

Flood Investigation Report

Swinefleet, 5. and 6. July 2012

CES\D200\LDES\1464

February 2013



EAST RIDING
OF YORKSHIRE COUNCIL

Revision Schedule

East Riding of Yorkshire Council Flood Investigation Report

CES\D200\LDES\1464 19/12/2012

Rev	Date	Details	Author	Checked and Approved By
0.1	13/12/12	Initial Draft	AMM	
1.0	19/12/12	Issued for comments	AMM	DJW
2.0	14/1/13	Includes consultation result	DJW	CMT
3.0	16/1/13	IDB Consultation	DJW	NL
4.0	8/2/13	Includes all consultation responses	AMM	DJW

Copyright Notice

Maps in this report are reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of Her Majesty's Stationery Office Crown copyright 2008.

Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. East Riding of Yorkshire Council 100023383.

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

Reedness & Swinefleet Drainage Board District Plan supplied by the Shire Group of IDBs.

Acknowledgement

The Council would like to thank members of the Swinefleet community, The Reedness and Swinefleet Internal Drainage Board and Yorkshire Water Services Ltd for their assistance in this investigation.

Table of Contents

Executive Summary.....	4
1 Introduction	5
1.1 Section 19 Investigations.....	5
1.2 Relevant Flood Risk Management Authorities	5
1.3 Location of Flooding	6
2 The Drainage System.....	8
2.1 The Land Drainage System	8
2.2 Flooding History.....	9
3 The Flooding Incident.....	10
3.1 Conditions before the event.....	10
3.2 Rainfall on 5 th and 6 th July.....	10
3.3 The Incident.....	11
3.4 Causes and Investigation Findings.....	12
3.4.1 Land Drainage	12
3.4.2 Public Sewer System	12
3.4.3 Highway Drainage	12
4 Conclusions	13
4.1 Relevant Authorities.....	13
4.2 Investigation Conclusions.....	14
5 Recommendations	15
Useful Links and Contact Details:.....	17

List of Figures

Figure 1 Location Plan.....	6
Figure 2 July 2012 Flooded Areas	7
Figure 3 Photograph of Quayfield Square on 6 th July	7
Figure 4 New Cut Location	9
Figure 5 Photograph of Low Street on 6 th July.....	10
Figure 6 - HF&RS in attendance at Quayfield Square	11

Appendix A – Large format plans

Executive Summary

In July 2012 the village of Swinefleet experienced severe flooding which affected at least 10 properties internally and many other properties externally, and caused disruption on the highways.

Following a prolonged period of wet weather affecting much of the county heavy rainfall in the Swinefleet catchment on Thursday 5th July was followed by further less intense rainfall on Friday 6th July. As a result flooding of highways and properties occurred at Low Street, Quayfield Square, Kings Causeway and Church Lane.

An extensive area of farmland south of the village was also flooded at this time. This can be expected to result in considerable loss to the local farming community.

The village surface water drainage relies on the land drainage system to the south of the village, which in turn discharges to the main Swinefleet Warping Drain which has a tidal outfall to the River Ouse. The Swinefleet Warping Drain and the land drainage ditches are maintained by the Reedness and Swinefleet Internal Drainage Board (IDB).

The whole catchment area is very flat, with little fall on the drains; the land drainage system relies on storage by holding water in open ditches. Some of these ditches had heavy weed growth in the channels.

The drainage ditches were due to be cleaned by the IDB later in 2012. Following the event the Warping Drain was cleaned out by the IDB and the programmed ditch cleaning work started.

Had the ditches and the Warping Drain been cleaned out before the event it is likely that the water would have drained away from the village much quicker, as more storage would have been available. However due to the flooding of open farmland prior to the and high water table event it is considered likely that some flooding in the village would still have occurred.

Yorkshire Water's foul sewer system was overwhelmed by overland flows of surface water entering the foul system. The foul pumping station remained operational throughout the event.

In summary it is believed that the flooding was the result of the extent of the rainfall on the whole area which overwhelmed the land drainage system. The condition of the land drainage system at the time contributed to the time taken for the flood water to recede but did not cause the flooding.

Various options to reduce flood risk are considered in this report's recommendations.

1 Introduction

1.1 Section 19 Investigations

East Riding of Yorkshire Council, as the Lead Local Flood Authority (LLFA), has a responsibility under Section 19 of the Flood and Water Management Act 2010 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.

This report has been prepared by the Council in its role as LLFA in response to repeated flooding incidents in Swinefleet and in particular to a flooding incident which occurred on Thursday 5th and Friday 6th July 2012.

This report provides details and an overview of flooding that has occurred, describes the conditions which led to the flooding, considers the response to the flooding thus far and makes technical recommendations for the flood risk authorities concerned.

1.2 Relevant Flood Risk Management Authorities

The East Riding of Yorkshire Council is the Lead Local Flood Authority in this area, and the Highway Authority for the area with responsibilities for the highway drainage.

Yorkshire Water Services is the statutory sewerage undertaker in the area and is responsible for the public sewer network within the village.

The Reedness and Swinefleet IDB have permissive powers to maintain Ordinary Watercourses within their defined Drainage District which lies to the south of the village and has an area of approximately 19km². This includes the Swinefleet Warping Drain and the tidal gate into the River Ouse.

Natural England is responsible for the Humberhead Peat lands which include the Thorne Moors wetland area. The area is classed as a Special Area of Conservation (SAC). Natural England operates a pumped discharge into the Swinefleet Warping Drain.

The Environment Agency is responsible for managing the flood risk from main rivers including the River Ouse, the sea and reservoirs including coastal erosion risk management. The EA have permissive powers to maintain main rivers, strategic overview over all forms of flooding and development of a national Flood Risk Strategy.

1.3 Location of Flooding

The village of Swinefleet is situated on the south bank of the River Ouse approximately 3km (2 miles) downstream from the town of Goole.

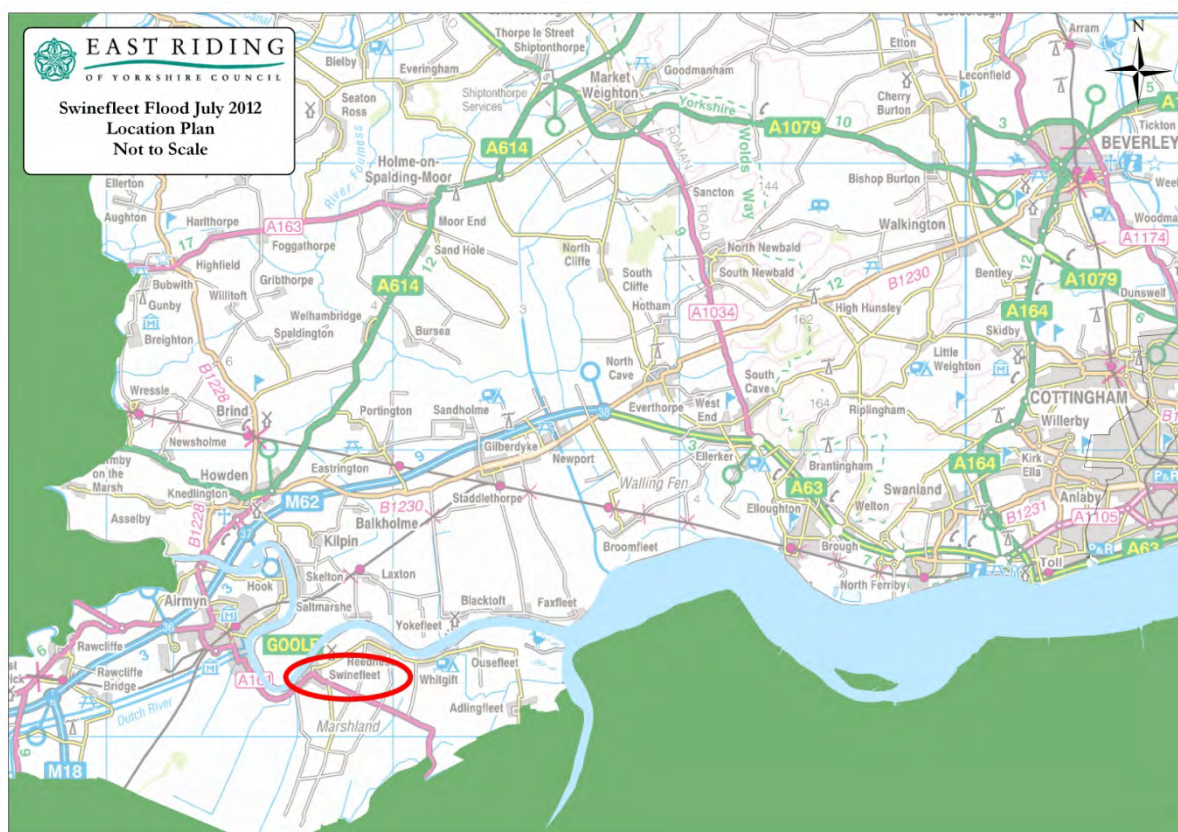


Figure 1 Location Plan

Following the rainfall on Thursday 5th July some surface flooding was experienced in Church Lane and Low Street. No property flooding was reported at this time.

On Friday 6th July the drainage system was overwhelmed and affected properties in Quayfield Square, Low Street and Kings Causeway. (see figure 2 and 3 on next page).

Water levels within the village receded very slowly until the Square was finally cleared of flood water on Sunday 8 July. At this time an extensive area of farmland which drains to the same land drainage system remained flooded.



Figure 2 July 2012 Flooded Areas



Figure 3 Photograph of Quayfield Square on 6th July

2 The Drainage System

The topography of the land in the area is quite flat with most ground levels being less than 3.0m aod (above ordnance datum)

Swinefleet has a foul drainage system which is operated by Yorkshire Water Services Ltd (YW) that drains to a pumping station adjacent to Quayfield Square. The foul flows are pumped up to a partial treatment works before discharging to the River Ouse.

The surface water drainage within Swinefleet discharges into the land drainage system to the south and east of the village. The main land drainage system in the area is maintained by the Reedness and Swinefleet Internal Drainage Board (the IDB). Water levels in the system are dependent on the levels in the Swinefleet Warping Drain which in turn has a tidal outfall to the River Ouse.

The highway drainage in Low Street discharges into an IDB maintained ditch at the rear of the YW pumping station.

The ditch adjacent to Kings Causeway which takes surface water from the east of the village drains off towards Reedness.

In 2010 the Environment Agency (EA) carried out flood defence works to reinforce the embankments along the River Ouse to reduce the flood risk in the village. At high tide much of the land is below the water level in the river.

2.1 The Land Drainage System

(See Appendix A - Plan 3)

The land drainage system in the area is totally reliant on this tidal gravity outfall into the River Ouse. It is estimated that the tidal outfall from the land drainage system is restricted to 8 hours approx, in every 24. A land drainage system responds to prolonged rainfall as the water soaks into the ground before entering the ditches, which is different to the response from an urban drainage system such as Goole town.

The Warping Drain (see figure 4) extends approximately 12km to the south of Swinefleet and takes land drainage from a large area of agricultural land to the south of the River Ouse. The catchment includes an area known as the Humberhead Peatlands and the Thorne Moors wetland area.

Thorne Moor is a special conservation area of wetland habitat managed by Natural England. Natural England operates a pumped discharge into the Warping Drain from this area to maintain a water levels within the wetlands to preserve habitats for wildlife and plants.

Following the widespread flooding in 2007 the Reedness and Swinefleet IDB took a decision to cut a new ditch connecting the Foulsey Dike immediately south of the village to the Keyfield Dike. (See figure 4 on next page). This was constructed to increase capacity within the land drainage system and so reduce the risk of flooding in the village.

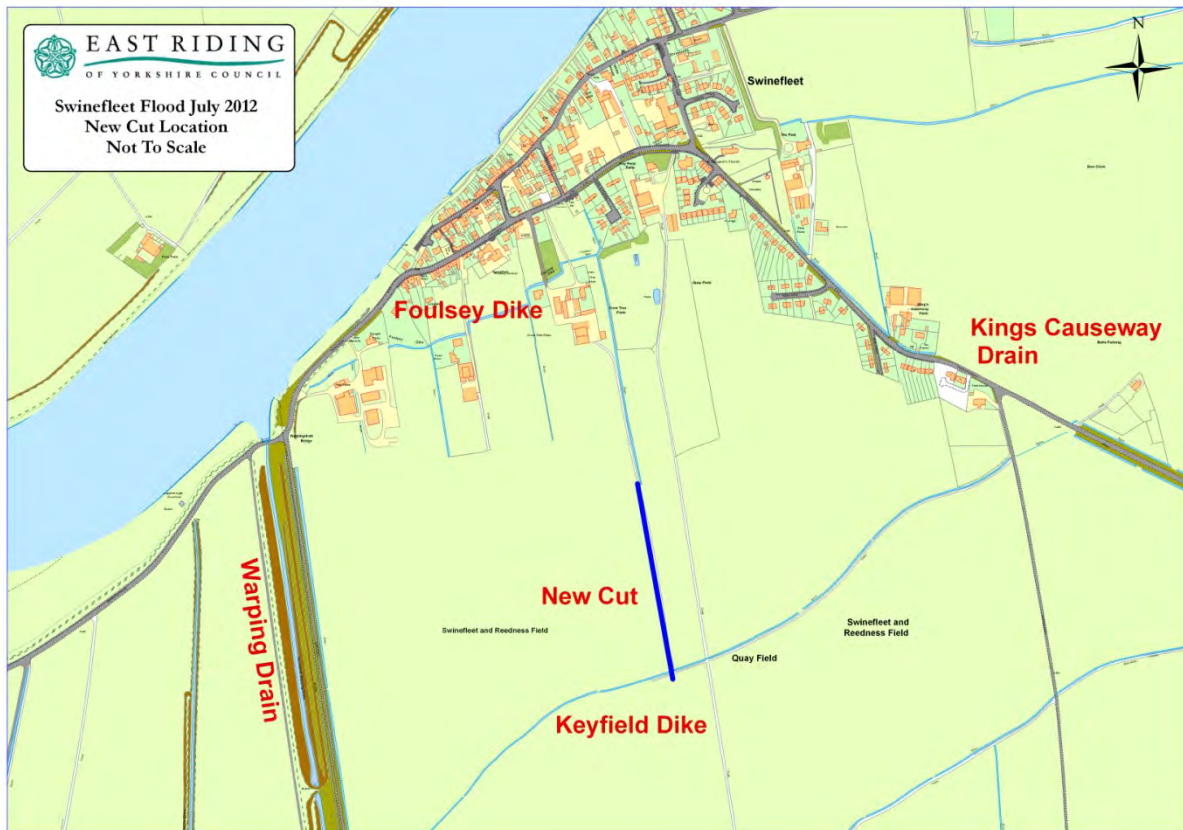


Figure 4 New Cut Location

2.2 Flooding History

There is a historic record of flooding in the village and in common with many parts of East Yorkshire, the most serious recent event occurred in June 2007.

Kings Causeway is susceptible to flooding because of surface water run-off from agricultural land and highway drainage. Quayfield Square and adjacent properties on Low Street are located in a low spot in the village and as such the area is susceptible to flooding.



Figure 5 Photograph of Low Street on 6th July

3 The Flooding Incident

3.1 Conditions before the event

The catchment as a whole was subject to prolonged periods of rainfall in the weeks preceding the flood event.

Data has been provided by the EA from Broomfleet Weighton Lock TBR which is the nearest rain gauge to Swinefleet village (some 10km away). This data indicates that 134mm of rain fell in the area during June, which led to saturated ground conditions and elevated water levels in the land drainage system.

This same rainfall had affected the whole area including Goole town. However the land drainage system serving Swinefleet will respond differently to the urban drainage system in Goole. The land drainage system has a slower response and was at elevated levels due to the slow runoff from the previous wet weather, and the tidal nature of its outfall, whereas the urban system which has a pumped outflow would normally be expected to drain down except during exceptional rainfall.

3.2 Rainfall on 5th and 6th July

Rainfall data from the EA rain gauges, one at Broomfleet Weighton Lock (some 12km to the northeast) and the other at Kneadby (some 12km to the south), together with Met office rainfall radar data was considered in compiling this report.

The available data shows that on 5th July that about 22mm of rain fell over a 5 hour period. This is equivalent to a four year return period. The data also shows a short high intensity burst of about 40mm/hour within those 5 hours.

The rainfall data shows that on the 6th July about 22mm of rain fell in about 10 hours, equivalent to a 3 year rainfall return period.

3.3 The Incident

Following the rainfall on Thursday 5th July some surface flooding was experienced in Church Lane and Low Street. No property flooding was reported at this time, nevertheless the parish council deployed pumps to protect local properties.

On Friday 6th July the subsequent rain led to increased surface flooding which eventually inundated the drainage system in the village and affected properties in Quayfield Square, Low Street and Kings Causeway.

Natural England turned off their pump during the afternoon of 6th July at the request of the IDB, in order to give more capacity in Warping Drain.

During this time a unit from Humberside Fire and Rescue Service attended and pumped water away from the at-risk areas. Flood water was also pumped from the Kings Causeway area towards the Reedness Drain.



Figure 6 - HF&RS in attendance at Quayfield Square

At the location where the land drainage should discharge into the Warping Drain the IDB excavated an access into the Black Dike adjacent to the Warping Drain eastern bank and installed a temporary pump to pump water out of the Black Dike into the Warping Drain in

an effort to lower the water levels in the system. Despite this the agricultural land remained waterlogged for a number of days. This access has now been made permanent.

Nevertheless water levels in the Quayfield Square area continued to rise and a number of properties flooded in the Quayfield Square. A number of properties on Low Street and Kings Road were also affected.

Water levels within the village receded very slowly until the Square was finally cleared of flood water on Sunday 8th July. At this time an extensive area of farmland which drains to the same land drainage system remained flooded.

3.4 Causes and Investigation Findings

3.4.1 Land Drainage

The land drainage system in the area is totally reliant on this tidal gravity outfall into the River Ouse restricted to 8 hours approx, in every 24. This means that it can take a number of days for the system to return to normal levels after rainfall events in near succession such as that which occurred on 5th and 6th July.

It is believed that the water levels in the land drainage system were high enough to have restricted the outflow from the village. It is considered probable that land drainage water flowed backwards and entered the village system.

During the dry summers of 2010 and 2011 the low levels of water in the ditches allowed exceptional quantities of weed to become established. Then during the wet summer of 2012 the weeds grew prolifically and this weed growth contributed to the elevated water levels and reduced flow in the ditch system.

The main Swinefleet Warping Drain had not been fully cleared out which reduced its capacity. Furthermore the discharge into the Warping Drain from the Black Dike was restricted by silt and debris at the inlet and the high water levels in the Warping Drain.

It is considered possible that because of the high water levels in the land drainage system generally, that some of the flood water may have flowed backwards along the new cut drain. Thus allowing water to flow towards the village instead of away and preventing the flood waters from draining down even after the rain had stopped. This cannot be confirmed without extensive computer modelling.

3.4.2 Public Sewer System

The YW foul pumping station was inundated with surface water during the evening of 5th July. Despite being inundated with surface water there is no evidence that the submersible pumps stopped. However the levels of surface water resulted in effluent from the foul drainage system contaminating the flood water on 6th July.

3.4.3 Highway Drainage

The highway drainage outfall from Low Street was found to be partially obstructed by the level of the bed of the Foulsey Dike. The outfall was found to be in poor condition, at a low

level and this ditch had not been maintained for some time. . The investigation established that the outfall pipe and the outfall had subsided.

These circumstances will have restricted the discharge from the highway drainage outfall. The water levels in this ditch were also controlled by the elevated levels in the Warping Drain and the Black Dike.

Some of the highway drainage from Quayfield Square and Kings Causeway were found to discharge into the foul sewer system.

The investigation into the outfall of the highway drainage from Church Lane is ongoing.

4 Conclusions

The Council, as LLFA has investigated the flooding at Swinefleet on 5th and 6th July using its powers under Section 19 of the Flood and Water Management Act 2010 and has concluded the following:

A protracted period of wet weather in June and July 2012, heavy rainfall on Thursday 5th July, and a further rainfall event on Friday 6th July lead to Swinefleet experiencing the subsequent flooding of highways and properties.

The combination of rainfall events and the high water levels in some of the land drainage system resulted in the flooding.

4.1 Relevant Authorities

The risk management authorities that have relevant flood risk management functions are:

East Riding of Yorkshire Council

The Council is the Lead Local Flood Authority responsible for managing flood risk from surface runoff, groundwater and ordinary watercourses, development of a Local Flood Risk Strategy, Asset Plans and Investigations under the Flood & Water Management Act 2010.

The Council is also the Highway Authority with responsibility for highway drainage under the Highway Act 1980.

Reedness and Swinefleet Internal Drainage Board

Reedness and Swinefleet Internal Drainage Board are responsible for the maintenance of the land drainage system within the Swinefleet and Reedness area under the Land Drainage Act 1991.

Environment Agency

Responsible for managing the Flood risk from main rivers, the sea and reservoirs including coastal erosion risk management, permissive powers to maintain Main Rivers, Strategic Overview over all forms of flooding and development of a national Flood Risk Strategy.

Yorkshire Water

Yorkshire Water Services is the statutory sewerage undertaker for the Yorkshire region with a duty to effectually drain sewers pursuant to the Water Industries Act 1991.

Riparian Landowners

Riparian landowners are those who own land adjoining a watercourse and have certain responsibilities, including the following:

- They must maintain the bed and banks of an open watercourse, and also the trees and shrubs growing on the banks.
- They must clear any debris, even if it did not originate from their land, this debris may be natural or man-made.
- They must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates.

If they do not carry out their responsibilities, they could face legal action under the Land Drainage Act 1991. Details of a riparian landowners responsibilities can be found in “Living on the Edge” published by the Environment Agency.

4.2 Investigation Conclusions

The Council is required to conclude whether each of those risk management authorities identified has exercised, or is proposing to exercise, their functions in response to the flood incident. Following the investigation it can be concluded that the flood risk management authorities have or are proposing to exercise their relevant functions appropriately.

Nevertheless the investigation has identified a number of measures that could improve flood risk management and these are set out in the following recommendations.

5 Recommendations

Recommendation 1

All Parish and Town Councils should review their Local Emergency Plan, with a view to providing improved response to residents in the event of further intense rainfall events in the future.

The Parish or Town Council should encourage residents to understand the flood risk in their local area and have a flood plan to guide their response in times of flooding. This could include actions such as; the best placement of sandbags, moving valuable items to a safe place and installing semi/permanent measures such as floodgates and airbrick covers to reduce the consequences of flooding at a property level.

Recommendation 2

East Riding of Yorkshire Council as the highway authority should consider implementing the following highway drainage improvement schemes:

- Installation of new separate highway drainage in Kings Causeway area, positively draining to the ditches on the east of the village.
- Removing the highway drainage discharge from the foul drainage system in the Quayfield Square and installation of a new highway drainage discharge point.
- Improvements to the highway drainage from the Church Lane area and providing an appropriate discharge point.
- Construction of a new outfall in Low Street or rebuilding of the existing outfall and headwall.
- Provide additional road gullies in Low Street at the Junction with Common Piece.

Recommendation 3

East Riding of Yorkshire Council as LLFA should consider the potential benefits of installing a surface water pumped system for the village highway drainage.

Then if appropriate seek funding to install such measures including provision of a terminal highway surface water pumping station.

Recommendation 4

Reedness and Swinefleet Internal Drainage Board supported by East Riding of Yorkshire Council as the LLFA should explore the possibility of isolating the village drainage system from the land drainage system by installing flap valves on all ditches at the edge of the village

e.g. at the outfall of the Foulsey Dike into the drain at Warping Drain Bridge and into new cut ditch at the junction with the Foulsey Dike.

Then if appropriate seek funding to install such measures including provision for temporary pumps to over pump in flood conditions.

Recommendation 5

East Riding of Yorkshire Council as LLFA should install rain gauges within the village and across the catchment for the Warping Drain and level monitors on the land drainage system to provide better flood risk management information.

Recommendation 6

Reedness and Swinefleet Internal Drainage Board should share their Water Level Management Plan and other information about the dyke maintenance program with East Riding of Yorkshire Council as the LLFA

Recommendation 7

Reedness and Swinefleet Internal Drainage Board should look into the cost / benefit of installing a pumped outfall for the Black Drain into the Warping Drain and for the Warping Drain itself into the river Ouse.

Useful Links and Contact Details:

<i>Lead Local Flood Authority</i> East Riding of Yorkshire Council County Hall Beverley East Riding of Yorkshire HU17 9BA	01482 887700	www.eastriding.gov.uk land.drainage@eastriding.gov.uk
<i>Internal Drainage Board</i> Reedness & Swinefleet Drainage Board Shires Group of IDBs Denison House Hexthorpe Road South Yorkshire DN14 0BF	01302 342 055	info@shiregroup-idbs.gov.uk
<i>Statutory Sewerage Undertaker</i> Yorkshire Water Services Ltd Western House Halifax Road Bradford BD6 2SZ	0845 1 242424	www.yorkshirewater.co.uk
<i>Environment Agency</i> Dales Area Office, Coverdale House, Amy Johnson Way, Clifton Moor, York YO30 4UZ	General Enquiries 08708 506506 (Mon-Fri, 8am – 6pm) Incident Hotline 0800 807060 (24hrs)	www.environment-agency.gov.uk

Appendix A - Large Format Plans

- Figure 1 Location Plan**
- Figure 2 July 2012 Flooded Areas**
- Figure 3 Reedness & Swinefleet Drainage Board Area**
- Figure 4 New Cut Location**
- Figure 5 Public Sewer Network**

Figure 1 - Location Plan

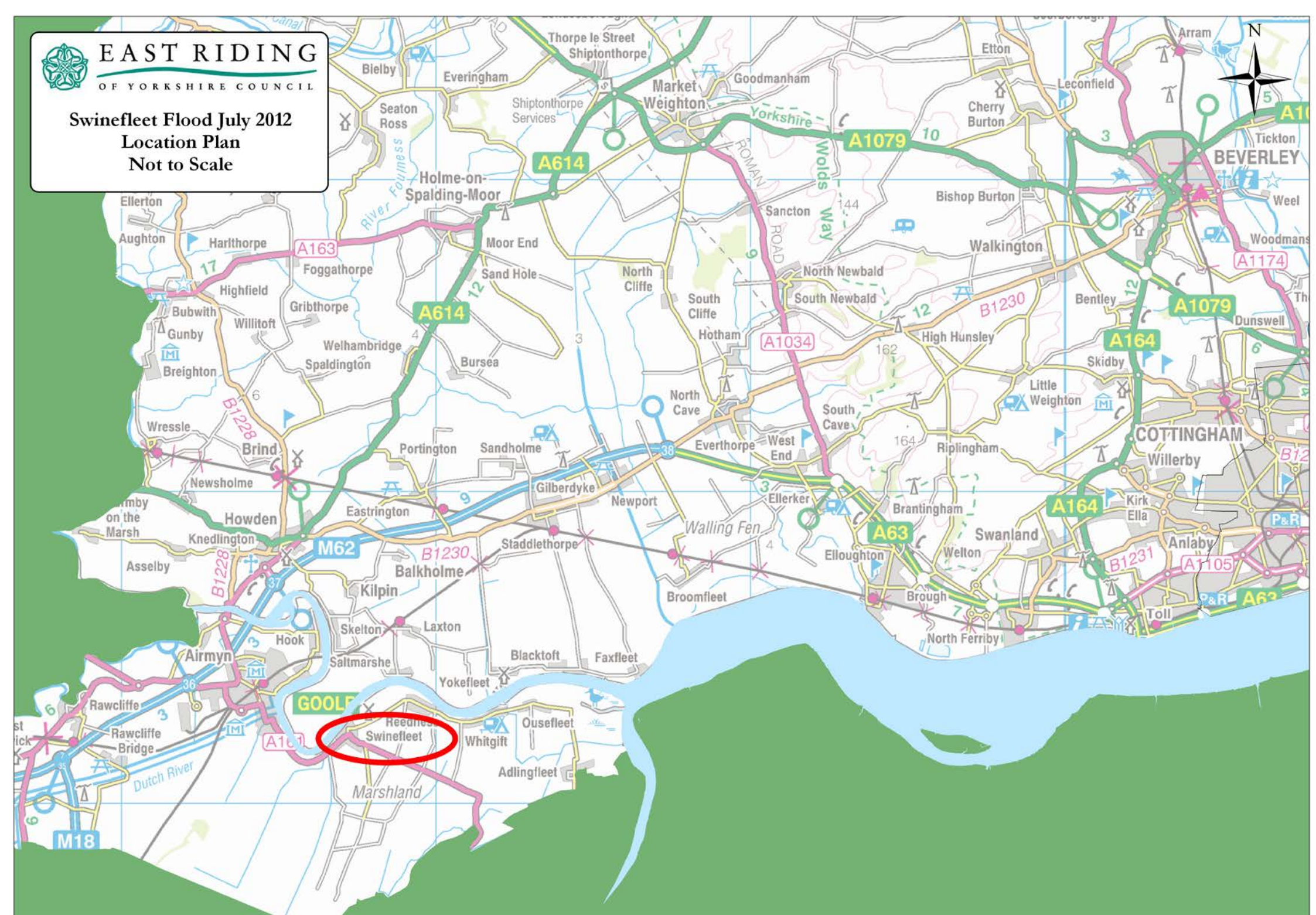
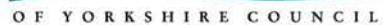


Figure 2 - July 2012 Flooded Areas



EAST RIDING
OF YORKSHIRE COUNCIL

Swinefleet Flood July 2012
Affected Areas
Not To Scale



Swinefleet

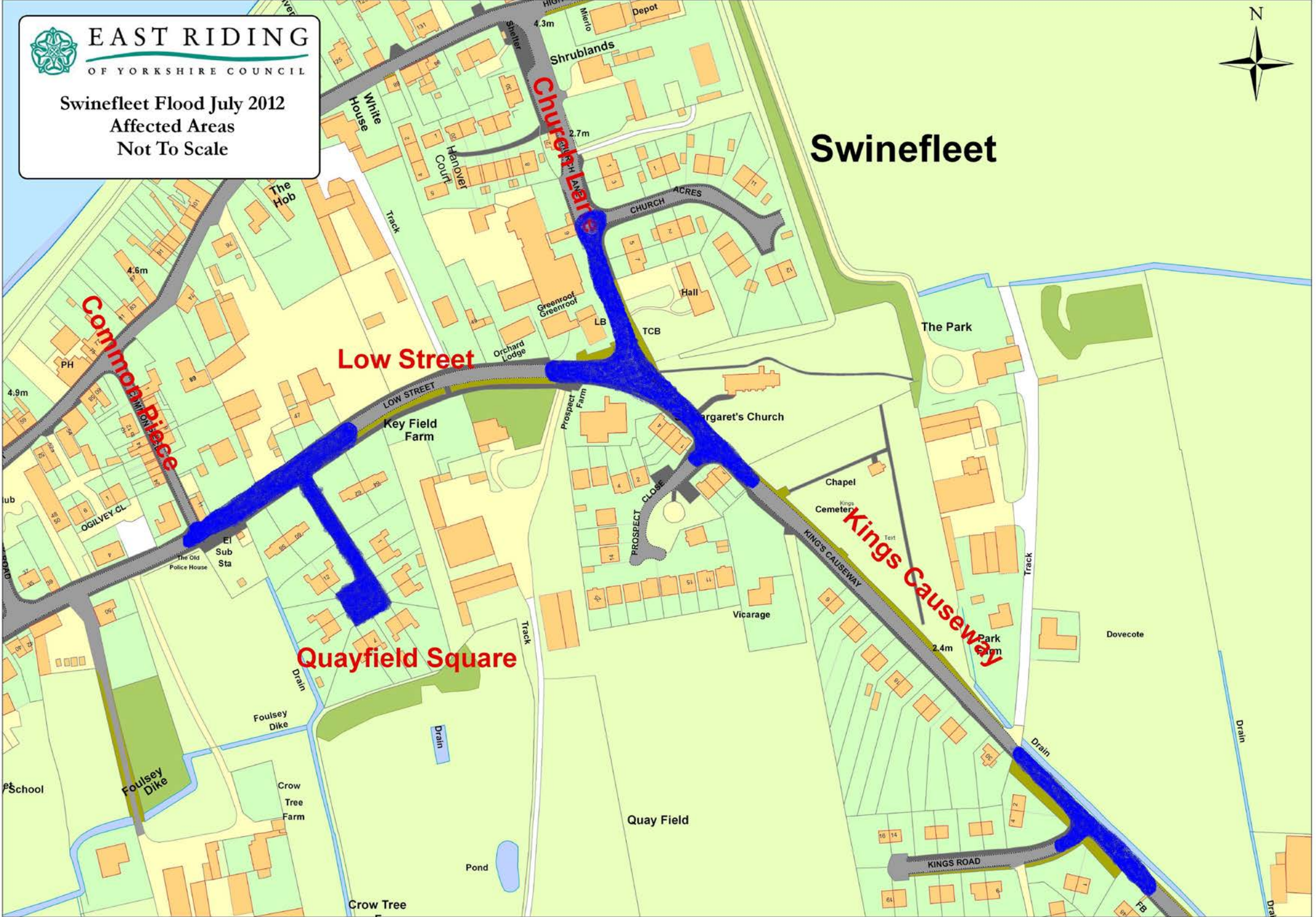
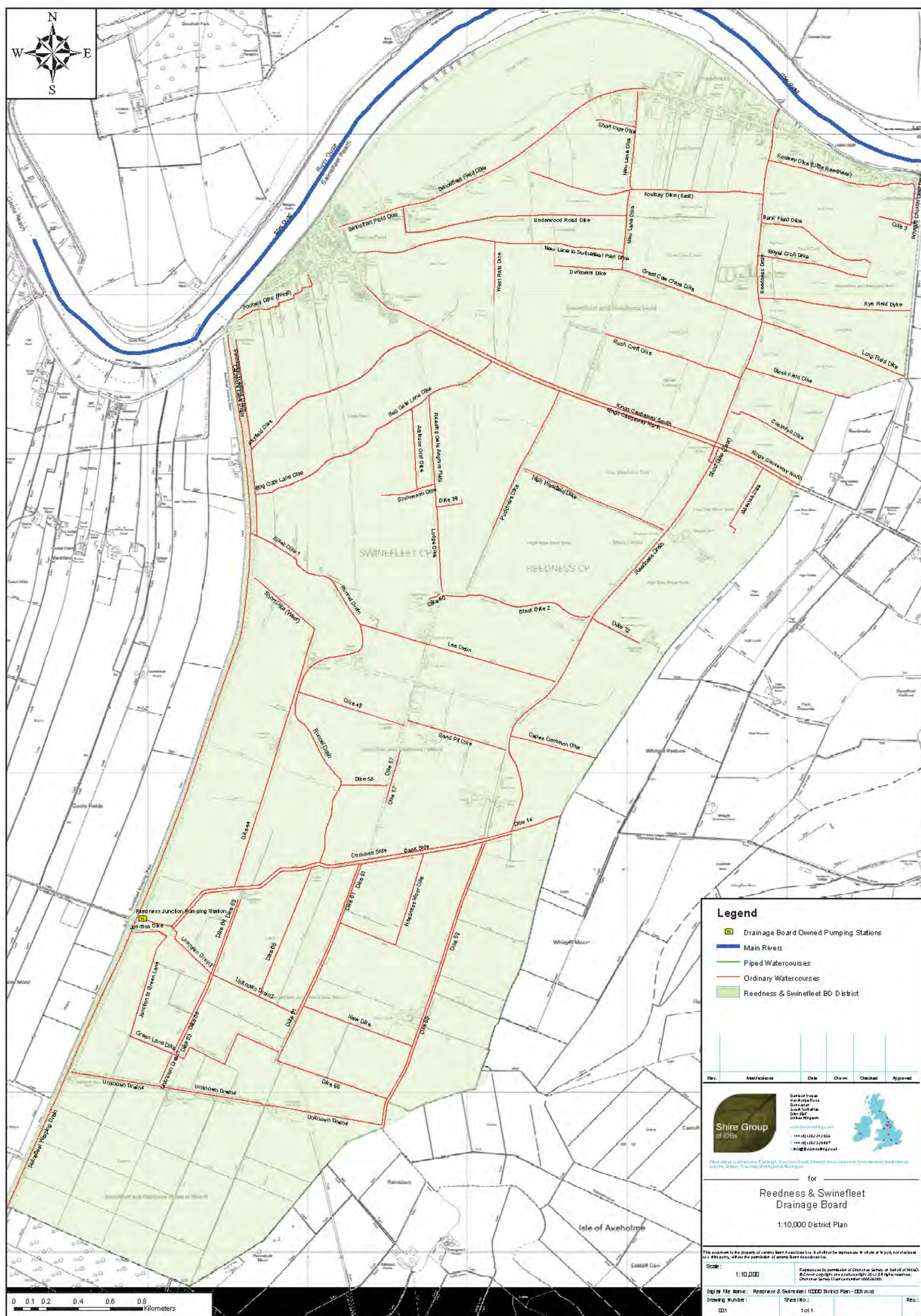


Figure 3 - Reedness & Swinefleet Drainage Board Areas





EAST RIDING
OF YORKSHIRE COUNCIL

Swinefleet Flood July 2012
New Cut Location
Not To Scale



Warping Drain

Foulsey Dike

New Cut

Keyfield Dike

Swinefleet

**Kings Causeway
Drain**

Swinefleet and
Reedness Field

Quay Field

Swinefleet and Reedness Field

**Figure 4 - New Cut
Location**



1:1,250

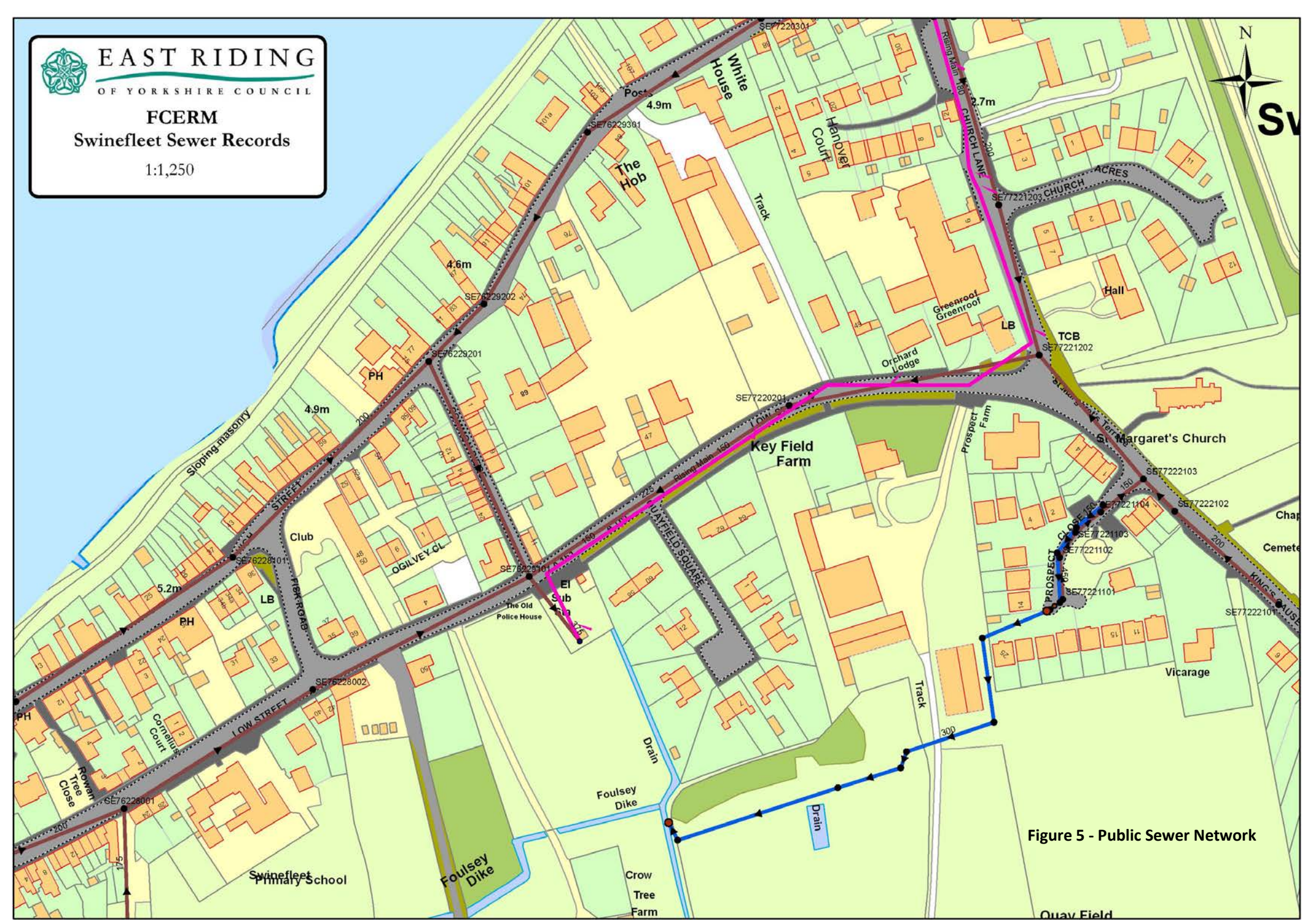


Figure 5 - Public Sewer Network



East Riding of Yorkshire Council, County Hall, Cross Street, Beverley, East Yorkshire HU17 9BA