

Flood Investigation Report

Whixley



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Records of the public sewer system included are a facsimile of the statutory record provided by Yorkshire Water Services Ltd (YWSL). For the purposes of this report minor sewers and other non-relevant data have been omitted from the plans for clarity.

Purpose

This document has been prepared specifically for the purpose of meeting the requirements of Section 19 of the Flood and Water Management Act 2010.

The purpose of this report is to investigate which Risk Management Authorities (RMAs) had relevant flood risk management functions during the flooding incident, and whether the relevant RMAs have exercised, or propose to exercise, their risk management functions (as per section 19(1) of the Flood and Water Management Act 2010). It does not address wider issues beyond that remit, nor include recommendations for future actions.

The supporting data has been put together based on records of internal property flooding and road closure information from a variety of sources. While every effort has been made to verify the locations of the Section 19s identified, the nature of the data and the methods used to collate this information mean that it does not include every occurrence of flooding. This data only identifies where flooding has been reported and is indicative only.

Acknowledgements

Mouchel would like to thank the following for their cooperation and assistance in this investigation:

North Yorkshire County Council Flood Risk Management Team

North Yorkshire County Council Highways Department

North Yorkshire County Council Emergency Planning Unit

The Environment Agency

Yorkshire Water Services Ltd

Harrogate Borough Council

Whixley Parish Council

Dates of Inspections

Tuesday 13th September 2016

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2 Executive Summary

The flooding in Whixley was a result of heavy rainfall on the 25th and 26th December 2015. The primary source of the flood waters was runoff from the surrounding agricultural land discharging onto West Lane and Church Street. The flooding was exacerbated by:

- The restricted capacity of the pipe under the Cherry Tree Farm Development.
- The grass verge on West Lane preventing free flow of highway surface water into a critical ditch system.
- The Church Street access ramp to the Cherry Tree Farm Development resulting in surface water overtopping into The Planting.

This report has identified the actions and responses of the Risk Management Authorities who have responsibilities during a flood event in Whixley.

The Flood Risk Management team has supported the residents at the Cherry Tree Farm House in obtaining a Flood Resilience Grant, has coordinated with other Risk Management Authorities to investigate the flood event that occurred in Whixley, and has undertaken drainage investigations along Starra Field Lane.

The County Council as Highway Authority carries out regular maintenance of the highway drainage system, and has undertaken maintenance activities such as jetting and repair of gully pots after the flood event in Whixley.

Yorkshire Water Services Ltd has undertaken inspections and has confirmed the presence of roots and concrete in the foul sewer in Back Lane which prevented the free flow of effluent. These obstructions were subsequently cleared.

North Yorkshire Fire and Rescue Service was in attendance during the flood event. It undertook pumping operations to alleviate flooding to the Cherry Tree Farm Development. In addition it constructed a temporary bund to divert excess surface water into a ditch which alleviated flooding along Church Street.

Following the Boxing Day 2015 flood event, the owner of Cherry Tree Farmhouse has constructed a new masonry wall to stop surface water runoff from Church Street entering the property, and the riparian owner of a critical ditch system has carried out maintenance work on the ditch.

3 Introduction

3.1 Flood and Water Management Act (2010)

In his review of the summer 2007 floods, Sir Michael Pitt recommended that local authorities should be given a duty to investigate flooding.

The Flood and Water Management Act 2010 (FWMA), defines the roles and responsibilities of 'Risk Management Authorities' and designates the unitary or upper tier authority for an area as Lead Local Flood Authority (LLFA).

The LLFA has responsibility for leading and co-ordinating local flood risk management. Local flood risk is defined as the risk of flooding from surface water runoff, groundwater and small ditches and watercourses (collectively known as ordinary watercourses). The responsibility to lead and co-ordinate the management of tidal and fluvial flood risk remains that of the Environment Agency (EA).

The Act also implements the recommendations made by Sir Michael Pitt that local authorities should have a duty to investigate flooding from all sources.

3.2 Section 19 Investigation Requirement

North Yorkshire County Council (NYCC), as LLFA, has a responsibility under Section 19 of the FWMA to investigate significant flood incidents in its area. Section 19 States:

(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.

Section 14 of the FWMA grants the LLFA power to request information associated with its functions. These powers have been exercised in the preparation of this report.

3.3 Trigger for Section 19 Report

The incident has been assessed in line with the criteria set out in Section 3 of the North Yorkshire County Council Local Flood Risk Strategy (2015) and has been judged to warrant a formal Section 19 investigation on the basis of:

- Number of properties internally flooded.
- The depth, area or velocity of flooding reported.
- The frequency of flooding.
- The nature and extent of critical infrastructure impacted by the flood.

3.4 Location

Whixley is an historic village situated in the Harrogate Borough of North Yorkshire. Whixley is home to approximately 800 people and predominately consists of residential buildings¹. Whixley (Grid Reference: SE 44183 57935) is located 3.5km east of the A1 and 1.5km north of the A59, as shown in figure 2.1.

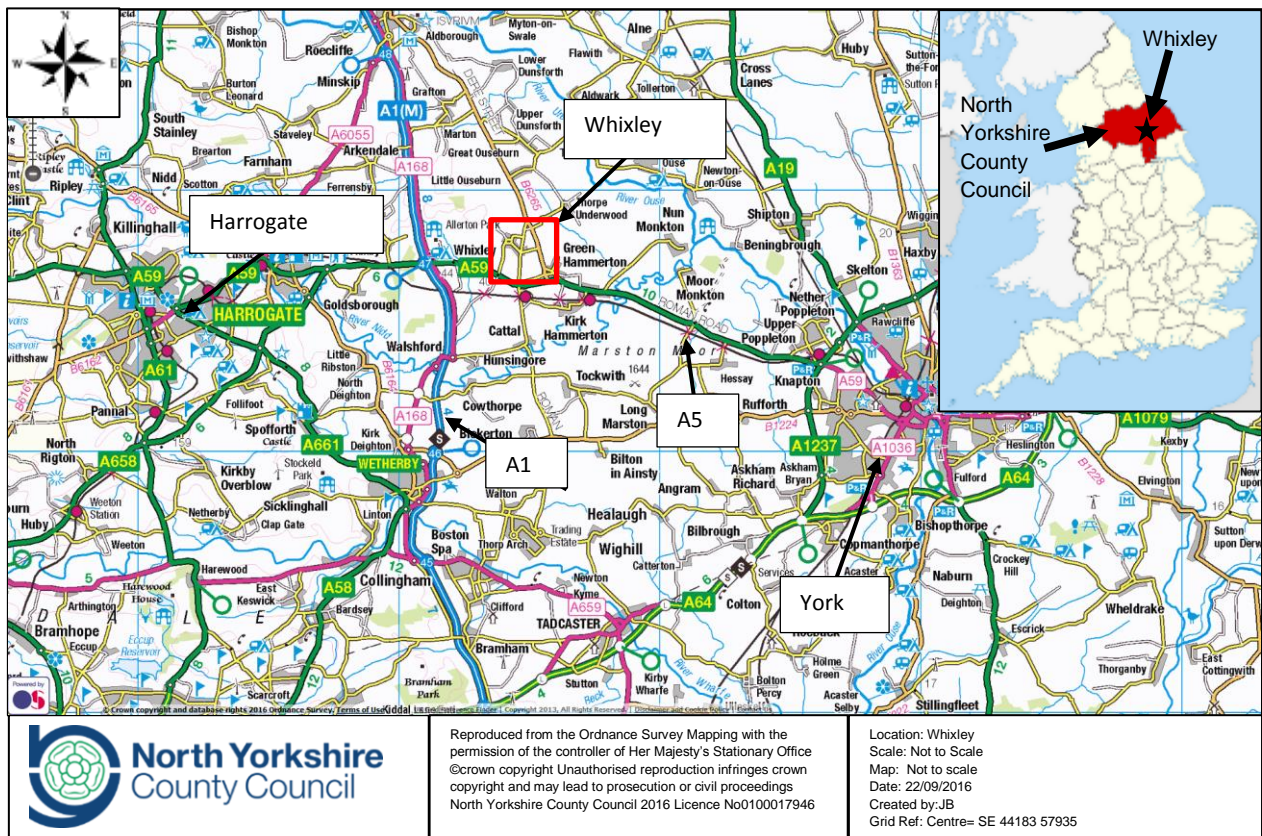


Figure 2.1 Whixley Location Map (Source: NYCC)

This report will investigate the flooding that occurred in Whixley, on Boxing Day 2015, where four properties were damaged by flood water. This report will focus on the flood damaged property at Cherry Tree Farm House, located off Church Street, as shown in Figure 2.2.

¹ Census 2011

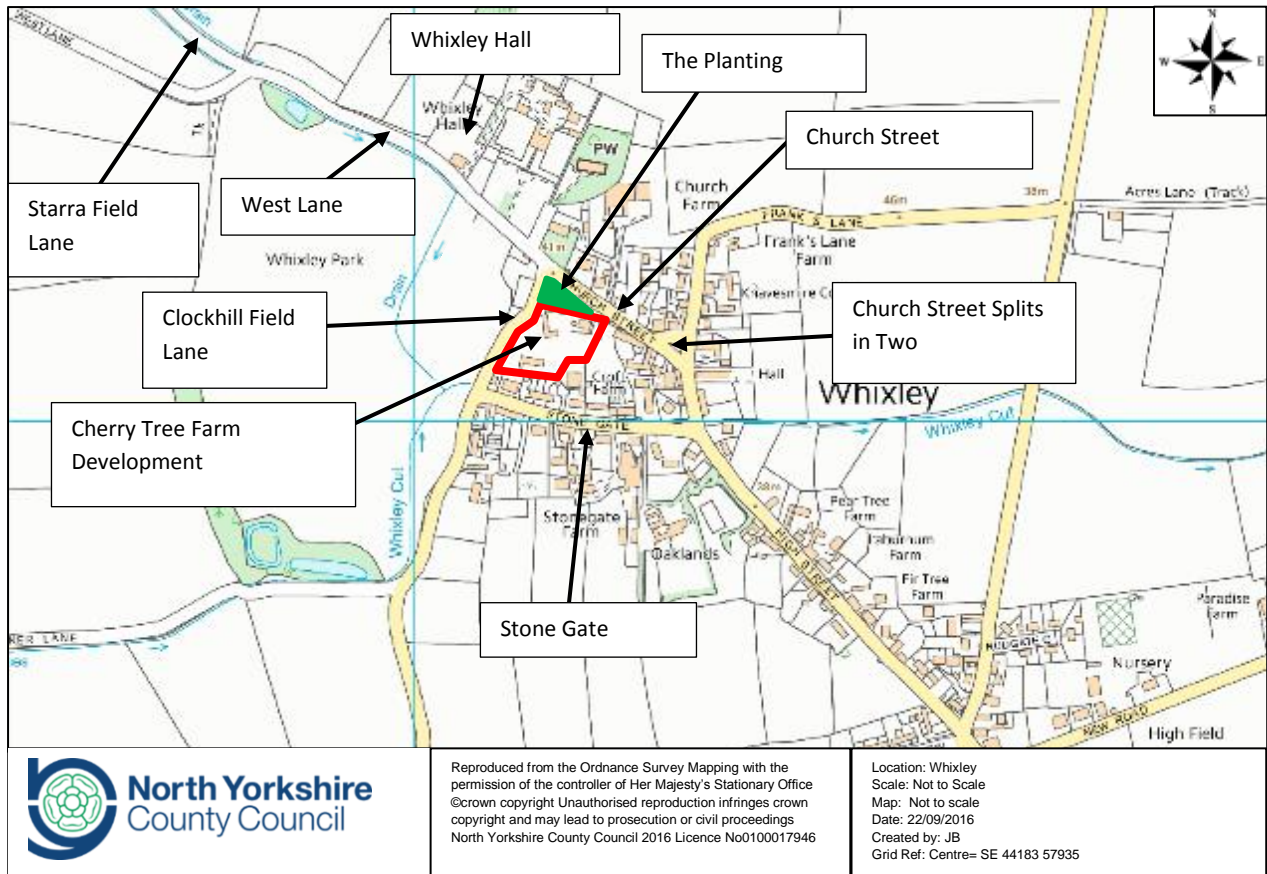


Figure 2.2 Whixley Local Map

3.5 Topography

Whixley is located in the Mid to Lower Nidd Catchment. It is surrounded by agricultural land on gently rolling hill slopes. The land gradient is illustrated on Figure 2.3, which shows a 14.5m change in elevation from the Cherry Tree Farm Development, to the top of Starra Field Lane 1.5km away. The land to the north of Whixley falls towards the Cherry Tree Farm Development.

Church Street falls in elevation from where it joins West Lane to the entrance of the Cherry Tree Farm Development, it then rises to the point where it splits in two, as shown in Figure 2.2.

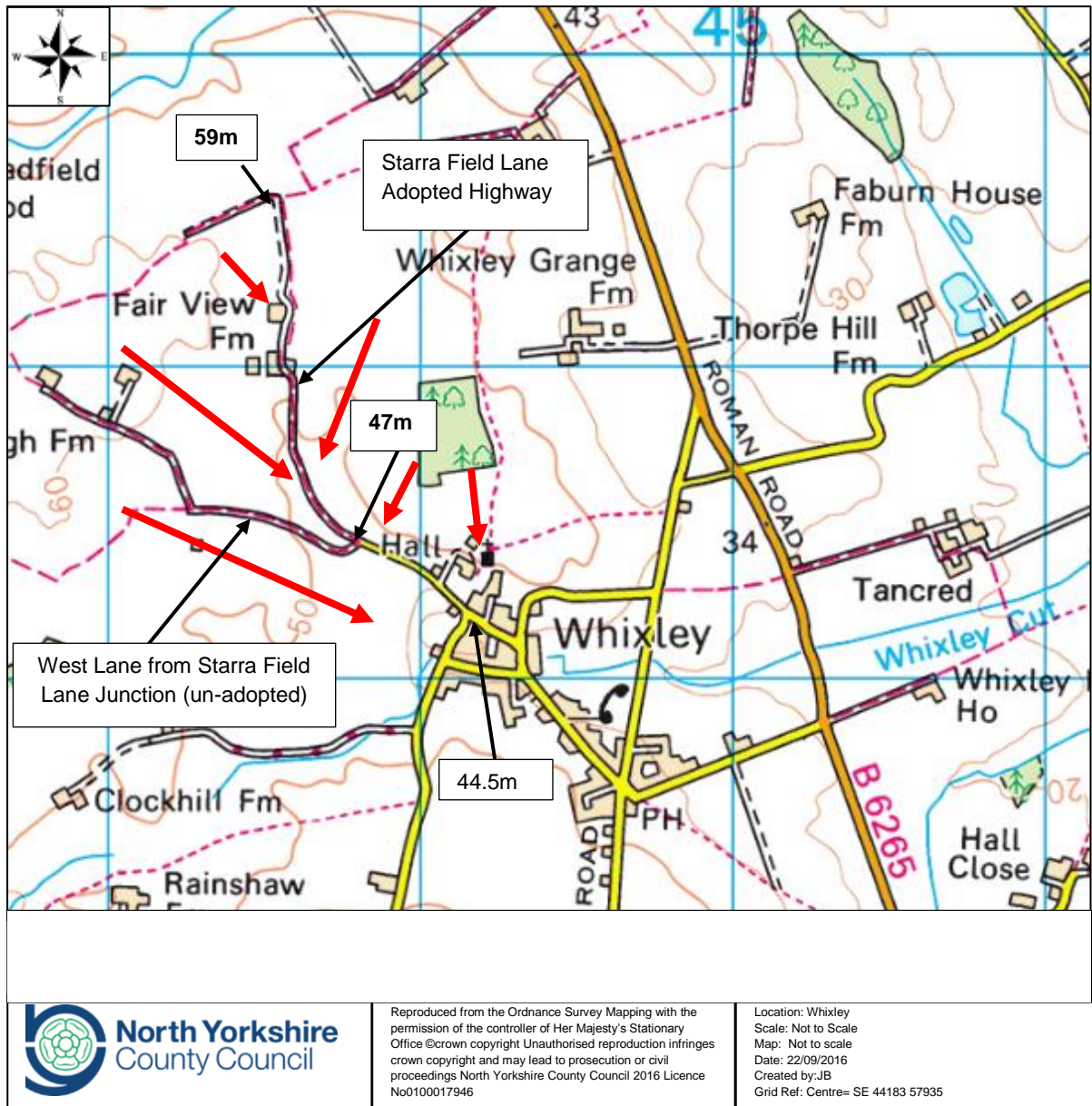


Figure 2.3 Whixley Topography Map

3.6 Watercourses and Ditches

Whixley Cut is the sole watercourse that drains surface water from the central and eastern side of Whixley. Whixley Cut originates on Braker Lane, as shown in Figure 2.4, it follows Braker Lane and proceeds to flow in a northerly direction into Whixley Park.

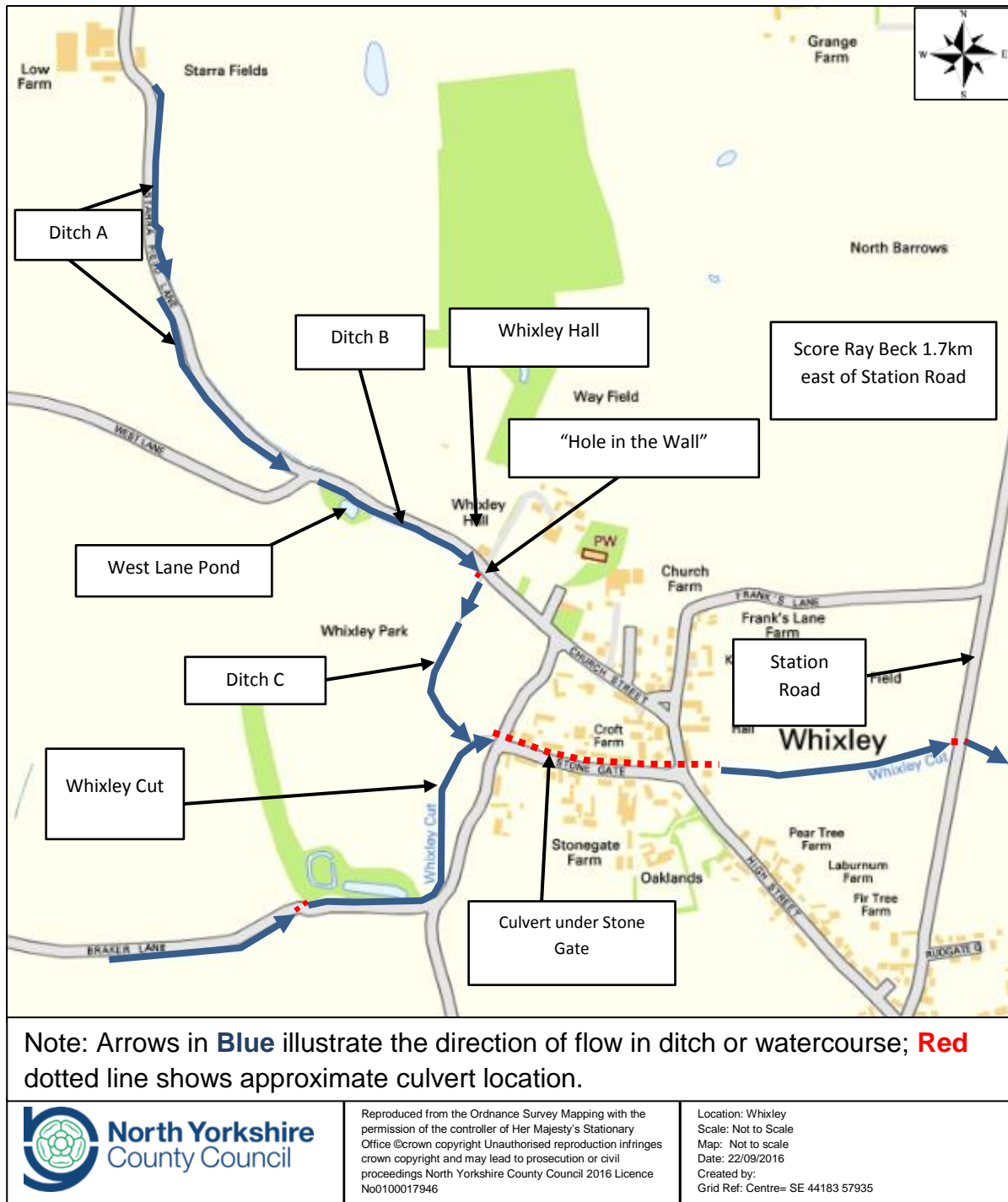


Figure 2.4 Watercourse Map

Ditch B, shown in the photograph in Figure 2.5, runs alongside West Lane from the Starra Field Lane junction to a short section of masonry culvert known as the “*hole in the wall*”, opposite Whixley Hall, photographed in Figure 2.6. Ditch B was overgrown and had a considerable amount of debris in the channel.



Figure 2.5 Photographs of West Lane Ditch



Figure 2.6 Photograph of the Hole in the Wall

After the “Hole in the Wall” Ditch C flows across Whixley Park and discharges into the Whixley Cut. The Whixley Cut is then culverted under Stone Gate and proceeds to flow to the east of Whixley in an open ditch and discharges into the Score Ray Beck, 2km to the east.

The key characteristics of the geology, soils and drainage of the surrounding land have been identified² as:

² Environmental Assessment Report on the Development Site at Cherry Tree Park, Whixley by Marshall Design Associates of Leeds LS14 1NH Dated March 2010 Project 8312

- Sherwood sandstone solid geology, overlain with till and sandy till drift geology.
- Deep, well drained, coarse loamy, slowly permeable brown soils with some light seasonal water logging.

3.7 Highway Drainage

The highway drainage on Church Street is via a mixture of 'set in' gullies and conventional gully grates, as shown in Figure 2.7, which feed into a 600mm brick culvert that runs along Church Street.

The 600mm brick culvert reduces down to a 150mm pipe, after the new highway gully, as shown in Figure 2.8. The system is routed under Cherry Tree Farm Development, where one section of the system is reduced down to a 100mm pipe, as shown in Figure 2.9. The system discharges into the culverted section of the Whixley Cut under Stone Gate, as shown in Figures 2.9³.



Figure 2.7 Church Street highway drainage gullies

³ Verbal reports from NYCC Highways

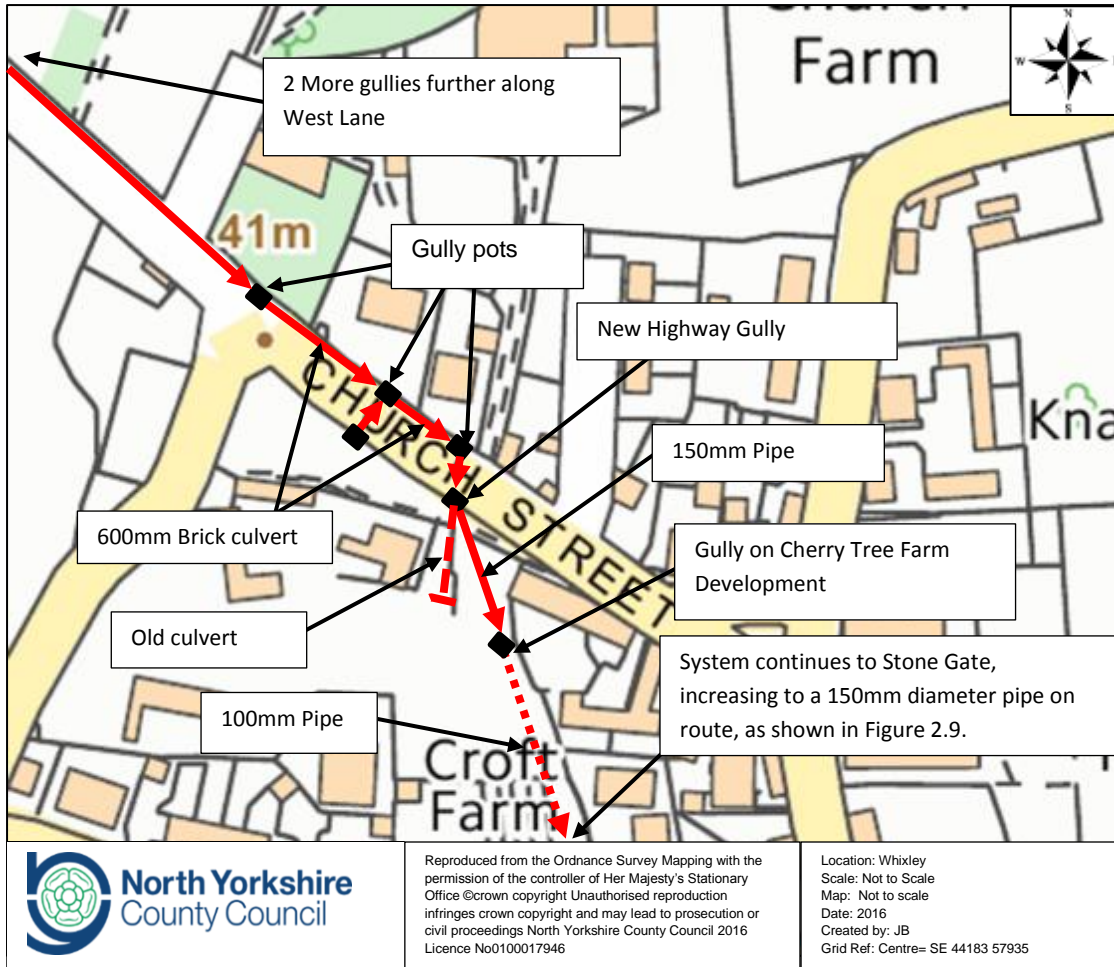


Figure 2.8 Highway Drainage on Church Street (Source: NYCC)

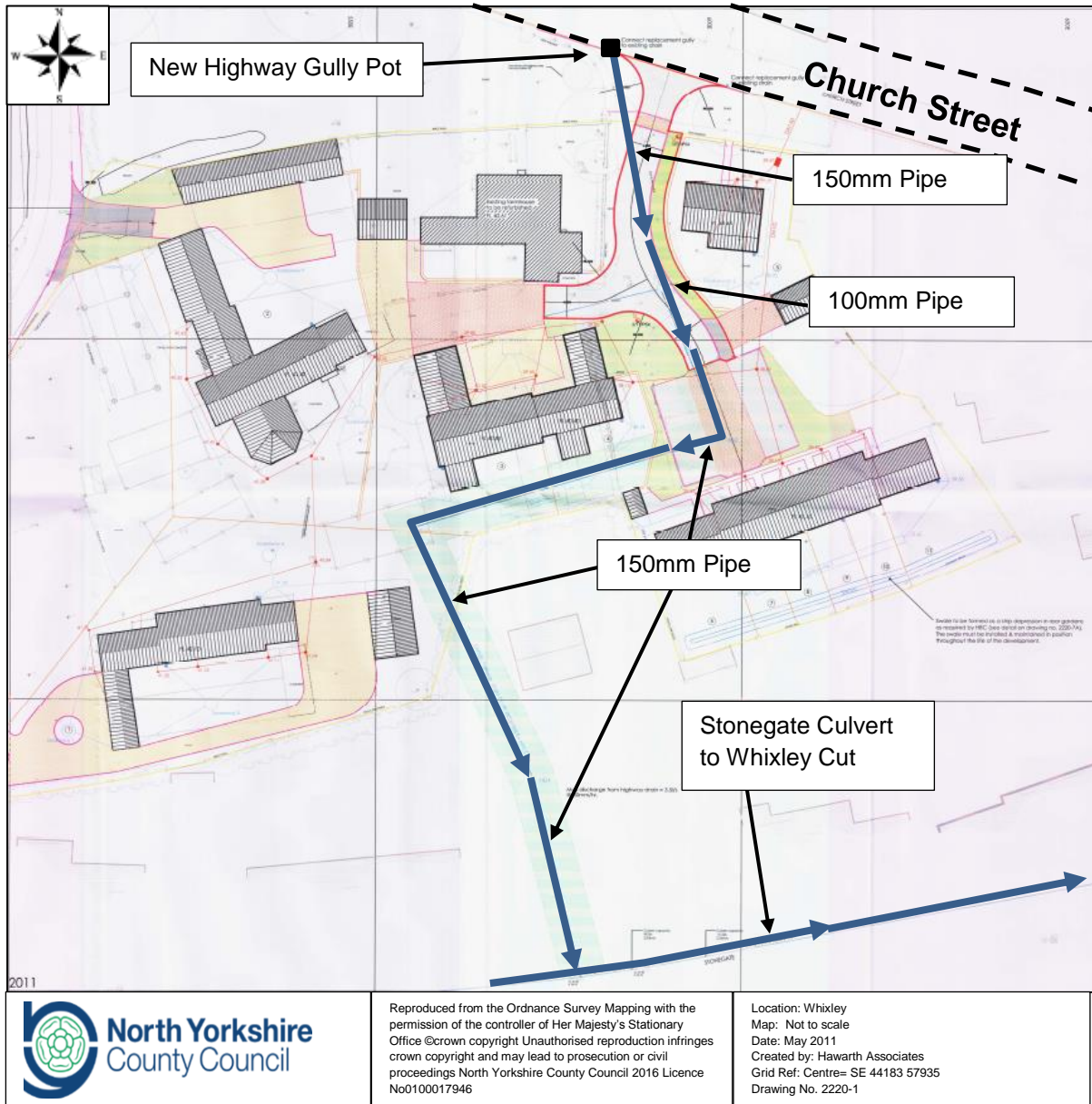


Figure 2.9 Highway drainage discharge pipe

Most of the highway on West Lane drains via a ditch (Ditch B, discussed in Section 2.6). Ditch B does not run the whole length of West Lane. From Whixley Hall to Church Street the highway drainage is taken via ‘set in’ gullies that connect to the highway drainage system on Church Street.

The ditch does not carry all of the West Lane surface water because the grass edge verge from the Starra Field Lane junction to the “the hole in the wall” does not allow free flow of rainwater from the carriageway surface into this ditch.

3.8 Public Sewers

Whixley has a foul water system owned by YWSL. The foul water system for the Cherry Tree Farm Development takes discharges from the properties to the main carrier on Church Street, as shown in Figure 2.10. The main carrier on Church Street flows east, and joins the foul sewer from Frank's Lane, which flows down High Street and then exits the village to the East⁴.

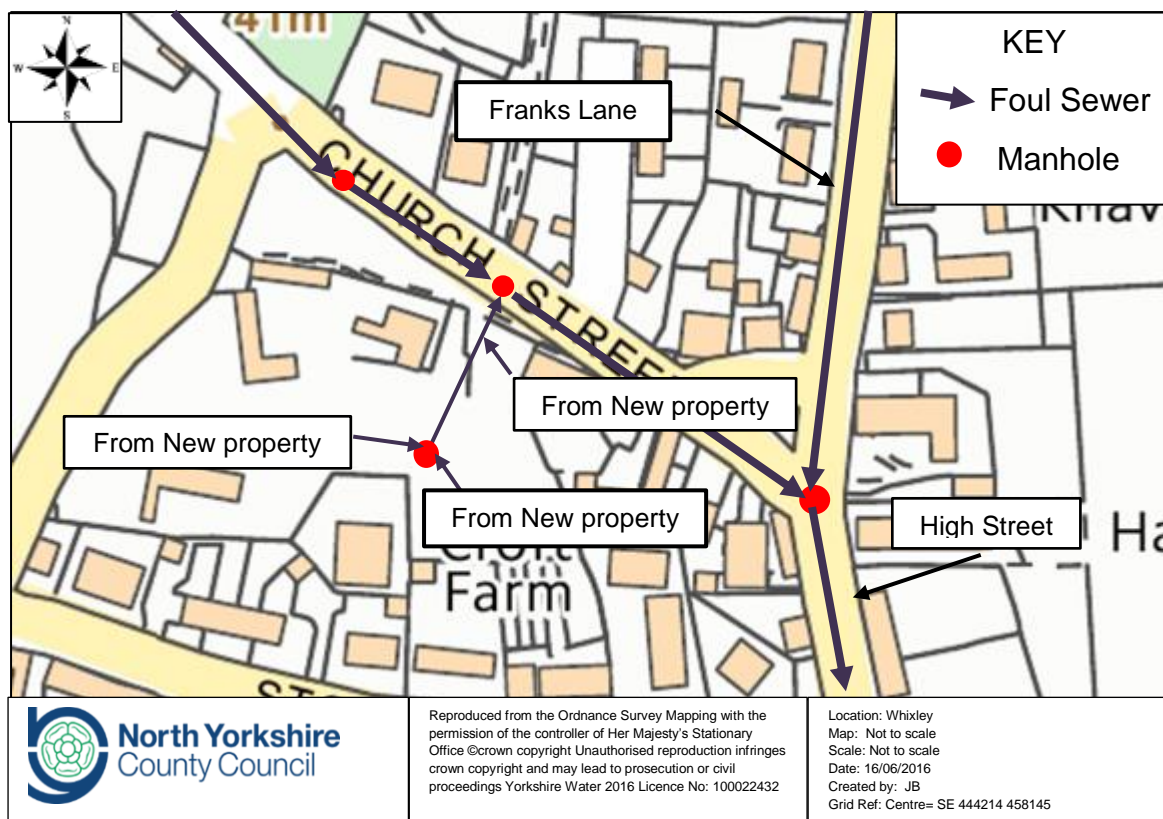


Figure 2.10 Foul water system at Cherry Tree Farm Development (Source: NYCC)

There are a limited number of formal surface water systems in Whixley. Some properties were seen to discharge roof drainage directly onto the highway.

3.9 Cherry Tree Farm Development

Cherry Tree Farm development built by David Holmes Properties Ltd, involved the conversion of two barns and the construction of new properties to create 9 dwellings, as shown in Figure 2.9 and 2.12 below⁵.

Anecdotal evidence advised that excessive rainfall had occurred twice in the last 10 years causing surface water flooding on this development site. In 2012, prior to development, a significant rainfall event resulted in excess surface water from West

⁴ Yorkshire Water sewer records

⁵ Planning application 10/03287/FULMAJ 12th February 2013 for 9 dwellings - the David Holmes Properties Ltd development.

Lane and Church Street flowing into Cherry Tree Farm. The pond that was previously located in the middle of the farm collected the excess surface water and discharged to the Whixley Cut culvert.

At some previous date a functioning culvert/sewer existed to carry West Lane/Church Street surface water to the Stonegate Whixley Cut culvert through the Cherry Tree Farm site prior to the development commencing. A *Flood Risk Assessment Report* (Ref 2220) by Howarth Associates undertaken in 2010 for the planning application states that part of this system was removed during the extension of Number 5 Stone Gate⁶.

A review of the EA Flood Maps for Surface Water show there is a significant surface water flow path flowing northwest to southeast originating from Starra Field Lane, as shown in Figure 2.11.



Figure 2.11 Whixley flow path map. (Source: EA)

The development has vehicle access at three locations; one off Church Street, and two off Clockhill Field Lane. Surface water runoff from the development is managed via a conventional gully and sewer system with an additional 10 soakaways, as shown in Figure 2.12 below.

⁶ Flood Risk Assessment Report March 2010 Ref 2220 by Howarth Associates

The highway accesses and drainage proposals for the development were approved by NYCC and YWSL during the planning application stage in 2010.

Drainage for the new dwellings was designed to accommodate a 1 in 100 year storm event plus 30% factor for climate change. Threshold levels for new development were to be 800mm above the design flood level (46.35 AOD).

The Howarth Associates Flood Risk Assessment identified a need to reduce runoff at the site using a number of solutions including water butts, rainwater harvesting and attenuation. Further ground investigation involving percolation tests by David Holmes Property Ltd identified that the existing infiltration rates should permit soakaways that could be designed to achieve a 30% reduction in offsite flows.

Therefore, Cherry Tree Farm Development surface water is managed through the use of soakaways installed throughout the site and a 100mm carrier drain.

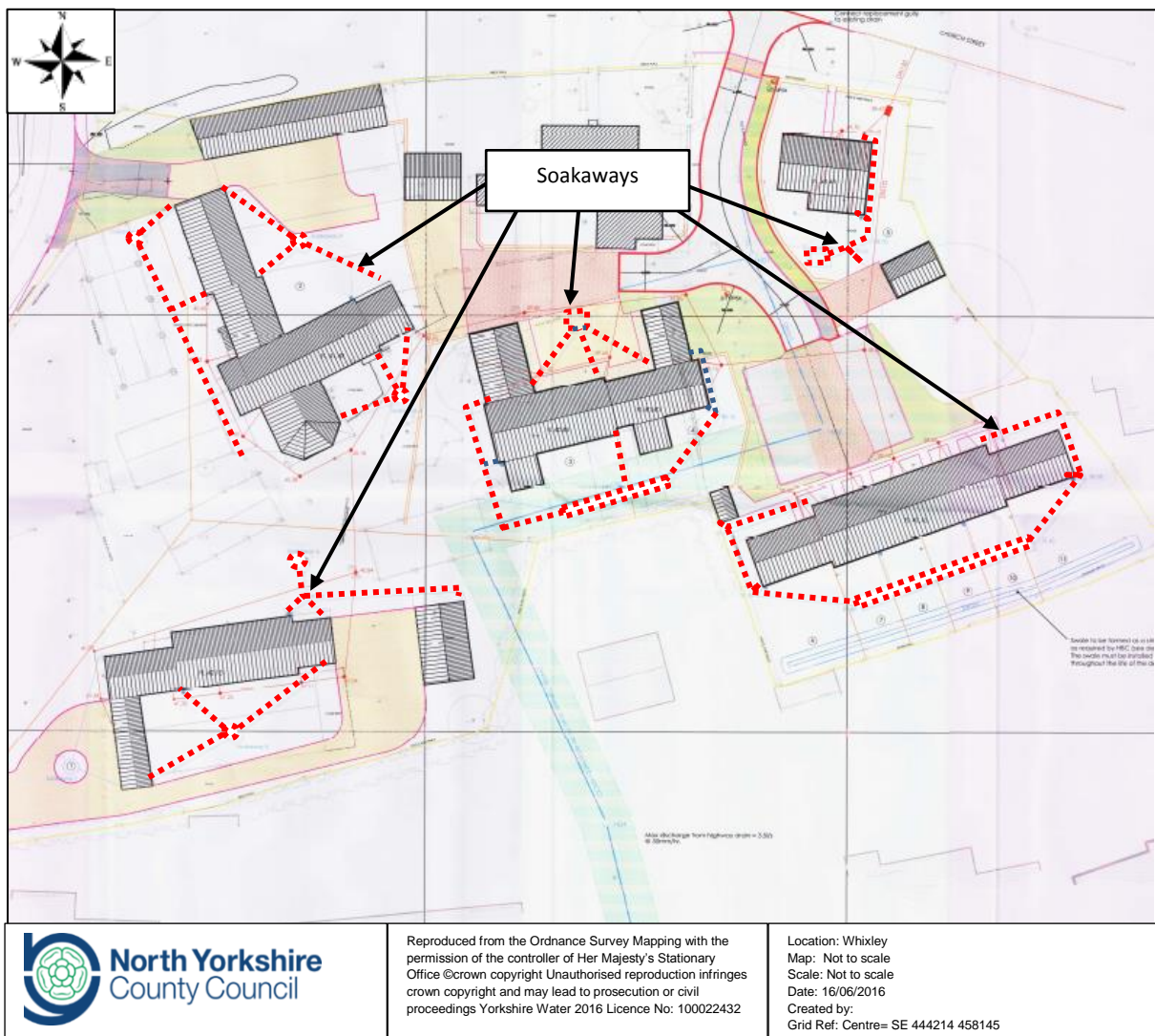


Figure 2.12 Cherry Tree Farm Development soakaway plan

There is a road “hump” at the Church Street entrance to the development to prevent excess surface water entering the Cherry Tree Farm Development from Church Street.

4 Flood Event

4.1 Rainfall data

4.1.1 Meteorological Conditions

The rainfall event was characterised by two distinct systems. The first rainfall system was Storm Eva, which brought high winds and a band of rain which spread across the country on the 23rd & 24th December 2015. The second system was a slow moving low pressure system and warm frontal zone, moving across the region from the west, on the 25th and 26th of December. The rainfall which caused the flooding was brought on by the weaker second low pressure system.⁷

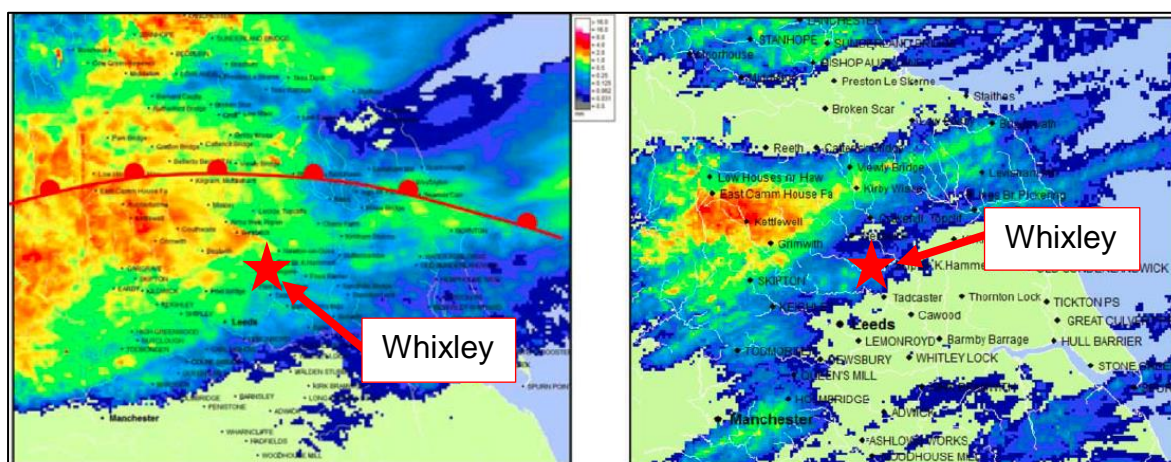


Figure 3.1 Radar image with overlaid front as of 18:00 on 25th December 2015 (left) and 01:00 on 26th December 2015 (Right) Copyright Meteorological Office

A warm frontal zone passed over the UK during the morning of 25th December, bringing scattered showers with it, and by midday there was a blanket of rainfall covering Yorkshire.

During the evening of the 25th December an occluded front had set over the northwest and northeast and it was this front which produced the more intense storms.

There were two main pulses of heavy rainfall that led to the flooding experienced over Yorkshire. The first pulse occurred once the occluded front had formed during Christmas Day afternoon and evening. The second pulse occurred in the early morning of Boxing Day. The two main pulses of heavy rainfall were mainly confined to the upper catchment of rivers Aire, Calder, Wharfe and Swale.⁷

⁷ Environment Agency, Hydrology of the December 2015 Flood in Yorkshire, 25th – 29th December 2016. April 2016

4.1.2 Antecedent conditions

A data set from the National Climate Information Centre (NCIC) shows the wettest rankings for November 2015. The percentage of the Long Term Average (LTA) rainfall in the wettest catchments exceeded 200%, with the Nidd catchment reaching 230% in November 2015. This indicates that the ground was already saturated from rainfall in November, prior to the exceptionally wet December 2015.⁷

Thus before the event the northern and western catchments of Yorkshire had generally received more than the LTA rainfall for December, particularly in the upper catchments. The catchments were already saturated before the Christmas Day and Boxing Day rainfall event.⁷

4.1.3 Whixley Rainfall Event

YWSL has provided rainfall radar data for the rainfall event in the Whixley area. This data shows that the peak rainfall fell on Boxing Day, producing a rainfall depth of 31mm in 10.5hours, and a second lower peak on Christmas Day of 19mm in 7hours.⁸

Environment Agency tipping bucket rain gauge (TBR) rainfall data has been provided for York Acomb Landing, 14.5km away from Whixley. The rainfall data is illustrated in Figure 3.2. The data from the TBR shows two rainfall events on the 25th and 26th of December 2015.

The rainfall event on the 25th started at 12:00 and finished at 23:00. The rainfall event on the 26th started at 02:30 and finished at 14:00 reaching a peak at 08:00. The total rainfall depths on Christmas and Boxing Day were 22.6mm and 34.2mm respectively.⁹

Comparison of the data from York Acomb with rainfall radar data from YWSL shows a good match. Within the same time periods as the YWSL data, the York Acomb data indicated a rainfall depth of 34mm on Boxing Day and 17mm on Christmas Day.

⁸ Rainfall Radar data, Yorkshire Water Services Ltd

⁹ Hydrometric data, Environment Agency

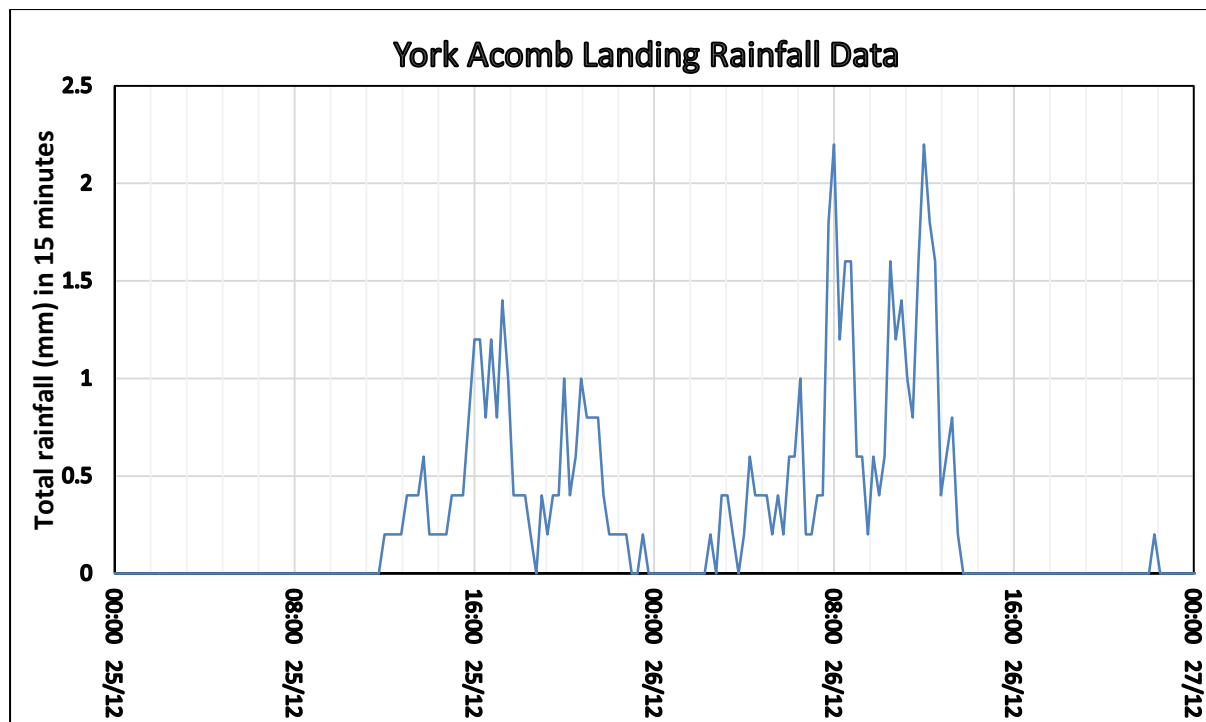


Figure 3.2 Rainfall Data for York Acomb Landing on the 25th and 26th of December.

4.2 Description of events

The rainfall events over the Christmas period resulted in the flooding of Cherry Tree Farmhouse on the 26th of December.

The 11hour rainfall event on the 25th December 2015 fully saturated the agricultural land surrounding Whixley. The second pulse of rainfall started at 2:30am on the 26th December and fell on already saturated ground. This resulted in a large volume of surface water, following the natural topography, towards Whixley from the northwest, via West Lane onto Church Street, as shown in Figure 3.3.

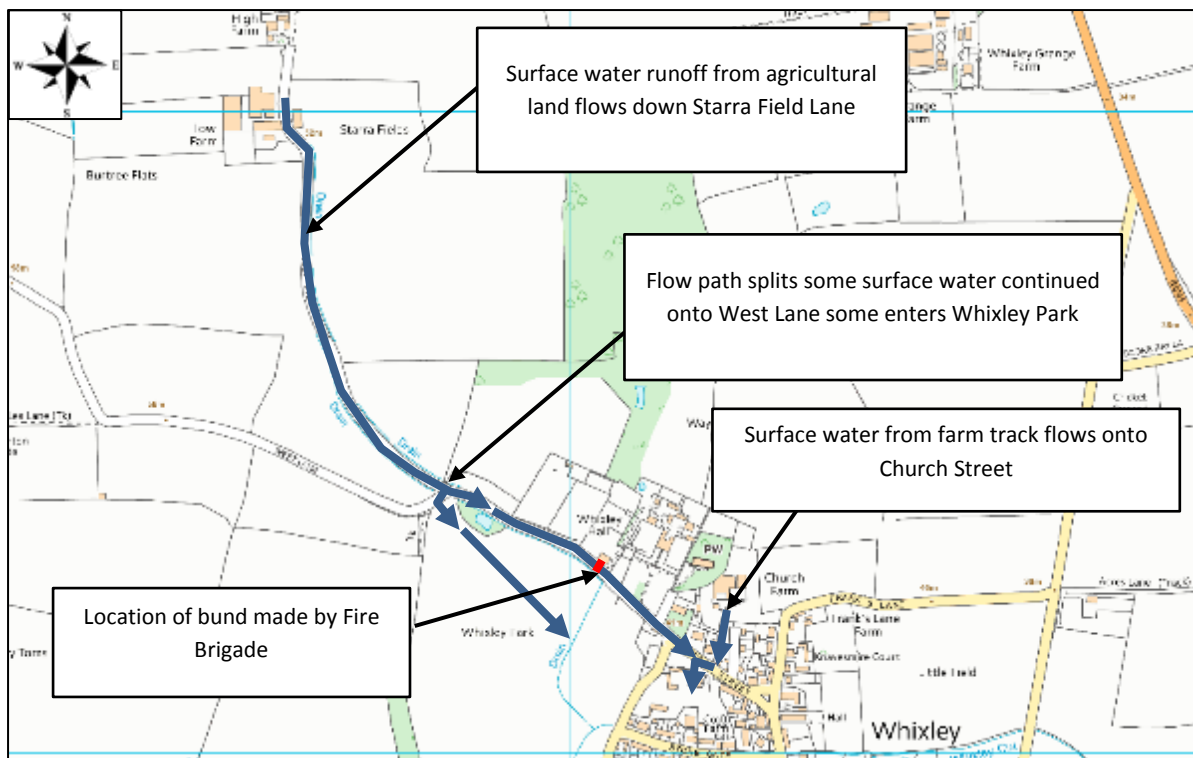


Figure 3.3 Surface water flow path during the 25th and 26th December.

Excess surface water on Church Street overwhelmed the drainage infrastructure and began to pond at a low point at the entrance to Cherry Tree Farm Development, as shown in Figure 3.4.

Surface water was reported to be surcharging from the existing culvert and highway drainage systems. It is also reported that excess surface water was flowing down the private lane opposite Cherry Tree's Church Street entrance. It was reported that this lane conveyed a significant amount of surface water and debris.¹⁰

¹⁰ Verbal report by local resident



Figure 3.4 Photograph showing ponding on Church Street

The raised access hump to the entrance of Cherry Tree Farm Development prevented surface water from flowing into the site. Surface water consequently overtopped the highway kerbs on Church Street and spilled into “The Planting”¹⁰.

The surface water continued to overflow through the gate belonging to Cherry Tree Farmhouse and entered the internal ground floor. The owner of Cherry Tree Farm House reported that his cellar was flooded by 7am on Boxing Day.

It is possible that some surface water is entering the foul sewer, as there was a report from a resident that his toilet was bubbling, which is a sign that additional flows are entering the foul sewer system and is a common occurrence in flood events¹⁰.

During the event North Yorkshire Fire and Rescue Service (NYFRS) was in attendance. NYFRS pumped surface water from the manhole opposite Cherry Tree Farm House on Church Street to Whixley Park. It is understood that NYFRS also partially bunded off West Lane to divert the excess surface water into Ditch B, as shown in Figure 3.5.

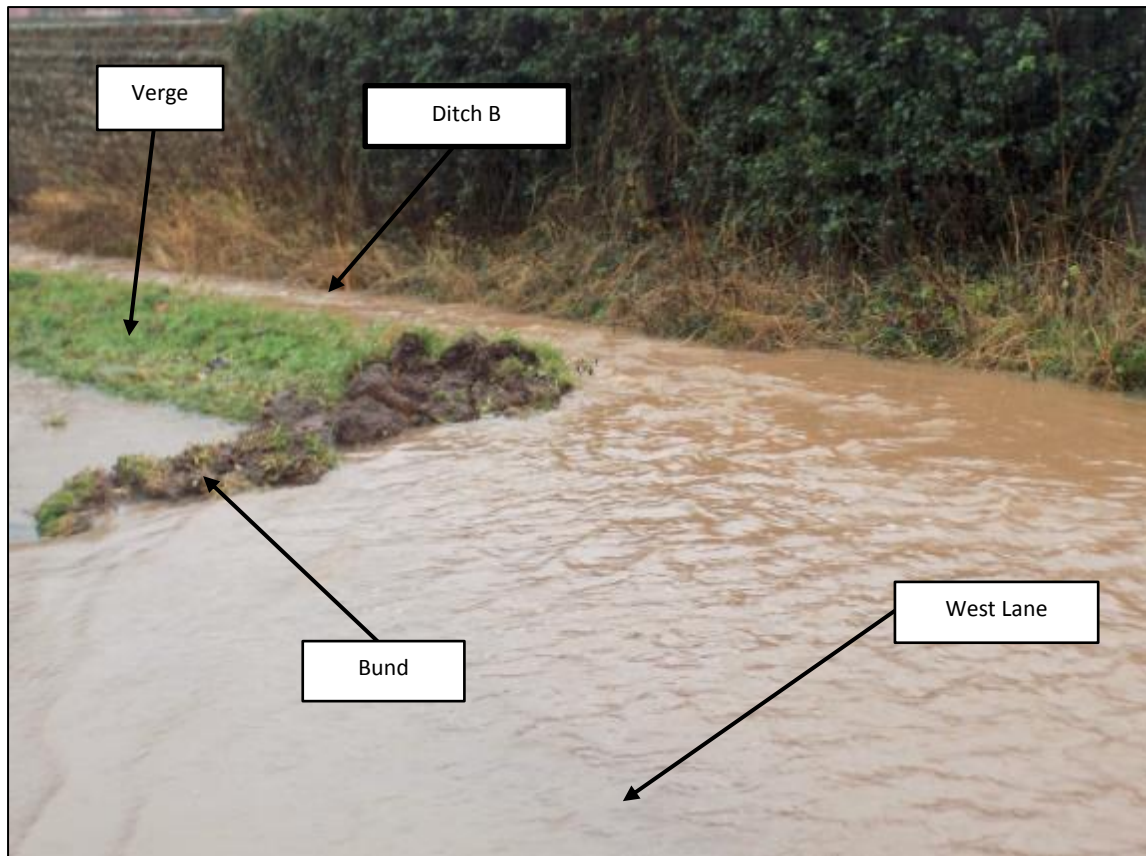


Figure 3.5 Photograph showing the system used to drain West Lane surface water into Ditch B.

Back Lane, Rudgate Grove and Stonegate

It is reported that properties along Back Lane and Rudgate Grove suffered internal flooding, from the foul sewer system surcharging, during the flood event.

It is also reported that properties along Stonegate suffered minor surface water flooding problems with runoff from the highway during the intense rainfall.

5 Risk Management Roles, Responsibilities and Actions

5.1 RMA Responsibilities

5.1.1 Environment Agency

Under the FWMA the Environment Agency (EA) has a strategic overview role for all sources of flooding as well as an operational role in managing flood risk from Main Rivers, reservoirs and the sea. As part of this role the EA has developed a National Flood and Coastal Erosion Risk Management Strategy for England – ‘Understanding the Risks, Empowering Communities, Building Resilience.’

This national strategy outlines the EA’s strategic functions as:

- Ensuring that flood risk management plans (FRMPs) are in place and are monitored to assess progress. The plans will set out high-level current and future risk management measures across the catchment.
- Publishing and regularly updating its programme for implementing new risk management schemes and maintaining existing assets.
- Supporting risk management authorities’ understanding of local flood risk by commissioning studies and sharing information and data.
- Supporting the development of local plans and ensuring their consistency with strategic plans.
- Managing and supporting Regional Flood and Coastal Committees and allocating funding.

The EA’s operational functions include:

- Risk-based management of flooding from Main Rivers including permissive powers to do works including building flood defences.
- Regulation of works in Main Rivers through the consenting process.
- Regulation of reservoirs with a capacity exceeding 10,000m³.
- Provision of a flood forecasting and warnings service, working with the Met Office Hazard Warning Service.
- The maintenance and operational management of Main River assets including flood defences.
- Statutory consultee to the development planning process.
- The power to serve notice on any person or body requiring them to carry out necessary works to maintain the flow in Main Rivers.

‘Main Rivers’ are defined through an agreed map which is updated 2-3 times per year to reflect changes in the designation of a watercourse or in the environment. These Main Rivers tend to be the larger rivers in the country, though some smaller watercourses in sensitive locations are also defined as ‘Main Rivers’.

The EA are also category 1 responders regarding flood risk (Civil Contingencies Act 2004). They are required to warn and inform of flood risk.

5.1.2 Water Company

Water companies in England and Wales are named as a Risk Management Authority under the Flood and Water Management Act 2010 and must have regard to the Local Strategy of the LLFA. They are required to manage risks associated with assets or processes that may cause or be affected by flooding, and must share relevant data with other flood risk authorities.

They also have flood risk management functions under the Water Resources Act (1991). Relevant actions of water companies include: the inspection, maintenance, repair and any works to their drainage assets which may include watercourses, pipes, ditches or other infrastructure such as pumping stations.

The Civil Contingencies Act 2004 (CCA) also designates water and wastewater undertakers as statutory category 2 responders to national disasters and emergencies, placing on them duties to share assured information with other responders in an appropriate manner.

5.1.3 North Yorkshire County Council (NYCC)

NYCC, as LLFA, has flood risk management functions which include (but are not limited to);

- Provision of a Local Flood Risk Management Strategy (LFRMS).
- Designation and maintenance of a register of structures or features that have a significant effect on flood risk.
- Consenting and enforcement works on Ordinary Watercourses.
- Responding to statutory consultations on drainage proposals in planning applications.
- Undertaking Section 19 investigations.

NYCC also has responsibilities as a Highways Authority and as an Emergency Responder (under the Land Drainage Act 1991 and the S19 Flood Investigation Report Civil Contingencies Act 2004 respectively) which may relate to flooding.

Highway Authorities are responsible for providing and managing highway drainage which may include provision of roadside drains and ditches, and must ensure that road projects do not increase flood risk.

The Highways Authority has a duty under the Highways Act 1980 to maintain highways that are maintainable at public expense. This includes a duty to maintain existing highway drainage. Highway drainage systems are designed to take highway surface water. Highway drainage systems are not designed as “storm drains”, and do not have the capacity for the level of rainfall from an extreme flash

flood. The Highway Authority has powers to improve drainage systems but no duty to do so.

Roadside gullies are subject to routine maintenance in accordance with the NYCC Highway Asset Management Plan. The frequency of cleaning is dependent on an evidence based categorisation of risk, determined by factors relating to the consequence of failure and a range of other operational factors.

5.1.4 District or Borough Council

District and Borough Councils are named as Risk Management Authorities within the Flood and Water Management Act 2010, and are required to comply with the LLFA Local Strategy. Through the planning processes, they control development in their area, ensuring that flood risks are effectively managed.

In addition, in relation to the Civil Contingency Act (2004), the Borough Council:

- Is a Category 1 Responder and may lead recovery work if specific to the Harrogate Borough area.
- Develop specific Multi Agency Flood Plans for known flood risk areas within the Borough.
- On a priority basis, it may provide sandbags to impacted residents and businesses where property is at risk of flooding.
- Support the Emergency Services on request by providing Incident Liaison Officers.
- Participate in identifying vulnerable people within affected areas.
- Provide emergency accommodation – i.e. set up rest centre as required and other welfare provision.
- Assist with arranging transport or evacuating areas.

5.1.5 Internal Drainage Board

Internal Drainage Boards (IDBs) are local operating authorities established in areas of special drainage need (typically low lying areas) in England and Wales. Their primary role is to manage water levels and reduce the risk from flooding within their designated drainage districts. Their work includes;

- Maintenance and improvement works on watercourses and related infrastructure.
- Consenting works on Ordinary Watercourses.
- Responding to consultations on drainage proposals in planning applications.
- Exercising permissive powers to undertake works where appropriate.

In managing water levels IDBs also have an important role in reducing flood risk in areas beyond their administrative boundary.

5.1.6 All Risk Management Authorities

All RMAs under the Flood and Water Management Act (2010) have a responsibility to cooperate and coordinate with regards to their flood risk management functions, including raising awareness of flood risk and the sharing of information.

5.1.7 Riparian Owners

Landowners whose land is adjacent to a watercourse are known as 'riparian owners'.

A landowner can be an individual e.g. home owner or farmer, private business or an organisation e.g. the district council as park owner, on school grounds the county council as property owner.

A watercourse is defined as every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and feature through which water flows, but which does not form part of a Main River.

Riparian owners have legal duties, rights and responsibilities under common law and the Land Drainage Act 1991 for watercourses passing through or adjoining their land. These responsibilities are to:

- Pass on the flow of water without obstruction, pollution or diversion affecting the rights of others.
- Accept flood flows through their land, even if these are caused by inadequate capacity downstream.
- Maintain the banks and bed of the watercourse and keep structures maintained.
- Keep the bed and banks free from any artificial obstructions that may affect the flow of water including clearing litter, heavy siltation or excessive vegetation.

Guidance on the rights and responsibilities of riparian ownership are outlined in the Environment Agency publication 'Living on the edge', available at:

<http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx>

5.2 Actions and Responses to December 2015 Floods

5.2.1 North Yorkshire County Council as Lead Local Flood Authority

The Flood Risk Management (FRM) Team provides an overarching view on flood risk management activities within the county. The FRM team has undertaken the following activities;

- Administered the property level resilience grant to permit resilience works to Cherry Tree Farm House.
- Local area officers have coordinated with other Risk Management Authorities to investigate the flood event that occurred in Whixley.

5.2.2 North Yorkshire County Council as Highway Authority

The Highway Authority carries out regular maintenance of the highway drainage system. NYCC Highway Authority has undertaken the following activities;

- Maintenance activities such as jetting and repair of gully pots post flood event in Whixley.
- Drainage investigations along Starra Field Lane. Some minor repairs to a headwall and installation of larger gully grates will be carried out as part of a resurfacing scheme to take place in the 2017/18 financial year
- Installation of a 10m concrete apron to provide a high level flow path to drain water from West Lane into Ditch B at point adjacent to Way Lodge.



No alterations to the surface water drainage system are proposed at this stage.

5.2.3 Yorkshire Water Services Ltd

Yorkshire Water Services Ltd has undertaken the following post flood event activities:

- Inspections confirmed the presence of roots and concrete in the foul sewer in Back Lane, which deterred free flow of effluent. These obstructions were subsequently cleared.

5.2.4 Emergency Services

NYFRS was in attendance during the flood event, It undertook pumping operations to alleviate flooding to the Cherry Tree development. In addition it constructed a temporary bund to divert excess surface water into Drain B which alleviated flooding along Church Street.

5.2.5 Cherry Tree Farmhouse

Following the Boxing Day 2015 flood event, the owner of Cherry Tree Farmhouse has constructed a new masonry wall to stop surface water runoff from Church Street entering the property.

5.2.6 Riparian Owner

The riparian owner (Mr Crowther) of Ditch B has carried out maintenance work on the ditch.

5.3 Conclusions

The 48 hours of heavy rainfall over the 25th and 26th December, falling on an already saturated catchment, placed an unusually heavy load on the local water courses and drainage systems. These systems were overwhelmed and in some locations this flood water found its way into properties.

The volume and speed of surface water coming off agricultural land was a significant factor. Of particular impact were the build-up of surface water from fields to the North and West onto West Lane and the flow path through The Planting into the Cherry Tree Development.

Highway drains and sewers are not built to cope with excessive rainfall events, nor excessive flows from neighbouring land. Nevertheless the depth and duration of flooding can be reduced if water management systems are well maintained and working at their maximum capacity. Although no specific issues with failure due to lack of maintenance have been identified during this investigation, such flood events highlight the importance of maintenance of drainage

This flow far exceeded the capacity of the only feasible drainage route from Church Lane, the 150 mm Ø pipe through the Cherry Tree Farm development to the culvert on Stonegate. Flooding was reduced by the transfer of water from West Lane onto Whixley Park. However, this will have had no impact on water flowing directly onto Church Street from the north.

5.4 Recommendations

To reduce the risk of future flooding in the location, the following recommendations are made:

- The Local Community to engage with HBC Emergency Planning to develop a community emergency response plan and the provision of a sand bag store on West Lane/Church Street. To include a plan for deployment of sandbags to augment action of concrete apron on West Lane.
- A review is carried out of the condition, capacity and connectivity of the drainage systems along Starra Field Lane, West Lane and Church Street. This work to be taken forward by the LLFA, North Yorkshire Highways and local stakeholders working in partnership.
- NYCC in its capacity as LLFA to work with local stakeholders to review condition of local riparian drainage ditches and culverts, with particular focus on the assets draining the catchment surrounding Starra Field Lane and West Lane, and Whixley Cut down stream of the village.

- NYCC in both its capacities as LLFA & Highways Authority to continue to work with local stakeholders to identify other opportunities for restricting/slowing surface water flow from neighbouring farmland in times of extreme rainfall.
- Future development in the area to take into account the management of surface water runoff from the development, and to ensure Sustainable Drainage Systems (SuDS) are used where ever possible.

NYCC as LLFA will continue to work with RMAs, and local stakeholders to develop action plans to address the issues raised in this report.