation.gov.uk/ukpga/1991/59/contents>

EA - 'Living on the Edge' a guide to the rights and responsibilities of riverside occupation:
<http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx>

EA - Prepare your Property for Flooding: Reducing flood damage; flood protection products and services
<http://www.environment-agency.gov.uk/homeandleisure/floods/31644.aspx>

ECC – Flood and Water Management in Essex:
<http://www.essex.gov.uk/flooding>

National Flood Forum – Blue Pages: Advice and contacts for flood protection products
<http://www.bluepages.org.uk/>

Six Steps to Flood Resilience: Step-by-step guidance and advice for property owners interested in Property Level Protection
<http://www.smartfloodprotection.com>

Appendix A – Photos from December 2020 (Provided by residents).



Kingsway suffering internal flooding



Garage of Kingsway during flood



Ground water within Fieldfare



Damage to Garage foundations Fieldfare



Watercourse to the rear of Fieldfare



Fire Services attendance

Appendix C- Extended area of the Risk of Flooding from Surface Water



Extent of flooding from surface water

- High
- Medium
- Low
- Very low

UFMfSW: EA, 2021. Base Map: Ordnance Survey (2021)