



North Yorkshire
County Council

Flood Investigation Report Tockwith



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Records of the public sewer system included are a facsimile of the statutory record provided by Yorkshire Water Services Ltd. 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 19's 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

The Ainsty (2008) Internal Drainage Board

Tockwith with Wilstrop Parish Council

Tockwith Residents Community

Delivery Group and Protect Tockwith Emergency Committee

Dates of Inspections

Wednesday 13th September 2016

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1 Executive Summary

Persistent rainfall throughout December 2015 saturated the Nidd catchment. This was further exacerbated by the equivalent to the whole of December's rainfall falling in 48 hours on the 25th and 26th December. This resulted in large volumes of surface water, which overwhelmed the highway drainage, public sewers, land drainage and culverted sections of watercourses and led to the flooding of properties in Tockwith at five separate locations.

New Road Cottages

Surface water runoff from the agricultural land to the south was the primary source of flood water. The highway and land drainage systems were overwhelmed by the volume of surface water.

Marston Road

The Sike Beck was the primary source of flood waters – levels were high due to the rainfall on the catchment to the south. The two culverts in this location had insufficient capacity to deal with the high flows. Consequently, the culverts surcharged causing flood waters to flow onto Marston Road.

If it had not been for the quick and effective actions of the residents and local farmers the extent of flooding along Marston Road had the potential to have caused more extensive internal property flooding.

Prince Rupert Drive

The large catchment area to the south discharged a significant amount of water into the historic culvert system. A 750mm culvert reduces to a 300mm culvert under properties on Prince Rupert Drive, creating a pinch point, and this was the most significant factor contributing to flooding.

Blind Lane

Blind Lane was flooded by surface water runoff from agricultural land. There appears to be no outfall for the water draining from this area. Extensive flooding to gardens and internal property flooding occurred.

Westfield Road and Fleet Lane

Properties along Westfield Road and Fleet Lane were affected by flood water contaminated with sewage, indicating that the separate foul sewer received surface water which caused the sewer to overflow.

2 Introduction

2.1 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.

2.2 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.

2.3 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

2.4 Location

Tockwith is a historic village situated in the Harrogate district of North Yorkshire and is home to approximately 1600 residents¹. Tockwith contains a combination of commercial and residential properties. Tockwith (Grid Reference: SE 46490 52458) is located 5km east of the A1, 12km west of York and 1km south of the River Nidd, as shown in Figure 2.1. To the south of the village there is a disused World War 2 Airfield and a Driving Training centre.

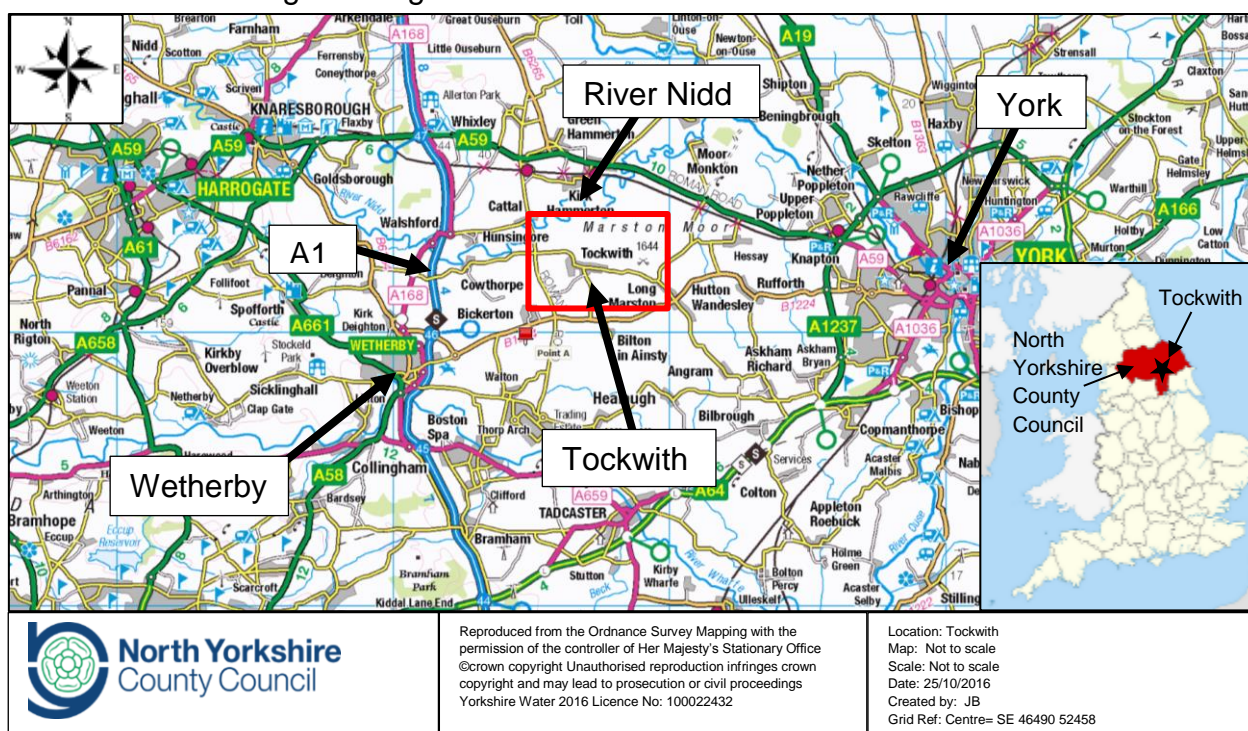


Figure 2.1 Tockwith Location Map (Source: NYCC) (Refer to Tockwith Figure Document)

The report will investigate the mechanisms of flooding that resulted in internal flooding of 20 properties in Tockwith on Boxing Day². These were all residential properties, located on Marston Road, Price Rupert Drive, Ness Lane, Blind Lane, and Westfield Road.

¹ Census 2011

² Reports of Flooding Map, NYCC

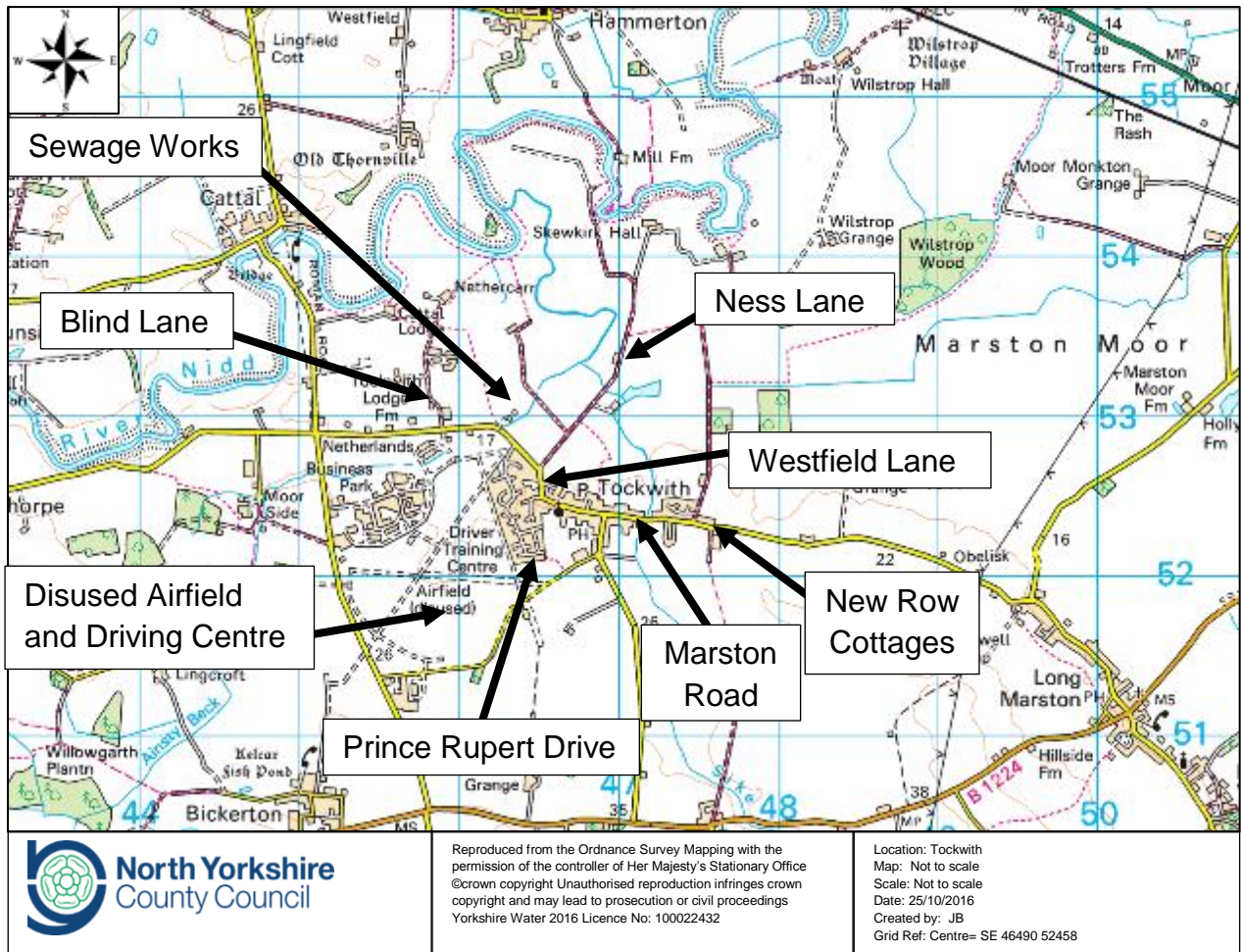


Figure 2.2 Tockwith Local Map

2.5 Topography

Tockwith is situated in low lying flat land. The surrounding land is predominately agricultural and has a gentle gradient towards the River Nidd³. The disused airfield and agricultural land, to the south slope towards Tockwith, as shown in Figure 2.3. The approximate height above sea level of the locations of interest³ range between 15m to 20m.

³ OS Maps

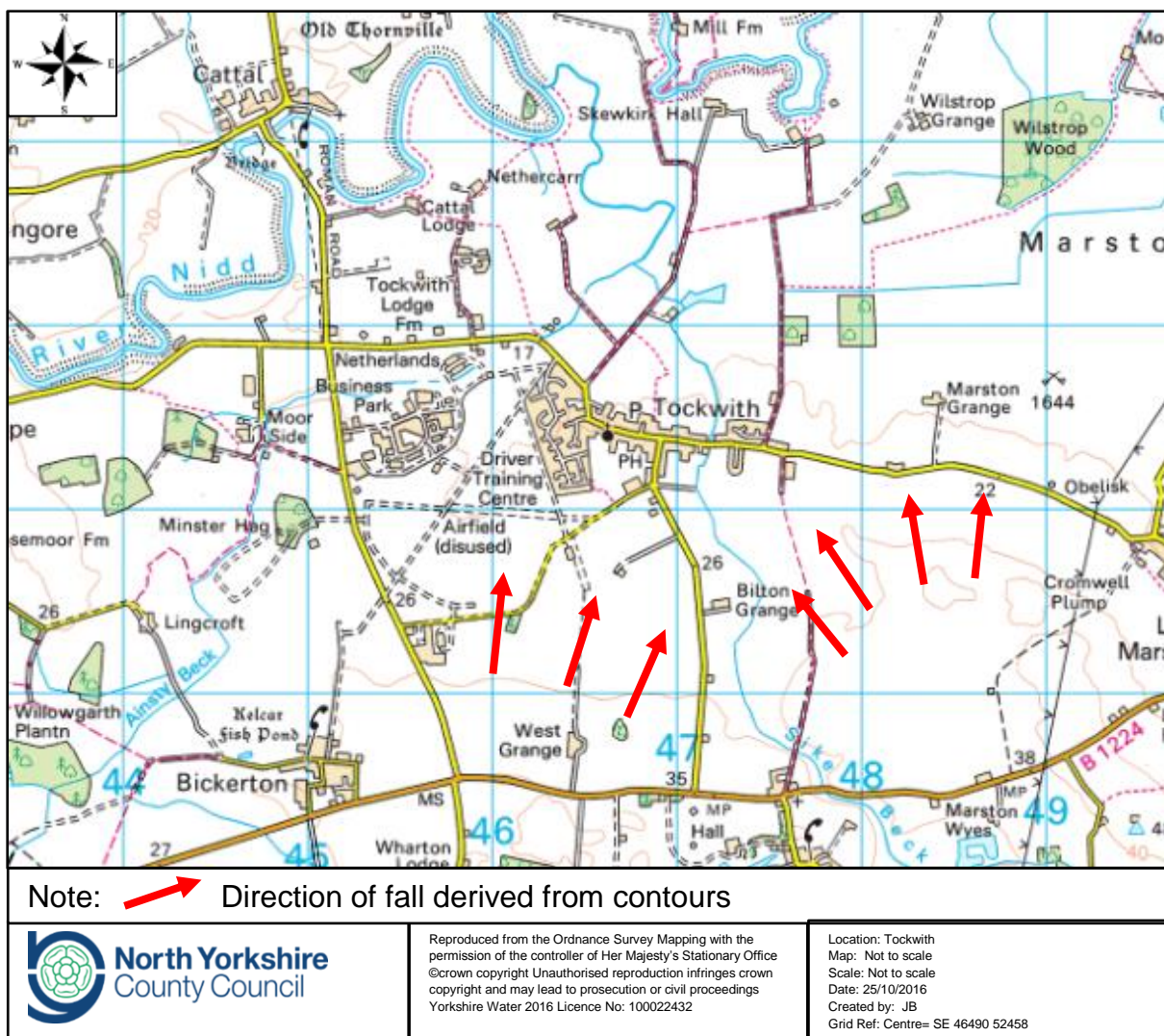


Figure 2.3 Tockwith topography map (Source: NYCC)

2.6 The River Nidd and local tributaries

Tockwith is located in the Lower Nidd catchment area⁴. The River Nidd is classified as a Main River running 90km from its source at Nidd Head Spring (595m above sea level), in the Yorkshire Dales, to Nun Monkton where it discharges into the River Ouse⁵. The River Nidd catchment is primarily rural and agricultural except for Harrogate and Knaresborough⁶, which are urban. The River Nidd meanders over a significant length approximately 1km north of Tockwith.

There are two small tributaries discharging into the River Nidd that flow through the village, in addition to White Sike drainage ditch to the north east of the village which takes surface water from land drainage, highways and agricultural runoff, as shown in Figure 2.4.

⁴ Catchment Data Explorer, Environment Agency

⁵ River Nidd and Wharfe Fact File, Environment Agency

⁶ Mid and Lower Nidd Catchment, Yorkshire Dales River Trust

Sike Beck flows from the south of the village, it is culverted within the grounds of 46 Marston Road, travels in an open channel for approximately 10m and then proceeds to be culverted under Marston Road⁷. Sike Beck then proceeds to flow north under Ness Lane, meets Fleet Beck and ultimately discharges into the River Nidd.

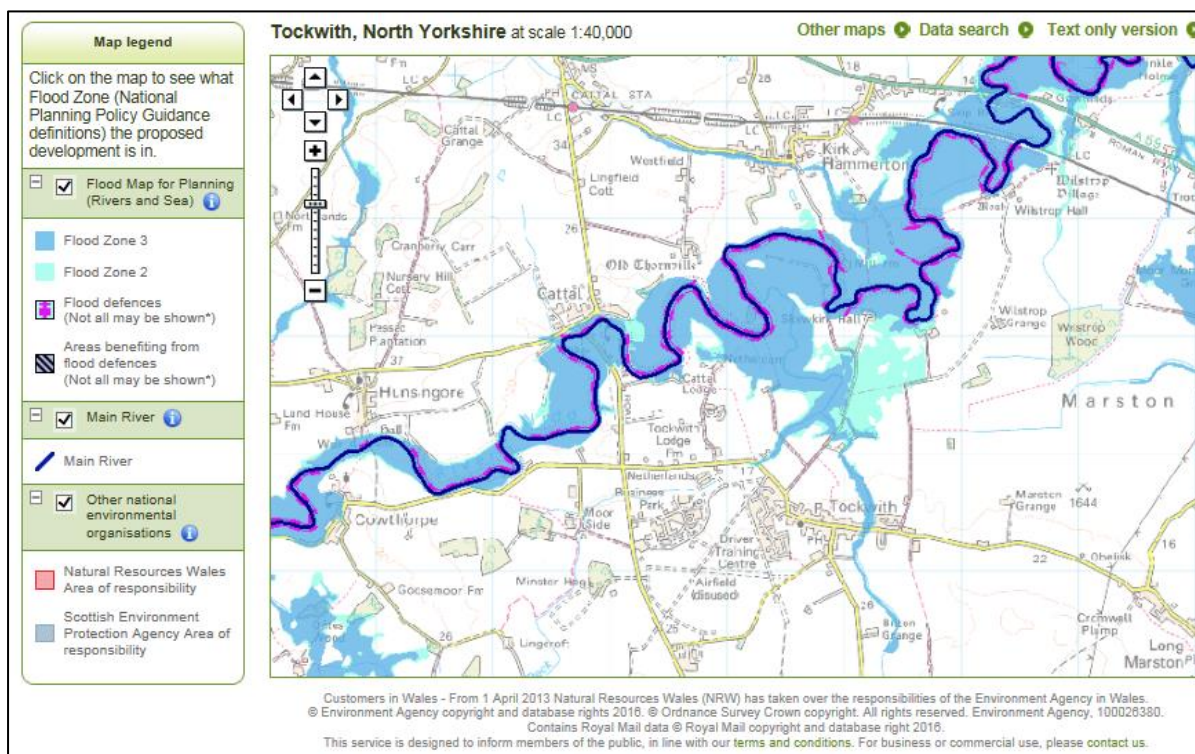


Figure 2.4 showing EA floodplain map⁸

The floodplain of Sike Beck is integrated with the floodplain of the River Nidd as shown in Figure 2.4. Owing to the extent of the floodplain and the flat, low lying nature of the topography, it is not possible to identify if the discharge of Sike Beck is likely to be restricted when water levels in the Nidd are high without detailed modelling.

Fleet Beck flows from the west of the village and is culverted under a stretch of land south of Fleet Lane to the northern side of Fleet Lane, the Beck then flows north and discharges into the River Nidd.

⁷ Site Inspection

⁸ River Flood Map, Environment Agency

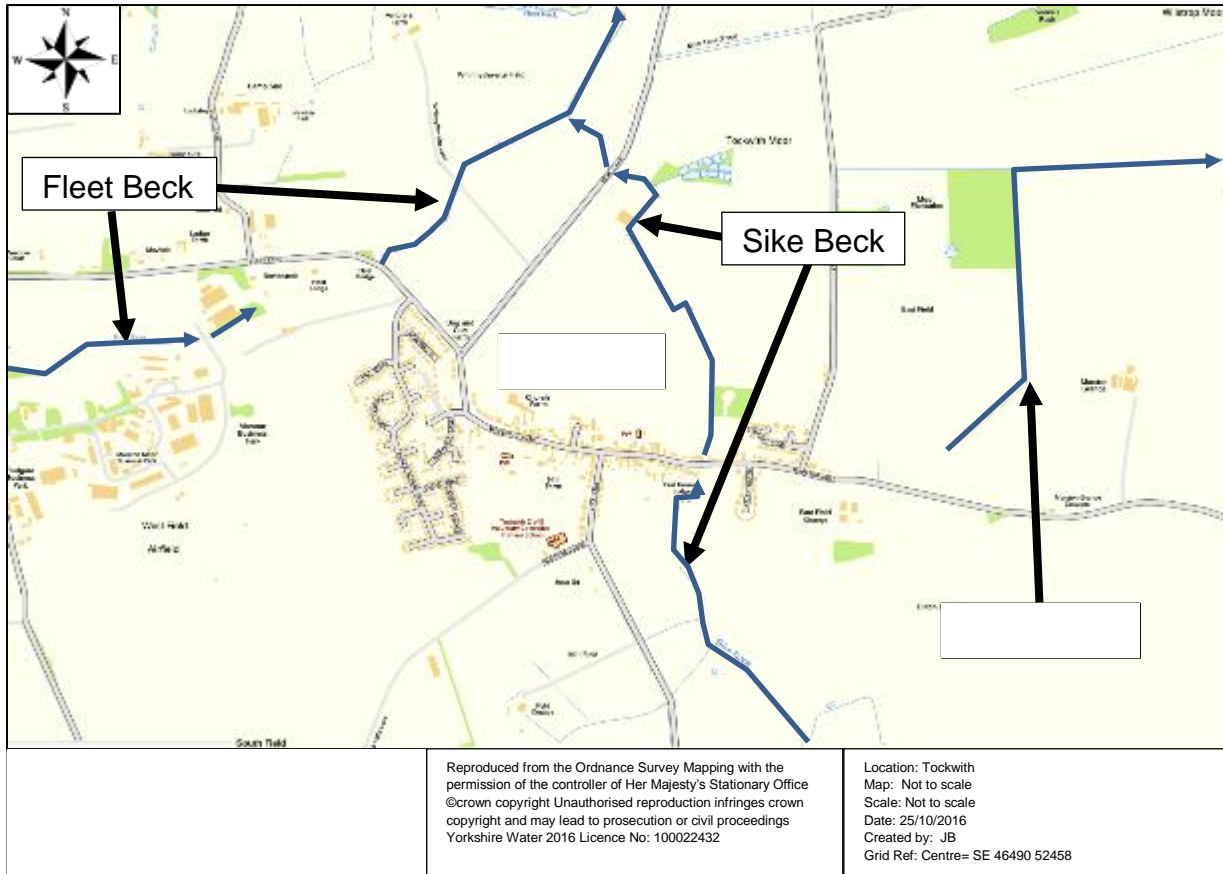


Figure 2.5 Sike Beck and Fleet Beck

2.7 Ainsty (2008) Drainage Board and Historic Watercourses

Tockwith falls within the drainage district for Ainsty (2008) Internal Drainage Board⁹ (IDB). The board operates as the Land Drainage Authority within its district and is responsible for the management of water levels in respect of Flood Risk Management within the Area. The Board is also directly responsible for the maintenance of a number of local watercourses, with respect to this report the most important being Fleet Beck and Sike Beck, as shown in Figure 2.6. The section of Duckpond Plantation Dyke, is not an IDB maintained watercourse as shown on the IDB map in Figure 2.6. This was confirmed to be an error by Ainsty IDB¹⁰.

⁹ Ainsty Drainage Board Map
¹⁰ Ainsty IDB Communications

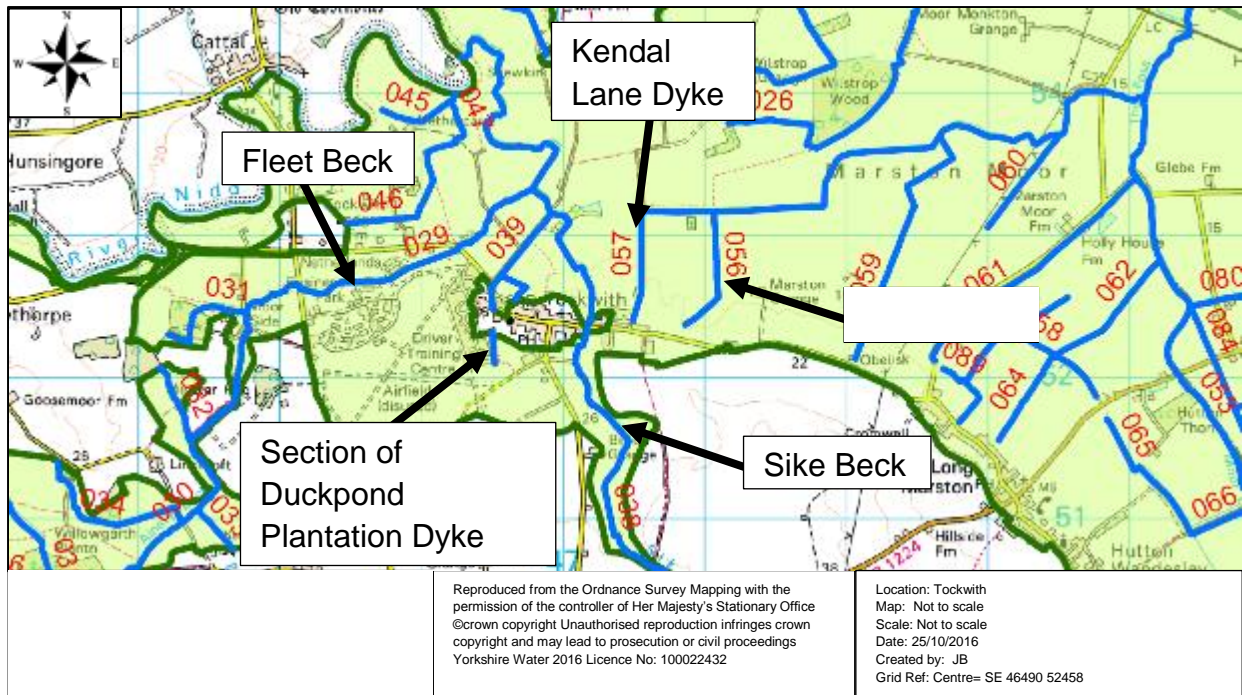


Figure 2.6 Ainsty Drainage Board Extents (Source: Ainsty Drainage Board)

Through the interpretation of historic maps (Pre 1960), it has become clear that Duckpond Plantation Dyke has been culverted under developments constructed after 1968. It is this section that has been excluded from the IDB watercourse network, as shown in Figure 2.6.

2.8 Highway gullies

Highway surface water drainage for Marston Road is taken by conventional road gullies, as shown in Figure 2.7.



Figure 2.7 Road Gully on Marston Road outside New Row Cottages

In the vicinity of New Row Cottages, which is located at the eastern end of the village, the surface water system discharges into Ditch A, as is represented in Figure 2.8. The majority of surface water is runoff from adjacent fields. The highway surface water system runs from west to east, the surface water is collected in gully pots and directed to Manhole A, as demonstrated in Figure 2.8.

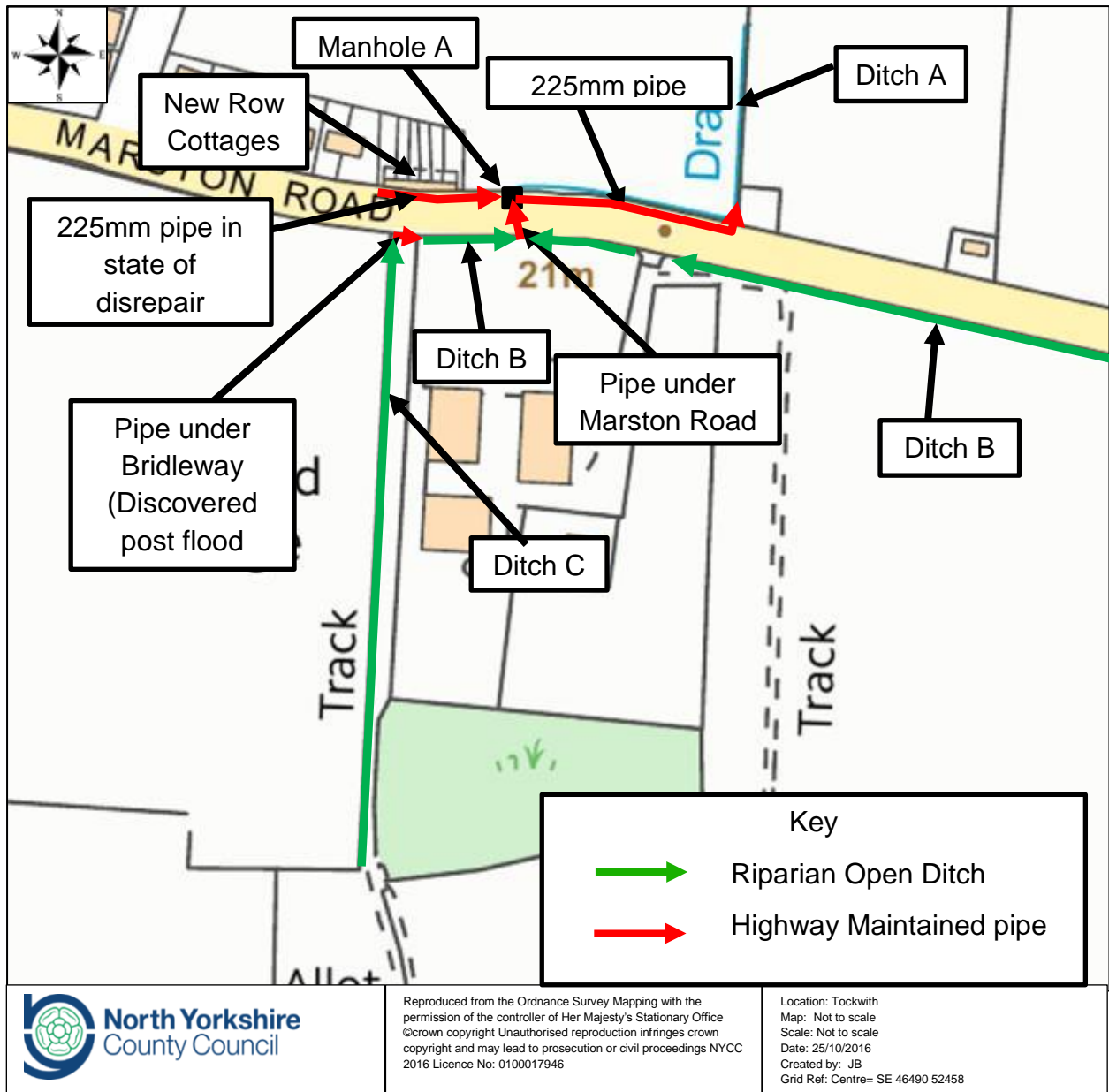
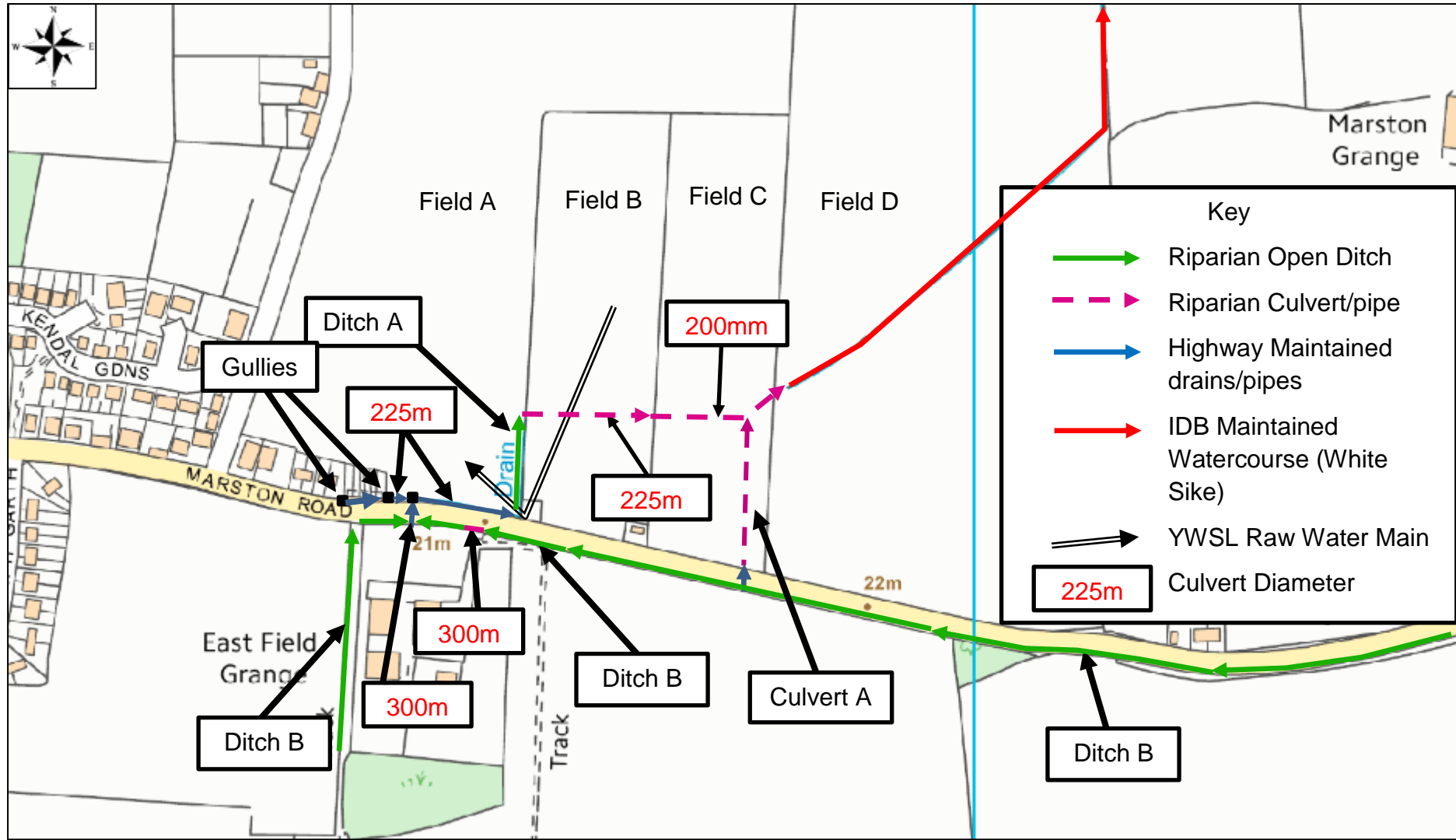


Figure 2.8 Drainage in vicinity of New Row Cottages

From Manhole A the flows are carried via a 225mm diameter pipe to Ditch A ¹¹. Ditch A is then carried via a 225mm culvert across 2 further fields (B & C below), reducing to 200mm diameter. This then discharges into White Sikes drainage ditch, as shown in Figure 2.9 which is Ainsty IDB maintained.

¹¹ Investigations carried out by Ainsty IDB, NYCC Highways and Harrogate Borough Council



Note: The culvert routes in Field B and C have been predicted from CCTV inspection.

Figure 2.9 Drainage at eastern end of Marston Road

2.9 Local Drainage Systems

2.9.1 Marston Road – Eastern edge of Tockwith village

An investigation using CCTV survey was carried out in August and September 2015 by NYCC and Harrogate Borough Council with the aim of identifying the operation and route of the culvert and associated drainage in the vicinity of the New Row cottages. The investigation identified the following, which is illustrated in Figure 2.9;

- The culvert taking discharges from Ditch B under Marston Road into Manhole A in the grass verge, was 300mm in diameter¹².
- The 225mm diameter highway culvert, 5m-8m west of Manhole A, carrying surface water is in a state of disrepair and showed signs of collapsing¹².
- Sharp bends, pinch points and changes in pipe size are present in the system
- Manhole A was created in 2015 by NYCC to provide the means of connecting with Ditch A in Field A to assist outflows¹²
- Culvert A¹² was found to run between Marston Road and the culvert system that crosses field B and C, as shown in Figure 2.9. NYCC highways have confirmed this culvert flows from south to north.
- Prior to the Boxing Day flood event NYCC highways had cleaned out the previously unmapped culvert under Marston Road, joining the large agricultural catchment to the south to culvert A, north of the road.
- In addition NYCC arranged for culvert A to be jetted clear, with the agreement of the landowner, and a new brick built chamber was constructed at the head of culvert A to provide a point of access for future maintenance.

From the examination of maps and sewerage drawings it has been deduced that the YWSL raw water main crosses the surface water drainage culvert in Field B, but no evidence of any damage is evident from the CCTV surveys.

2.9.2 Prince Rupert Drive

There is a historic culvert running from south to north under Prince Rupert Drive, this culvert originates in the agricultural land to the south of Tockwith. The route of the culvert is shown in Figure 2.10. At this stage the size of the catchment area drained by this culvert is unknown. This culvert could be the historic watercourse Duckpond Plantation Dyke as it is the only recorded watercourse in this area.

A CCTV¹³ survey has been carried out by a local developer to determine the connectivity and condition of the system following the flooding in December 2015. This showed that the culvert running from the south to Prince Rupert Drive is approximately 750mm in diameter. The culvert is then reduced down to 300mm under a property at the south of Prince Rupert Drive for approximately 30m, as shown in Figure 2.11, after passing under this property the culvert is increased back

¹² NYCC CCTV Investigation Report

¹³ South Field Lane, Drainage Flood Report, JPG

to approximately 750mm. The condition of the 300mm culvert is unknown. The CCTV survey report stated that 750mm diameter culverts were in poor structural condition with numerous longitudinal fractures along their lengths.

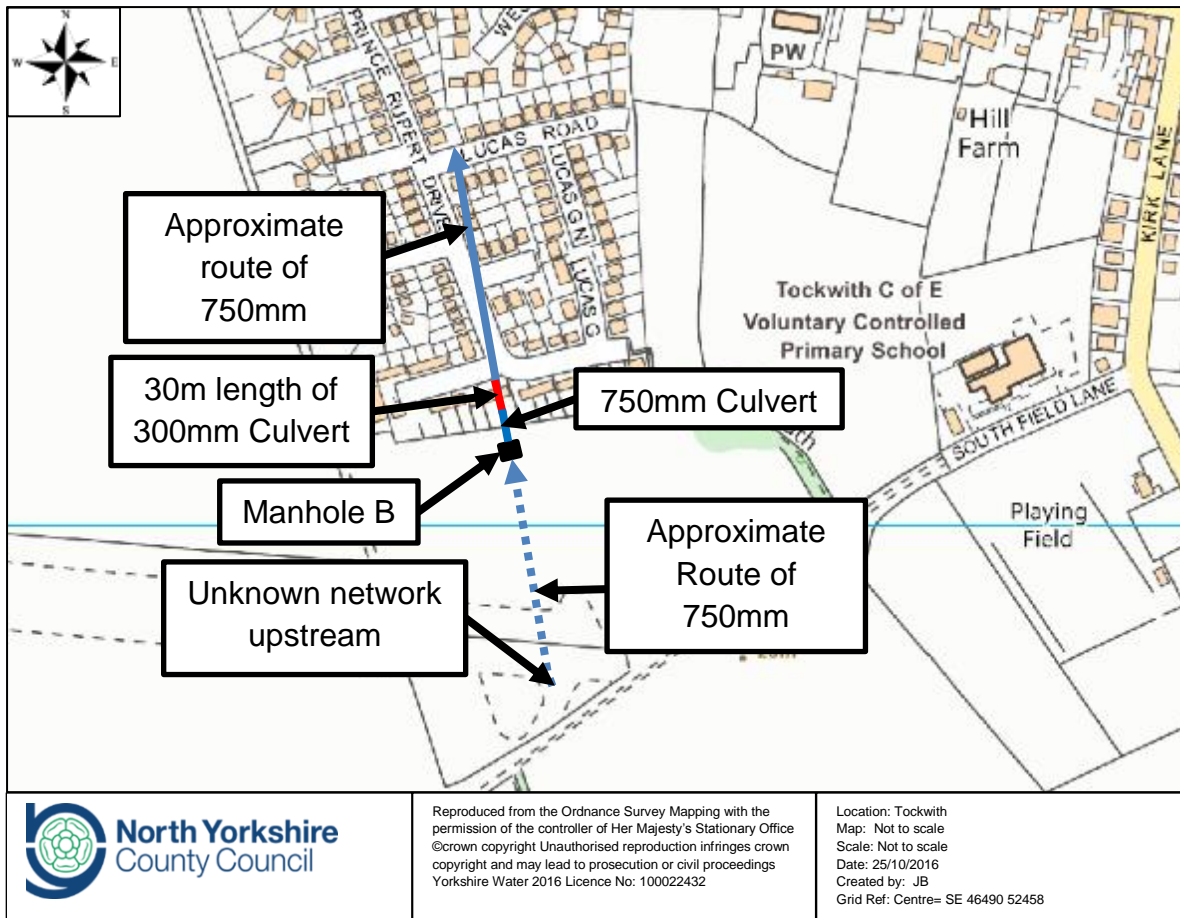


Figure 2.10 Route of historic culvert

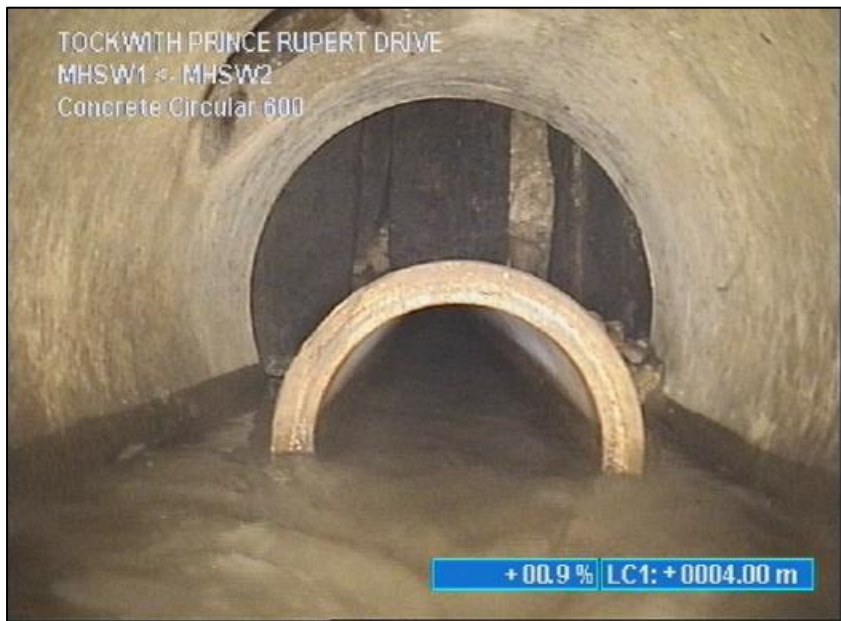


Figure 2.11 Photograph of surface water culvert reduction

2.10 Public Sewers

The majority of Tockwith's foul sewer system runs from east to west along Marston Road, Westfield Road and Fleet Lane where it passes through the Fleet Lane pumping station, identified in Figure 2.12, to the Waste Water Treatment Works (WWTW) (Grid Reference: SE 46318 52975)¹⁴.

Prince Rupert Drive has separate foul and surface water systems. The surface water system takes discharges north from Prince Rupert Drive, Lucas Grove North, Lucas Grove South and Lucas Road and discharges into Fleet Beck, as shown in Figure 2.12. The foul system in this area takes discharges from the same locations to the Fleet Lane Pumping Station where they are pumped via rising main to the Waste Water Treatment Works (WWTW)¹⁴.

¹⁴ YWSL Sewer Map

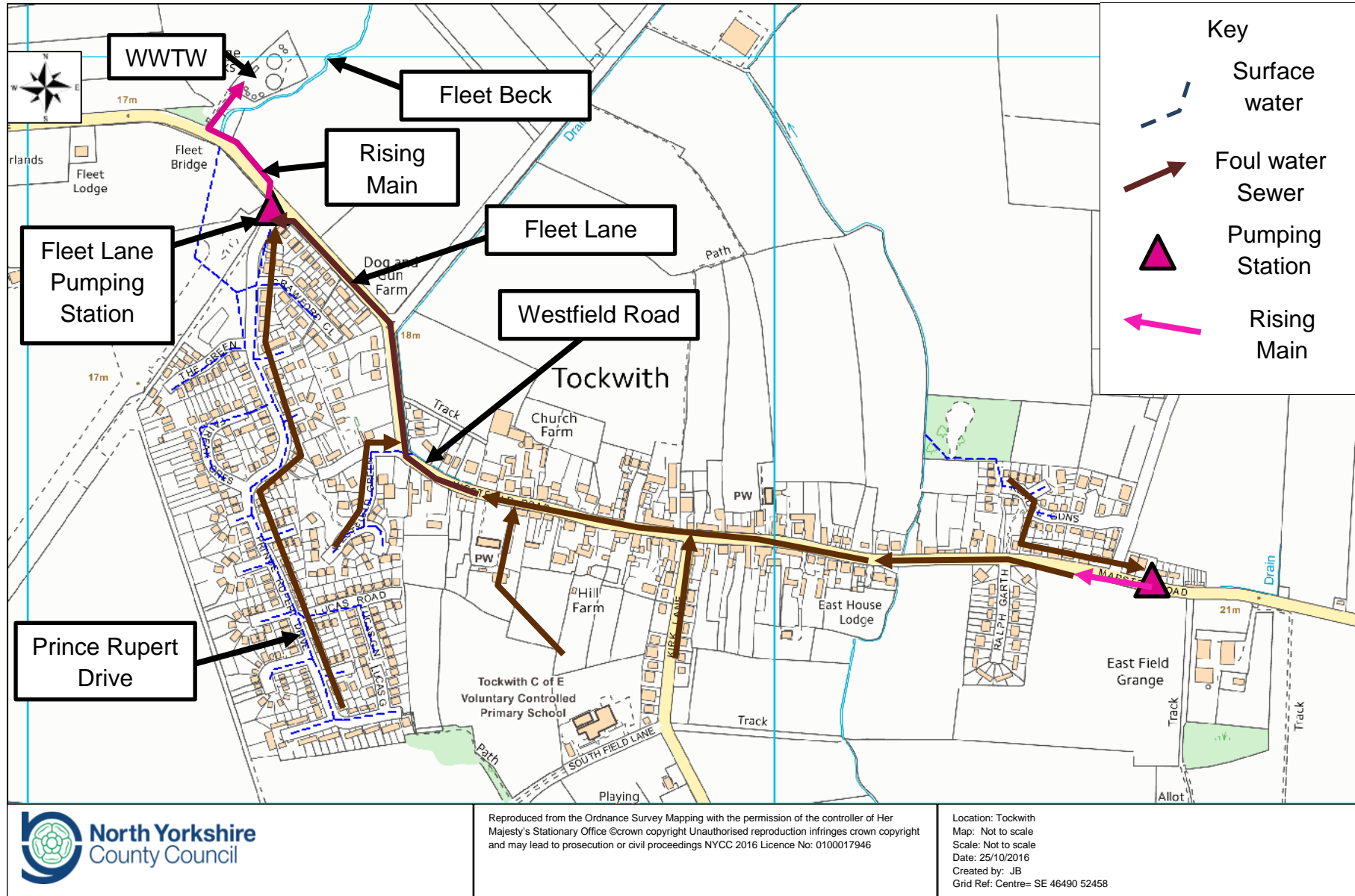


Figure 2.12 Prince Rupert Drive surface water system

3 Flood Events

The flood event that occurred on Boxing Day 2015 was triggered by extremely high rainfall, resulting in extensive property flooding across the county of North Yorkshire.

3.1 Rainfall data

3.1.1 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 that spread across the country on the 23rd & 24th December. 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 system¹⁵.

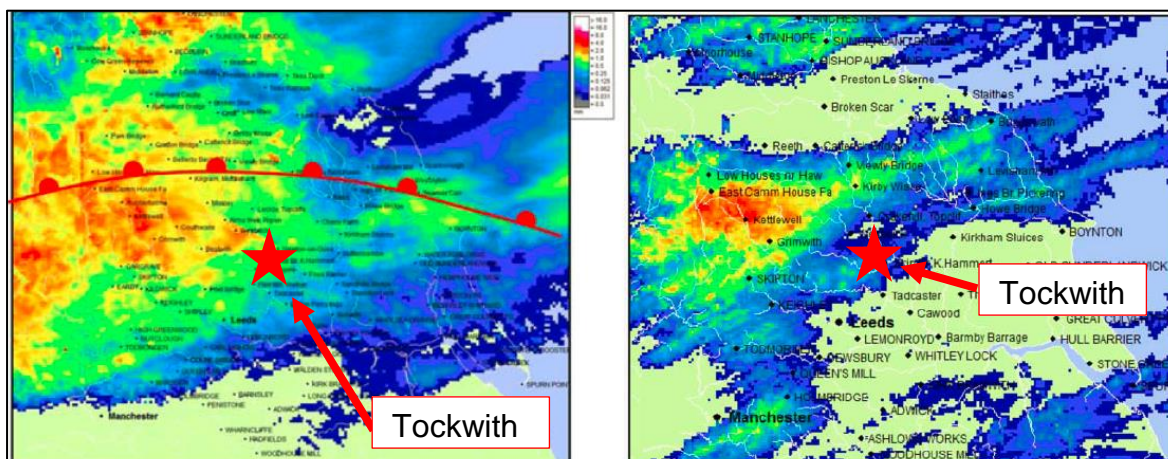


Figure 3.1 Radar image with overlaid front as of 18:00 on 25th December 2015 (left) and 01:00 on 26th December 2015 (Right) Copyright Meteorological Office

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 north west and north east and it was this front which produced the more intense storms.

There were two main pulses of heavy rainfall within 48 hours that led to the flooding experienced over Yorkshire. In the Nidd Catchment between 58-97% of December's Long Term Average (LTA) rainfall fell in 48 hours. 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

¹⁵ Hydrology of the December 2015 Flood In Yorkshire, Environment Agency

rainfall were mainly confined to the upper catchment of rivers Aire, Calder, Wharfe and Swale¹⁵.

3.1.2 Antecedent conditions

A data set from the National Climate Information Centre (NCIC) shows the position of the November 2015 event in the rainfall rankings of records from 1909.

The November 2015 rainfall exceed twice the Long Term Average (LTA) for the month of November in a number of catchments as shown in Table 3.1. This indicates that the ground was already saturated from rainfall in November, prior to the exceptionally wet December 2015¹⁵.

Catchment	Ranking of November 2015 in Rainfall Total Wettest since 1909	November 2015 rainfall as a % of the LTA
Yorkshire area	5	191 %
Nidd	3	230 %

Table 3.1 NCIC ranked rainfall totals wettest since 1909 and percentage of LTA

3.1.3 Tockwith Rainfall Event

YWSL has provided rainfall radar data for the rainfall event in the Tockwith area. This data shows that the peak rainfall fell on Boxing Day producing a rainfall depth of 25mm in 10.75hours, and a second lower peak on Christmas Day of 15mm in 6.5hours¹⁶.

EA tipping bucket rain gauge (TBR) rainfall data has been provided for York Acomb Landing 10.5km east of Tockwith¹⁷. The rainfall data is illustrated in Figure 3.2. The data from the TBR shows two rainfall events, on both 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 TBR depths for these periods on Christmas and Boxing Day are 16mm and 32mm respectively. So the total of 56.8mm represents approximately the whole of the month of December's LTA rainfall falling in the 48 hour period.

Comparison of the data from York Acomb with rainfall radar data from YWSL shows a good match. Depths for Christmas Day differ by 1mm and Boxing Day by 7mm. The two data sets show that although the rainfall duration at Tockwith on Christmas Day was shorter than that at Acomb, the rainfall depths were similar. This illustrates the high rainfall intensity that was experienced at Tockwith.

¹⁶ Radar Rainfall Data, Yorkshire water Services Ltd

¹⁷ Tockwith Hydrometric Data, Environment Agency

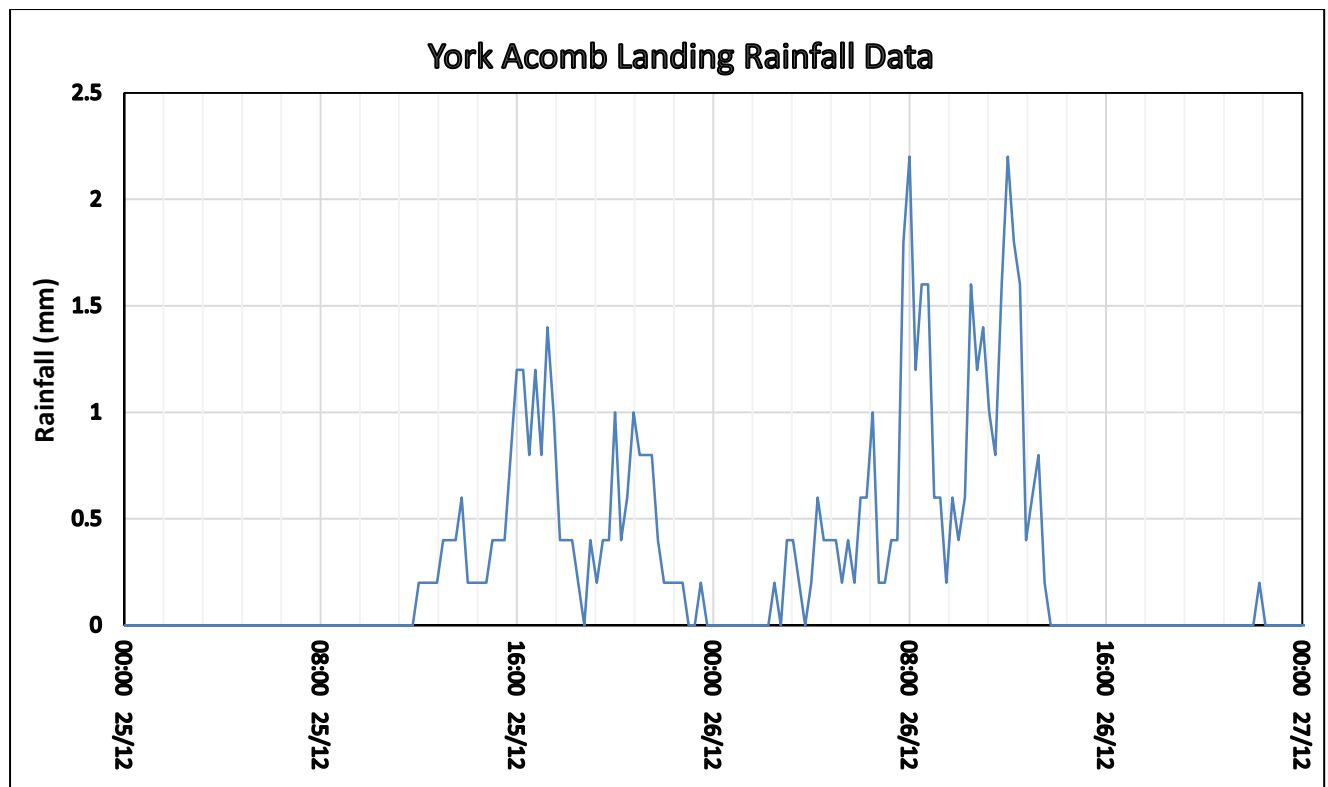


Figure 3.2 TBR data from York Acomb Landing (Source: EA)

3.2 Description of Events

Heavy rainfall during the 25th and 26th December 2015, fell on already saturated ground¹⁸ which resulted in large volumes of surface water running off and overwhelming the drainage systems. During the event flooding occurred at properties on Marston Road, Price Rupert Drive, Ness Lane, Blind Lane, and Westfield Road, as shown in Figure 3.3. The extent and severity of flooding are discussed in this section.

¹⁸ Hydrology of the December 2015 Flood In Yorkshire, Environment Agency

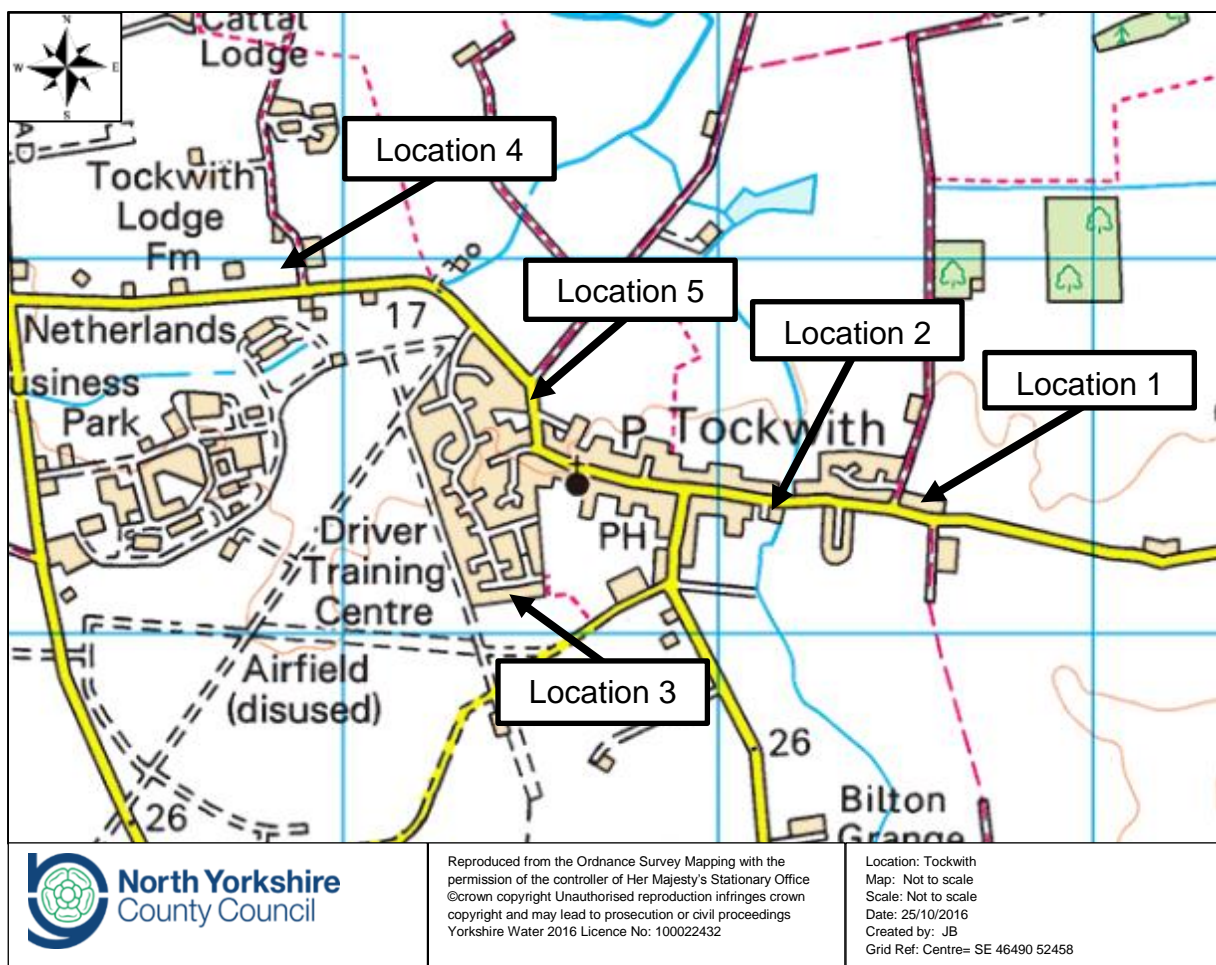


Figure 3.3 Locations of flooding in Tockwith

3.2.1 New Row Terraced Cottages, Marston Road (Location 1)

Surface water flowed on to Marston road, via the bridleway and surrounding agricultural land, as shown in Figure 3.4. Drainage Ditch C along the Bridleway could not contain the excess surface water¹⁹. In addition the culvert under the bridleway (discovered after the event and found to be blocked) could not effectively discharge flows from Ditch C to Ditch B, which exacerbated the flooding on Marston Road.

Surface water from agricultural land to the south east flowed down fields entering Ditch B, on the southern side of Marston road. Some of this will have flowed through the recently opened up culvert under the road towards culvert A and directly to White Syke. However, the large volumes of water coupled with the fall in Ditch B will have channelled much of the water back west towards New Row.

There is no formal highway drainage along Marston Road between New Row Cottages and Marston Grange access, apart from two gullies which discharge into Manhole A, to the east of the Cottages. During the rainfall event excess surface water built up on the highway, predominantly runoff from agricultural land. The water proceeded to flow west and collected at the low point in front of New Row Cottages.

¹⁹ Conversations with NYCC

The gully was overwhelmed, which exacerbated the flooding in this location.

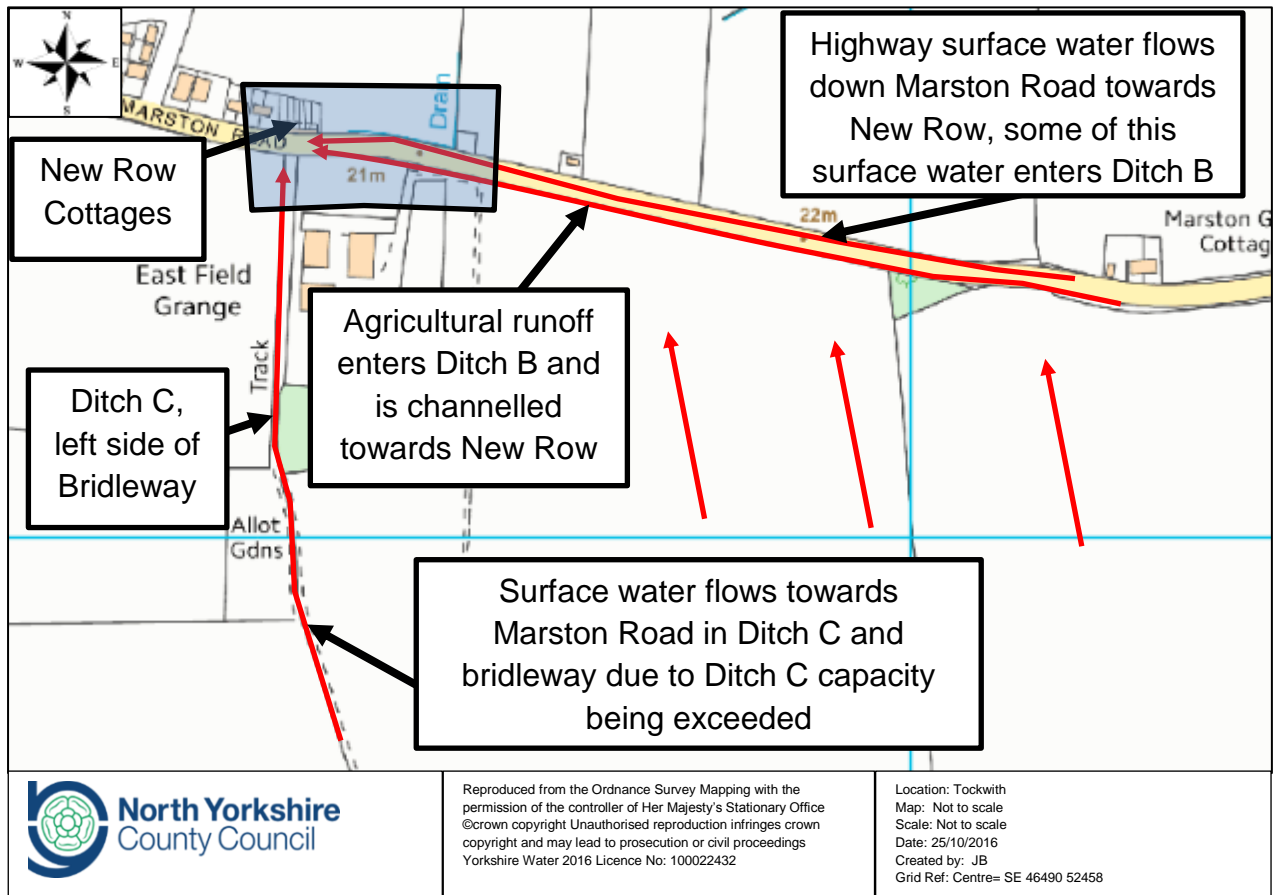


Figure 3.4 Flow paths to New Row from surrounding area

The combination of surface water from the Bridleway, Ditch B overflowing and highway runoff caused the ponding of flood water outside New Row Cottages. The properties at New Row Cottages have low thresholds. Surface water overtopped the footpath from Marston Road and flooded the properties, as shown in Figure 3.5. The majority of surface water runoff comes from the agricultural land with the highways providing a pathway for the flow once it has breached the ditches.

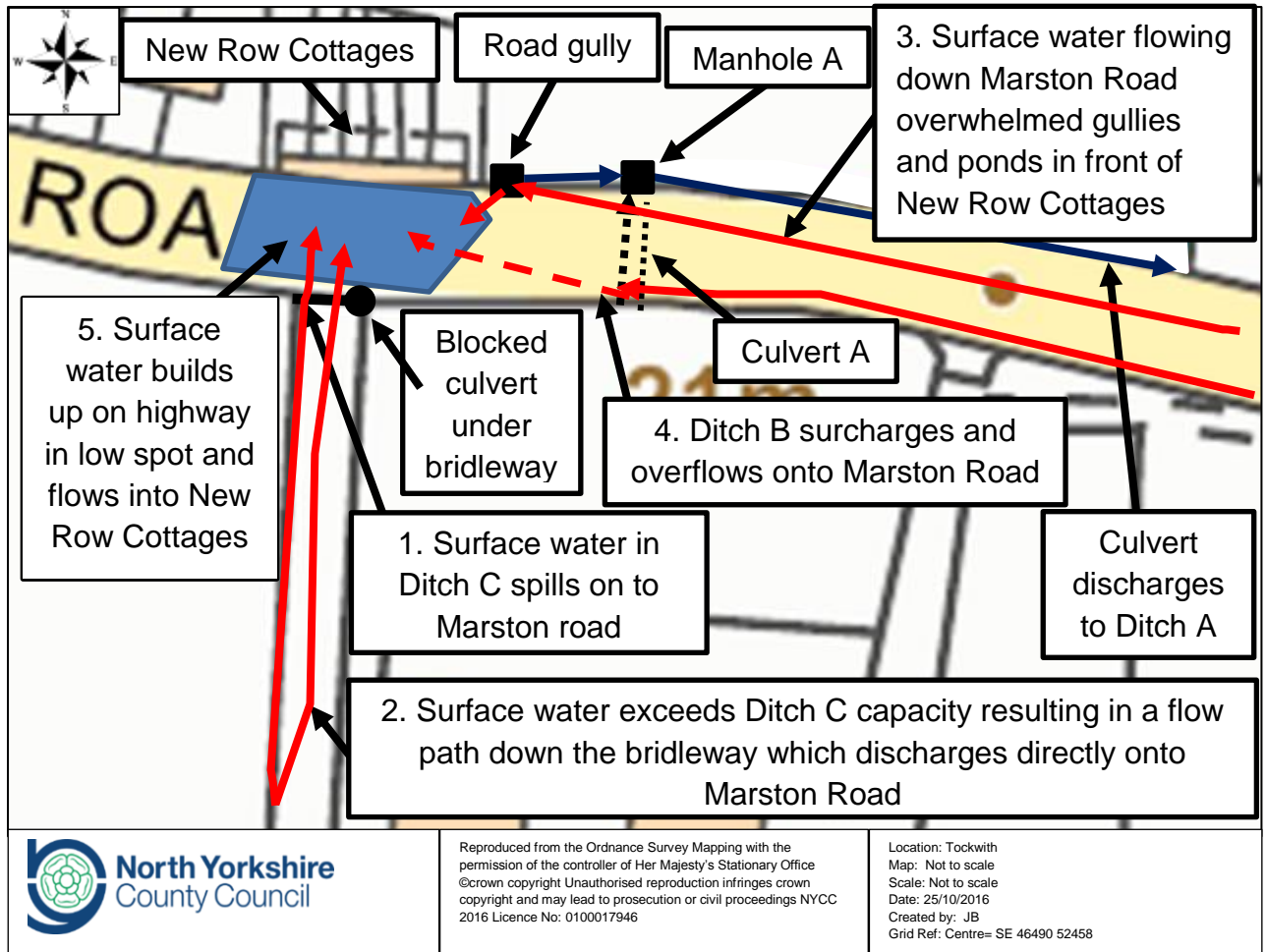


Figure 3.5 Flow paths intercepting at New Row Cottages

3.2.2 Marston Road at Sike Beck (Location 2)

The majority of agricultural runoff to the south of this location enters the Sike Beck²⁰. Sike Beck has a right angle bend 70m south of Marston Road. During the rainfall event, beck levels rose and overtopped into an adjacent field at the right angle bend.

The surface water then followed the gradient of the land, passing through a gateway onto the cul-de-sac next to 44 Marston Road, as shown in Figure 3.6 and 3.7. The flood waters entered the rear gardens from the cul-de-sac and the adjacent field, resulting in the properties and road flooding.



Figure 3.6 Photograph of flooding of cul-de-sac

²⁰ NYCC Rolling Ball Analysis – identifying indicative overland flow route

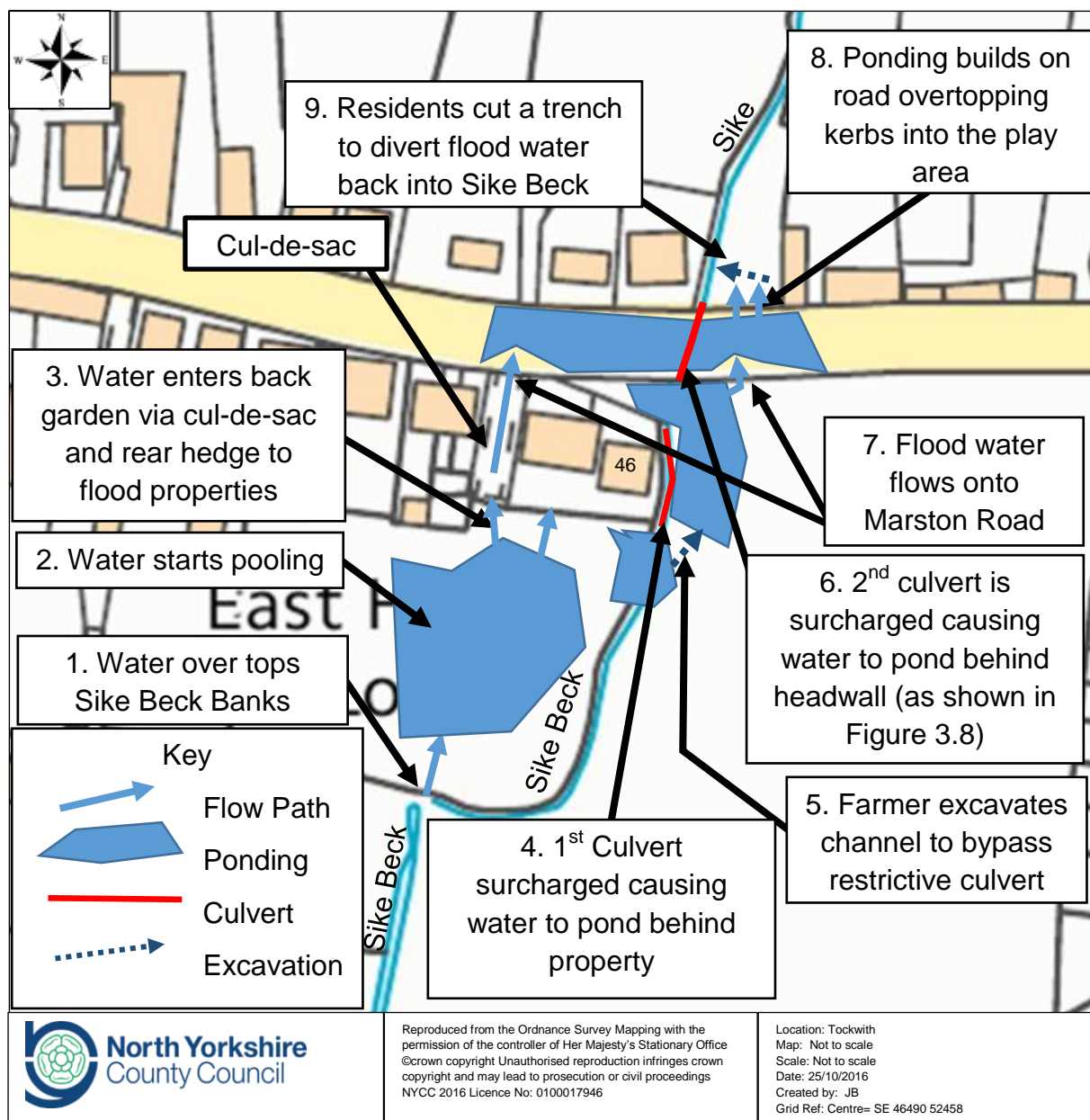


Figure 3.7 Flow paths at Marston Road from surrounding area

The 1st inlet to the culvert, located towards the south east corner of the grounds of No.46 Marston Road, surcharged during the rainfall event. Excess flood waters built up onto adjacent land.

Local farmers and residents created a ditch in the edge of the field to the east to bypass the culvert²¹. The flood water was however directed towards the second culvert inlet that flows under Marston Road, see Figures 3.7 & 3.8.

The additional flood water surcharged the 2nd culvert inlet, which resulted in surface water overtopping onto Marston Road. In an attempt to remove surface water from

²¹ Conversations with NYCC/Local residents

the highway, local residents created another ditch in the play area to the north, to divert flows back into the Sike Beck²².



Figure 3.8 Photograph showing flood water behind headwall



Figure 3.9 Photograph showing flood water on Marston Road

When surface water was building up on Marston Road, residents used sandbags to protect their properties from being flooded. At the time of the flood, local farmers pumped flood water into tankers in an attempt to reduce flood waters, as shown in Figure 2.10.

²² From Residents' photos of the event



Figure 3.10 Photograph showing farmer tankering flood waters

The River Nidd reached its highest recorded level of 3.06m at Hunsingore (3.6km away) on 26 December 2015. It is however considered unlikely that the outflows from Sike Beck were significantly restricted by high levels in the River Nidd, given the distance from the main river and the large area of potential flood plain between the two.

3.2.3 Prince Rupert Drive (Location 3)

The rainfall event created a large volume of surface water on the flat agricultural land and disused airfield south of Prince Rupert Drive. A proportion of the surface water from this large catchment area is discharging into a historic culvert that passes under Prince Rupert Drive.

Due to the heavy rainfall experienced on the 25th and 26th December 2015 the surface water inundated the system. The combination of heavy rainfall and the bottle neck, caused by the reduction in pipe diameter from 750mm to 300mm under properties on Prince Rupert Drive (assumed to be a legacy from their original construction in the 1980s), caused backing up in the system. The water in the historic culvert backed up until it stopped inflows from the catchment area.

This resulted in large volumes of water being discharged out of a manhole located in the airfield, as shown in Figure 3.11. Concerns were raised at the time that loose concrete slabs put on top of the manhole in place of a formal cover had slipped into the chamber and caused the flooding. However, it is unlikely that given the volumes

of water concerned and the restriction subsequently discovered lower in the system, that this would have had any significant impact on the flooding that occurred.



Figure 3.11 Photograph showing surface water discharge from manhole

The water bursting out from the over loaded culvert joined with other overland flows to inundate properties at the southern end of Prince Rupert Drive, resulting in internal flooding, as shown in Figure 3.12.

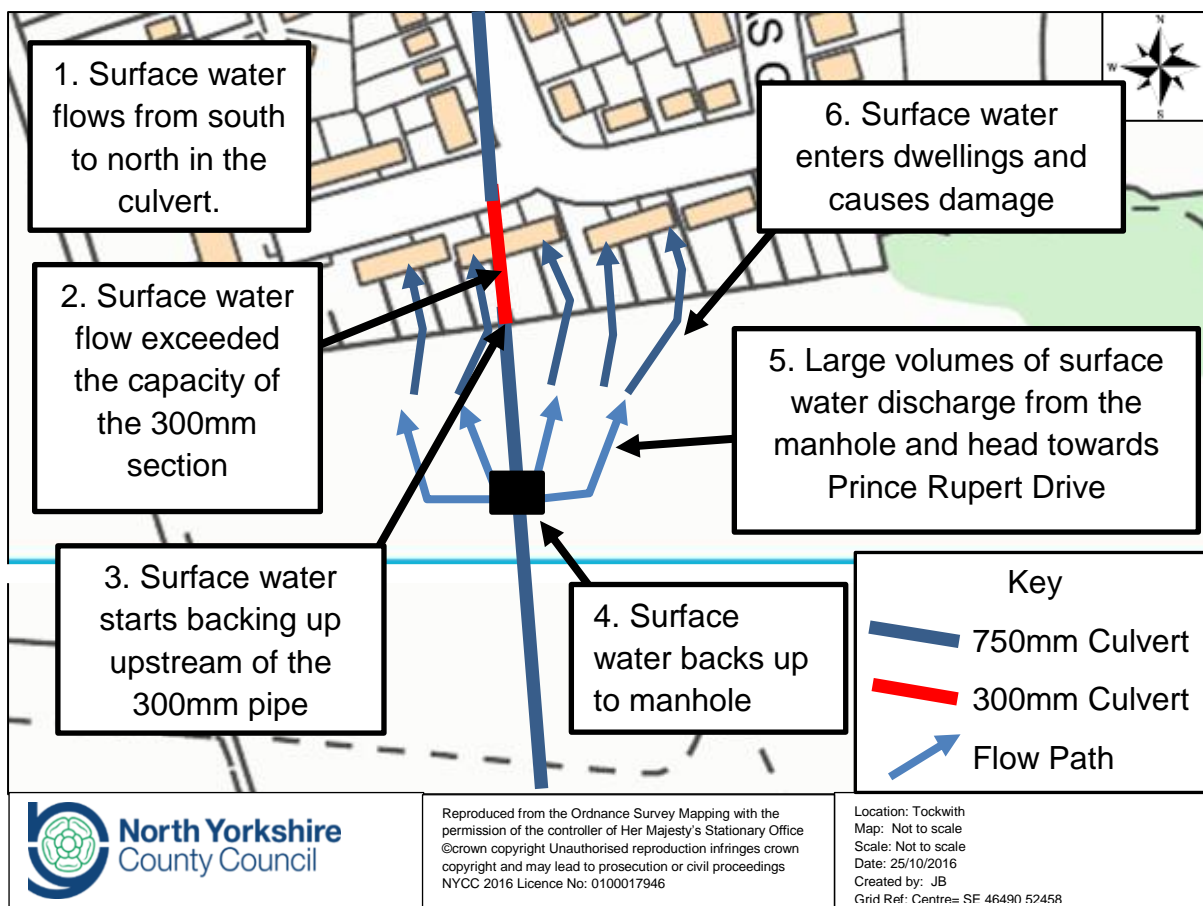


Figure 3.12 Prince Rupert Drive mechanism of flooding, culvert shown in approximate position.

3.2.4 Blind Lane (Location 4)

Blind Lane is a privately maintained access road leading off Fleet Lane that experienced floods on Boxing Day 2015.

Properties on Blind Lane experienced surface water flooding resulting from agricultural land runoff, with no appropriate outfall or discharge point. Significant build-up of water caused extensive flooding to gardens and internal damage, as shown in Figure 3.13.



Figure 3.13 Photographs showing flooding at Blind Lane

3.2.5 Westfield Road (Location 5)

The Parish Council has reported that contaminated water affected properties during the event along Westfield Road and Fleet Lane. According to YWSL records the public sewer system in Tockwith carries foul and surface water in separate systems. However, during periods of heavy rainfall the foul sewers become surcharged which suggests that significant levels of surface water and / or ground water is entering the 'foul only' sewers. This may compromise the functioning of the sewage treatment works and indeed YWSL has confirmed that Fleet Beck was polluted by effluent infiltration from the foul sewer during the December 2015 event²³.

²³ Yorkshire Water Services Ltd

4 Risk Management Roles, Responsibilities and Actions

4.1 RMA Responsibilities

4.1.1 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 is also a category 1 responder regarding flood risk (Civil Contingencies Act 2004). It is required to warn and inform of flood risk.

4.1.2 Water Company

Water companies in England and Wales are named as Risk Management Authorities 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.

4.1.3 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.

4.1.4 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.

4.1.5 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.

4.1.6 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.

4.1.7 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>

4.2 Actions and Responses to December 2015 Floods

4.2.1 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;

- Reprofiting of Ditch B has been carried out to utilise this culvert and alleviate pressure on the current surface water system -the details of the new works are shown in Figure 4.1.
- Supported impacted residents of Tockwith in obtaining Flood Resilience Grants. 12 properties have applied for the grant - £43k approved so far. Examples of measures include – flood doors and barriers, sump pumps, walls and bunds, Non-Return Valves on private drainage systems.

- Coordinated work with other Risk Management Authorities and local communities to investigate the flood event and the specific mechanisms identified from the December 2015 event.

4.2.2 North Yorkshire County Council as Highway Authority

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

- Investigating the effect of the culvert under Marston Road and the headwall restricting/diverting flows on the Marston Road near 46 Marston Road.
- Highway drainage along Marston Road and adjoining streets has been jetted and cleared of flood debris.

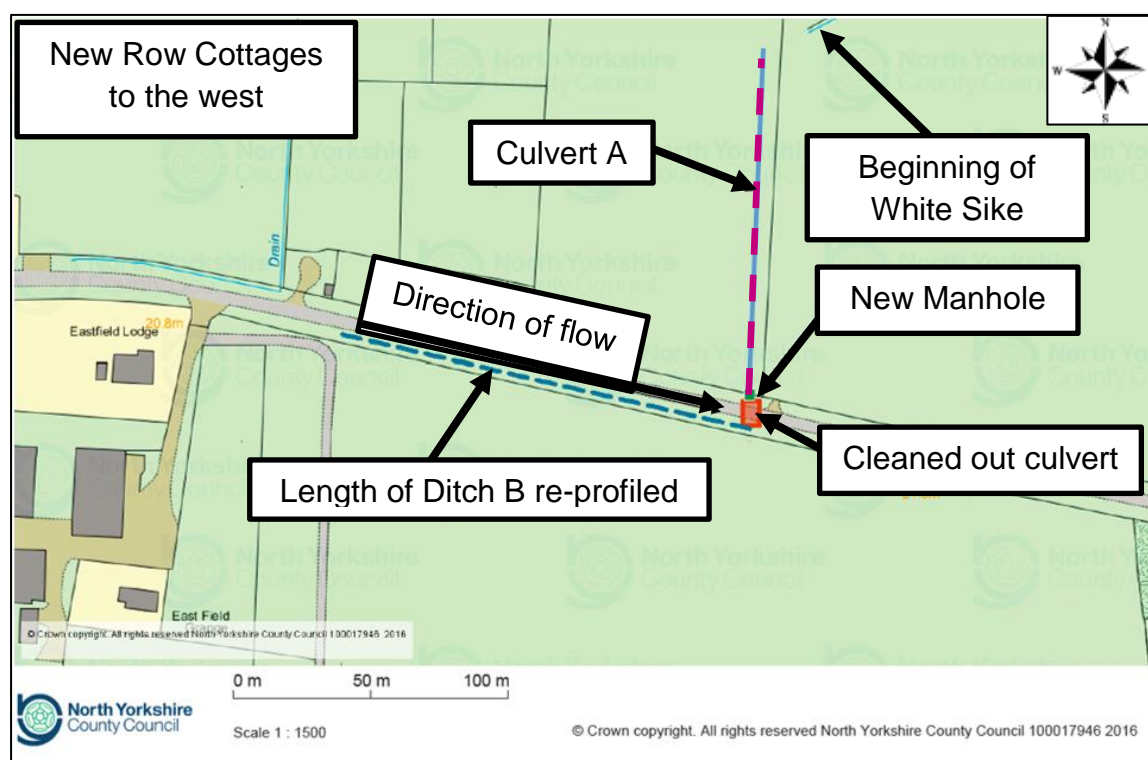


Figure 4.1 Works carried out by NYCC Highways in eastern Tockwith

4.2.3 The Environment Agency

- The EA assessed any cause of overflows from River Nidd which result in flooding - none were identified.

4.2.4 Yorkshire Water Services Limited

Yorkshire Water Services Ltd has responsibility for the main surface water and foul drainage systems. YWSL has undertaken the following activities;

- Eight customer contacts in all during this period.
- The cover to the water main in the play ground on Marston Road has been repaired.

- Investigated the cause of raw sewage discharging from the hole in Westfield Road, tankers were engaged to drain down system, and clean up was undertaken.
- A blockage in the sewer to the rear of Prince Rupert Drive, discovered post flood, has been cleared.

4.2.5 Harrogate Borough Council - HBC

HBC has undertaken the following activities;

- The culvert under the bridleway opposite New Row was located and desilted, opening up the drainage route from Ditch B to rest of surface water system.
- Identified those properties affected by flooding during Storms Desmond and Eva.
- Supported affected residents with council tax relief payments.
- Supported affected residents with initial £500 flood payments.
- Supported residents in the post flood event clean-up activities.
- HBC officers have supplied grant payments of £500 per household affected by flooding in this event as part of the government Communities and Business Recovery Scheme. This has helped with initial recovery costs such as provision of temporary accommodation.
- In addition HBC have provided council tax discounts for flooded households for a minimum 3 months following the event.

4.3 Conclusions

The 48 hours of heavy rainfall over the 25th and 26th December 2015, falling on an already saturated catchment, placed an unusually heavy load on the local drainage systems. These systems were overwhelmed and in some locations this flood water found its way into properties in Tockwith, at five different locations.

While the influence of levels in the River Nidd was not found to be a significant factor in this flood event, other flood sources (ground water, surface water, overwhelmed drainage systems and smaller watercourses) were seen to act in different combinations at each site.

The volume and speed of surface water coming off agricultural land was a significant factor in a number of locations, and one landowner to the South of Prince Rupert Drive has, since the flooding in December 2015, built a bund on the northern perimeter to interrupt the surface flow path that flooded adjacent properties. Opportunities for measures like this elsewhere in the village may serve to reduce risk where appropriate.

Highway drains and sewers are not built to cope with excessive rainfall events, nevertheless the depth and duration of flooding can be reduced if water management systems are well maintained and working at their maximum capacity.

In addition surface and/or Ground water infiltration into the Public Foul Sewer resulted in flood water contaminated with sewage in some locations and compromised the functioning of the sewage treatment works serving the village.

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 systems so as not to further exacerbate the problems experienced in high rainfall events.

There is not a complete picture of the arrangements for surface water management in Tockwith and it is likely that a number of private assets remain unmapped. An accurate understanding of the current system for managing surface water is essential to inform future improvements and any further development of the village.

4.4 Recommendations

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

- NYCC, in its capacity as LLFA, to work with local stakeholders to review condition of local riparian drainage ditches and culverts
- NYCC, in its capacity as LLFA to work with local landowners 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 the management of surface water runoff from the development into account, and to ensure Sustainable Drainage Systems (SuDS) are used where ever possible.
- Local residents, when noticing surcharge from the sewer, to contact YWSL to lodge the incident and retain incident reference.
- YWSL to investigate the extent of flood water ingress into the foul sewer, and take steps to reduce this where possible.

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