Flood Investigation Report

Leeman Road Area

26/27 September 2012

February 2013

Revision Schedule

City of York Council

Flood Investigation Report

November 2012

Revision	Date	Details	Author
01	January 13	Draft report for stakeholder consultation	M Tavener
02	February 13	Final report	M Tavener

Contents

Executive Summary

City of York Council (CYC), as the Lead Local Flood Authority (LLFA), has a duty under Section 19 of the Flood and Water Management Act 2010 (FWMA) to investigate significant flood incidents in its area. The investigation must identify which risk management authorities have relevant flood risk management functions in respect of the event and whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood. On completion of an investigation it must publish its findings and notify any relevant risk management authorities.

The affected location is known as the Leeman Road area and is approximately 2km west of the city centre within a meander in the river Ouse. It mainly comprises dense Victorian terraced housing, with later semi-detached housing on its fringes. Salisbury Road, Salisbury Terrace and Kingsland Terrace form a significant link through this area between Water End and Leeman Road into the City.

In this investigation there are three relevant flood risk authorities. CYC is the LLFA for its area with duties under the FWMA, which includes the investigation of flood incidents. The Environment Agency (EA) has a national overview of flood risk and owns and maintains the overland flood defences at this location. Yorkshire Water Services (YWS) is responsible for the maintenance of the public sewerage system, and at this particular location has a responsibility to operate the penstocks and pumping station to ensure that the public sewer system remains operational.

A significant part of the area is located in EA flood zone 3, indicating a risk of flooding of greater than 1 in 100 years (1%). The remainder is in flood zone 2, with a risk of flooding between 1 in 100 years (1%) and 1 in 1,000 years (0.1%).

Flooding in 1978 triggered a flood defence building programme throughout the City. The first scheme to be constructed, protecting the Leeman Road area, was completed in the early 1980s successfully protecting 225 properties against flooding which occurred in January 1982. Subsequent defences were built to protect other areas of the City and now a total of approximately 1,000 properties are defended to the same standard.

Each protected area is susceptible to floodwater bypassing the defences through the sewerage systems. To manage this penstocks are closed to isolate the river and a pumping station pumps the sewage flows out of the area. All of the works on the sewerage systems were designed and constructed by the York City Council's Main Drainage section, working as agents for the Yorkshire Water Authority (YWA) at the time. The defences were built by the YWA Rivers Division, the predecessor of the EA.

CYC maintained the sewerage flood defence installations on behalf of YWA/YWS, operating them in accordance with the trigger levels in its River Flood Emergency Plan. The trigger is the receipt of a forecast river level of 3.6m above summer level (ASL) and rising, and the frequency of operation can vary from zero to many times a year. In 1998 YWS ended the agency agreement and now operate the penstocks and pumping station.

The flood event started on 24 September 2012. With a forecast of 4.2m and rising, the multi-agency flood group met and considered the forecast. As the level was predicted to exceed 4.6m the response was escalated to silver control under the control of the police. Between 26 and 28 September the river continued to rise, peaking at a level of 5.07m above summer level (ASL), measured at the Viking recorder in the centre of York. The level reached was slightly higher than that reached in 1982 and 300mm below the top of the defences. Throughout the City the flood defences performed well, protecting an estimated 1,000 properties against overland flooding from the rivers Ouse and Foss.

The only location where problems occurred in the major defended areas was at Leeman Road. On 26 September water started flowing out of gullies in the Balfour Street/Carnot Street/Lincoln Street area. At this point the River Ouse level was well within the design range of the flood defences and it was apparent that the flooding was directly related to the river level. The level of the water flowing from the gullies continued to rise steadily with the river, affecting larger areas and threatening properties. On 27 September Salisbury Road and Salisbury Terrace, a major route into the City, had to be closed to traffic as the risk of flood water inundating properties was further aggravated by waves from vehicles.

Sandbagging was carried out by CYC, and pumps procured by the fire service, EA and YWS eventually reduced the level throughout the area by pumping from manholes on the sewerage systems directly into the river over the defence. Flooding to properties was avoided by the sandbagging and the event caused major concern and disruption to the residents of the area and considerable adverse publicity in what was, elsewhere in the city, a successful operation.

Information was gathered during the event and from liaison with YWS and the EA. Two further significant but lesser flood events in the following months aided the investigation. It is clear that the flooding occurred by river water entering the sewerage systems and its extent and level is directly related to the river. The reason for the ingress of river water into these systems was concluded to be leaking penstocks, and the extent of the flooding may have been aggravated by problems associated with the pumping station.

On request YWS provided details of their operating procedure, maintenance records and post event findings. Their operating procedure and guidance notes are the same as those inherited from CYC. Maintenance records specific to this area are unclear but a post event inspection of all penstocks and the pumping station has found that the penstocks were operational with the exception of the one at Balfour Street, which was sticking, and the one at Jubilee Terrace Pumping Station which appeared to close but was stuck in the open position. This is a 750mm diameter penstock that isolates the local sewer network for the area from the downstream sewer network, and prevents any backing up of the main sewers from impacting on Jubilee Terrace and Leeman Road area. River water ingress was witnessed also from the valve at Balfour Street even when in the closed position. A fault was also found in the seating of one of the pumps on its base.

The Leeman Road area has been successfully defended against flooding since 1982 including the highest recorded flood in 2000. It is known to be effective, but on several occasions the performance of the sewerage systems has been a cause for concern. CYC has had concerns that YWS did not have a clear understanding of the importance of the installation and this concern has been further compounded by a lack of continuity of staffing at YWS with local knowledge. Previous less severe events have raised the same issues and assurances have been given by YWS that they are aware of their obligations and that there were no problems with the installation.

The EA has received planning approval from CYC for improved flood defences for the area, and throughout the design process the Council's FRM team has worked with the EA to ensure that YWS are fully involved, but this had proved to be difficult. However the effect of the flooding has focussed YWS's attention on this matter and progress is being made to address sewerage issues in connection with the defence improvements.

In response to the investigation YWS have:

1 carried out an investigation to determine the exact cause of the flooding.

2 taken appropriate steps to ensure the resilience of their equipment which is required to protect the Leeman Road area from flooding through the sewerage systems.

3 liaised with the EA in the development of the improved flood defence scheme to provide confidence that the new defences will not be compromised by faults in the sewerage systems.

1. Introduction

1.1 LLFA Investigation

City of York Council (CYC), as the Lead Local Flood Authority (LLFA), has a duty under Section 19 of the Flood and Water Management Act 2010 (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 provides powers to request information in pursuance of the investigation:

(1) An authority listed in subsection (2) may request a person to provide information in connection with the authority's flood and coastal erosion risk management functions.

(2) The authorities are—

(a) the Environment Agency, and

(b) lead local flood authorities.

(3) The Welsh Ministers may request a person to provide information in connection with the function under section 8.

(4) Information requested under subsection (1) or (3) must be provided—

(a) in the form or manner specified in the request, and

(b) within the period specified in the request.

The report will be published on the council's website and copies delivered to those authorities deemed responsible for taking further action in relation to the flooding.

1.2 Site Location

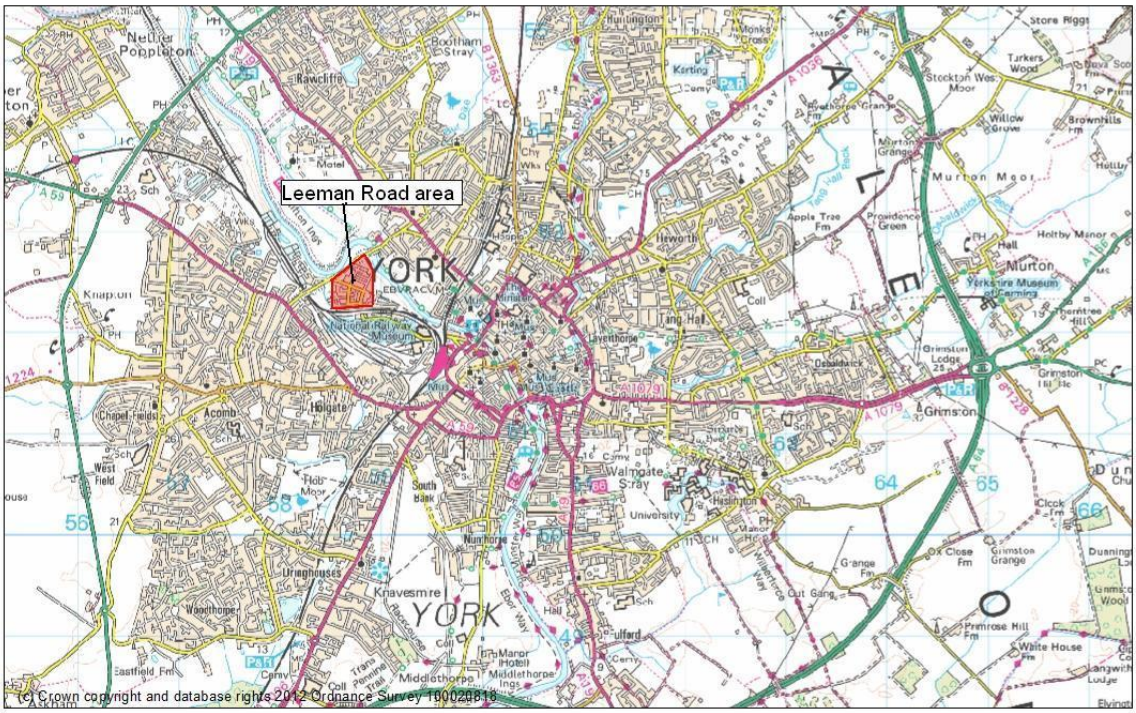


Figure 1: Location plan

The location which is the subject of this report is approximately 2km west of the city centre within a meander in the river Ouse, as shown in Figure 1. It mainly comprises dense Victorian terraced housing, with later semi-detached housing on its fringes. Salisbury Road, Salisbury Terrace and Kingsland Terrace form a significant link through this housing area between Water End and Leeman Road into the City. The location is known locally as the Leeman Road area.

2. Responsibilities

2.1 City of York Council

CYC is a flood risk management authority and the LLFA for its area with duties under the FWMA, which includes the investigation of flood incidents. The EA encourages the adoption of multi-agency flood risk plans for local authorities and the Council takes responsibility for maintaining and implementing its multi-agency River Flood Emergency Plan to manage river flood events.

The LLFA has the powers under s30 of the FWMA to designate features that it considers are critical to flood risk management, to ensure that they continue to operate effectively.

2.2 The Environment Agency

The EA is a flood risk management authority with a national overview of flood risk. It owns and maintains the overland flood defences and is responsible for monitoring river levels and issuing flood warnings.

2.3 Yorkshire Water Services

YWS is the flood risk management authority responsible for the maintenance of the public sewerage system. At this particular location it has a responsibility to operate the penstocks and pumping station to ensure that the public sewer system remains operational.

3 Flooding

3.1 Flood Risk and Existing Defences

A significant part of the area is located in the EA flood zone 3, indicating a risk of flooding of greater than 1 in 100 years (1%), as shown in figure 2. The remainder of the area is in flood zone 2, with a risk of flooding between 1 in 100 years (1%) and 1 in 1,000 years (0.1%).

Flooding in 1978 triggered a flood defence building programme by the Rivers Division of the Yorkshire Water Authority (YWA) throughout the City. The first scheme to be constructed, protecting the Leeman Road area, was completed in the early 1980s and successfully protected 225 properties against flooding which occurred in March 1982. This flooding was the highest since 1947, with the cause on both occasions being rapid snow melt. Subsequent defences were built to protect other areas of the City and now a total of approximately 1,000 properties are defended to the same standard.

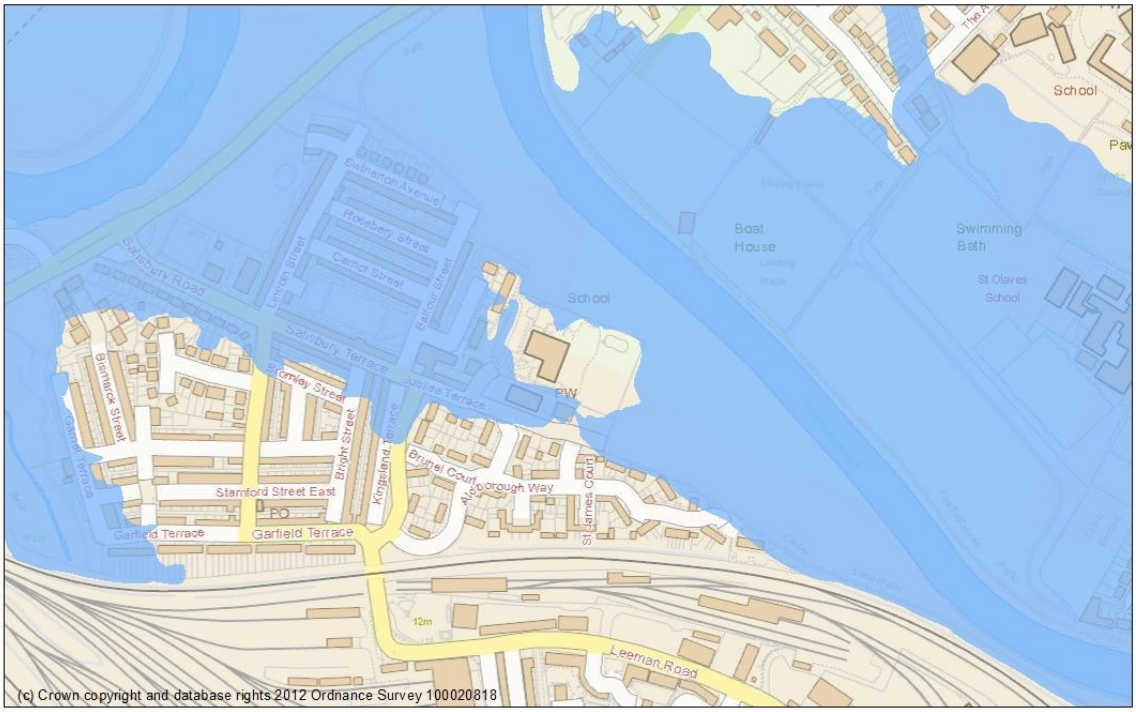


Figure 2: Flood Zone 3

Each protected area is susceptible to floodwater bypassing the defences, both through the sewerage system via combined sewage overflows working in reverse, and by surface water outfalls backing up. To manage this, each area has a pumping station on the sewerage system, and penstocks to close off the flows from the river. These are closed as the river rises, and the pumping stations switched on. This isolates the sewerage systems from the

river and pumps flows forward to a point outside the protected area. All of the works on the sewerage systems were designed and constructed by the York City Council's Main Drainage section, working as agents for the YWA at the time. The defences were built by the YWA Rivers Division, the predecessor of the EA.

The concept drawing for the Leeman Road sewerage works is included in as Annex 1. The Council maintained the sewerage flood defence installations as agents to YWA and latterly Yorkshire Water Services (YWS), operating them in accordance with the trigger levels in the Council's River Flood Emergency Plan. The operating procedure that the Council used is included as Annex 2. The trigger is the receipt of a forecast river level of 3.6m above summer level (ASL) and rising. The frequency of operation can vary from zero to many times a year, but it is vital to the defence of the areas that the installations are maintained and reliable to prevent river flows circumventing the overland defences through the sewerage systems.

CYC's agency arrangement was terminated in 1998 and since then YWS has been directly responsible for the maintenance and operation of these installations.

3.2 The Flood Event

The River Ouse started rising on Monday 24 September 2012 and rose rapidly by 2m overnight, continuing to rise steadily throughout Tuesday. In view of a forecast of 4.2m and rising the multi-agency flood group met on Wednesday morning in accordance with the CYC River Flood Emergency Plan. At that meeting the forecast was considered and as the level was predicted to exceed 4.6m the response was escalated to silver control under the control of the police. The silver control room was staffed by representatives of CYC, YWS, the EA and the three emergency services who responded to the forecasts in accordance with the Council's River Flood Emergency Plan and their own organisation's plans.

Between Wednesday 26 and Friday 28 September 2012 the river continued to rise, peaking at a level of 5.07m above summer level (ASL), measured at the Viking recorder in the centre of York, on the Friday morning. The level was slightly higher than that reached in 1982 and 300mm below the top of the defences. Throughout the City the EA's flood defences performed well, protecting an estimated 1,000 properties against overland flooding from the rivers Ouse and Foss.

3.3 Flooding in the Leeman Road area

The only location where problems occurred in the major defended areas was at Leeman Road. On Wednesday (26 September) water started flowing out of gullies in the Balfour Street/Carnot Street/Lincoln Street area. At this point the River Ouse level was approximately 4.5m ASL at the Viking recorder, equal to 9.5m above ordnance datum (AOD) and well within the design range of the EA flood defences (crest level equivalent to 10.45m AOD measured at the Viking recorder). Typical road levels in the areas first affected are approximately 9.5m AOD confirming that the flood level was directly related to the river level.

The level of the water flowing from the gullies in the defended area continued to rise steadily with the river, affecting larger areas and threatening properties. For a time on Thursday Salisbury Road and Salisbury Terrace, a major route into the City, had to be closed to traffic as the risk of flood water inundating properties was further aggravated by waves from vehicles.

Sandbagging was carried out by CYC, and pumps procured by the fire service, EA and YWS eventually reduced the level throughout the area late on Thursday by pumping from manholes on the sewerage systems directly into the river over the defence. Flooding to properties was only avoided by the sandbagging.

The event caused major concern and disruption to the residents of the area and considerable adverse publicity in what was, elsewhere in the city, a successful operation.

3.4 Investigation

Section 2 clarifies the responsibilities of the flood risk authorities and section 3.1 the history of the flood defences. The bodies responsible for the defence of this area are

- The EA – protection from overland flows
- YWS – protection from flooding from the sewerage system by ensuring that they continue to function.

The investigation was carried out by the CYC Flood Risk Management Team. Information was gathered both during the event and from subsequent liaison with YWS and the EA. The investigation was aided by the occurrence of two further significant but lesser flood events, in November 2012 when the river peaked at 4.65m ASL on 28 November, and at the New Year when it peaked at 4.35m ASL on 1 January. The November event threatened the area with flooding from the same source, but was managed by YWS with extra pumps that were put in place prior to the event. Due to remedial work that YWS carried out in December the

sewerage systems appeared to operate satisfactorily during the New Year event and also a subsequent lesser event at the end of January.

It was clear from observations on site that the flooding occurred through the sewerage systems serving the area and that the extent of it is directly related to the river level. It is also clear that the reason for this is the ingress of river water into these systems due to leaking penstocks and possibly aggravated by the ineffectiveness of the pumping station which is designed to pump all flows from the catchment over a penstock to the sewer outside the protected zone.

To confirm this, the levels at which flooding commences have been compared with river levels and ground levels. Flooding is known to commence when the river exceeds 4.2m ASL at the Viking recorder. From EA modelling the corresponding level at Leeman Road, due to the flow gradient, is approximately 300mm higher, i.e. 4.5m ASL or 9.5m AOD. The ground levels, taken from the YWS manhole records, at the car park and Balfour Street / Stephenson Court junction are:

Location	MH ref.	Cover Level (AOD)
Car park entrance	7407	9.26
Balfour St/Stephenson Court	8408	9.34

Thus a clear connection can be proved between the river level and the onset of flooding through the sewerage systems. As the river level rises greater areas of road become affected and properties in their vicinity are at risk of internal flooding.

Emergency action to reduce the levels in the sewerage systems was taken by YWS using two temporary pumps at the following manholes:

1. The manhole on the combined system at the north end of Lincoln Street (7605)
2. The manhole on the surface water sewer at the junction of Swinerton Avenue and Balfour Street, (8507), which also has an overflow connection into it from the head of the adjacent foul sewer.

The cover and invert levels of these are:

MH ref.	Invert Level (AOD)	Cover Level (AOD)
7605	8.38	9.73
8507	8.60	10.03

A comparison of the invert levels at these pumping locations with the ground levels at the flood locations demonstrates that this pumping can have an effect on levels in the sewerage systems and alleviate flooding. However the level in the system can, at best, only be drawn down to about 600mm below the lowest ground levels due to the manholes being near to the heads of their respective systems. Ideally, for temporary pumping to be most effective, pumps should be located further down the systems but this would require very long delivery hoses to discharge to the river and is not feasible. Therefore the key to the temporary pumping being effective, should it be required, is to ensure that the pumps have sufficient capacity to match the leakage entering the sewerage systems and are deployed early in an event if the need is identified from on site monitoring.

3.5 Reasons for ingress of river water into the sewerage systems

Having established the flooding mechanism, the causes are concluded to be one or more of the following:

1. Leakage of river water through penstock(s) due to:
    - operational error
    - failure to close due to damage, blockage, lack of maintenance or dilapidation due to age.
2. Failure of the pumping station due to:
    - operational error
    - equipment malfunction or breakdown

3.6 Information requested

Having reached the above conclusion YWS were requested to provide, in accordance with Section 14 of FWMA, details of:

- Their operating procedure for the installation.
- Maintenance records for the penstocks and pumping station.
- Findings on standing down the installation after the flood.

3.7 Information provided

An operating procedure plan for the penstocks and pumping station, and guidance notes covering all of the flood defences in the City has been provided and are included as Annex 3. It can be seen that the procedure is the same as the one inherited from CYC and the guidance notes are clear and very similar to those followed by CYC.

An audit trail of maintenance has been difficult to establish but since the events YWS has reviewed its procedures and increased maintenance visits to each of the flood defence pumping stations. Each station will receive a monthly visit and include a monthly exercising of all flood defence related penstock valves.

YWS findings on standing down of the flood defence pumping stations found that:

- River water ingress from behind the closed penstock valves was apparent
- Valve no 7 at Jubilee Terrace Pumping Station was stuck in the open position when it should have been closed
- Pump no 1 in Jubilee Terrace Pumping Station had a faulty duckfoot and was not seated correctly, this resulted in a reduction of pumping capacity

4 Discussion

The flood defence has a long history of successfully defending the Leeman Road area. It was first tested in 1982 against the same river level as recently experienced and has been used against numerous subsequent lesser events and also the highest recorded flood in 2000. It is therefore known to be effective, but on several occasions including those discussed in this report, the performance of the sewerage systems has been a cause for concern.

For many years the Council's Flood Risk Management (FRM) team has been concerned that a lack of knowledge by YWS of the complex operational requirements of the system, and a lack of understanding of its strategic importance in flood risk management, has made this area very vulnerable in times of flood. This concern has been further compounded by a lack of continuity of staffing at YWS with local knowledge. The issue was raised with YWS following the flood in 2000 and an incident in 2009, and on both occasions assurance was given by YWS that the company was aware of its obligations and that there were no problems with the installation.

Over the past three years the EA has been developing an improved flood defence scheme for the area, and this received planning approval from CYC in September 2012. Throughout the design process the Council's FRM team has discussed the scheme with the EA stressing the need to engage with YWS to ensure that the raised defences will not be compromised by a failure of the sewerage system, but this had proved to be difficult. However the effect of the flooding has focussed YWS's attention on this matter and following the flood CYC convened a meeting with the EA and YWS to discuss the event and the flood defence scheme. The minutes of this meeting are included in Annex 4 and progress is being made to address the actions identified in the meeting.

5 Conclusion

The conclusion of the investigation is that the flooding in the Leeman Road area in September and November 2012 was due to the ineffective operation of the flood defence measures on the YWS sewerage systems, which are required to complement the EA's overland defences. The reason for this has been established by YWS as:

- incorrect operation of the penstocks
- faults in the penstocks
- faults in the pumping station

6 Recommendations and actions taken

The following recommendations were made to YWS:

Recommendation 1

Carry out an investigation to determine the exact cause of the flooding.

Action taken

Investigation completed and cause identified.

Recommendation 2

Take appropriate steps to ensure the resilience of their equipment which is required to protect the Leeman Road area from flooding through the sewerage systems.

Action taken

Penstock no 7 has been freed and greased and is now operating as designed. The increase in maintenance and regular exercising should reduce the risk of this and the other penstocks sticking open significantly.

Pump no 1 in the pumping station has been repaired and is now operating as designed.

The issue of river water ingress will be addressed to a large degree, with the installation of new penstocks as part of the Water End Flood Alleviation Scheme.

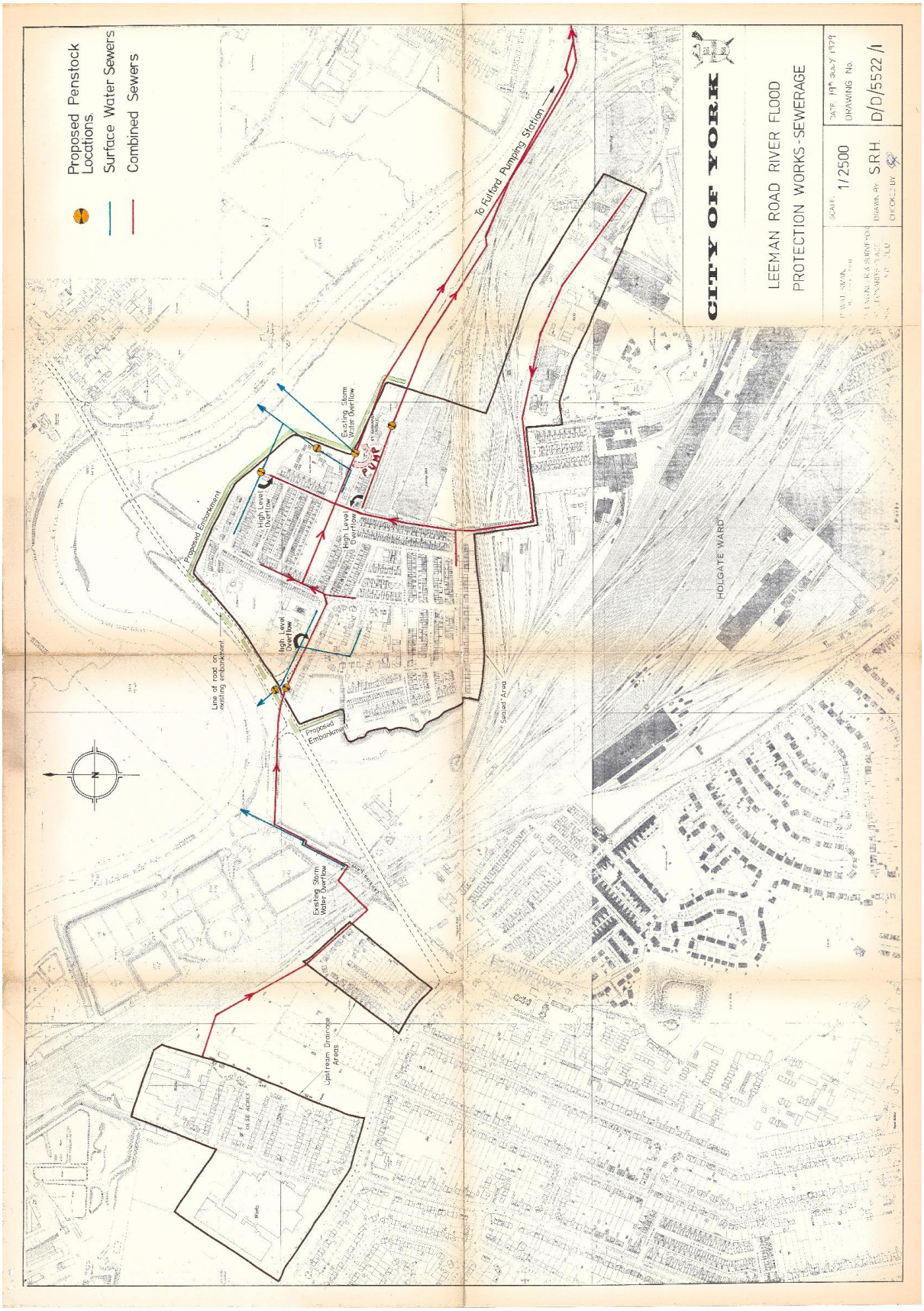
Recommendation 3

Fully engage with the EA in the development of the improved flood defence scheme for the Leeman Road area to provide confidence that the new defences will not be compromised by faults in the sewerage systems.

Action taken

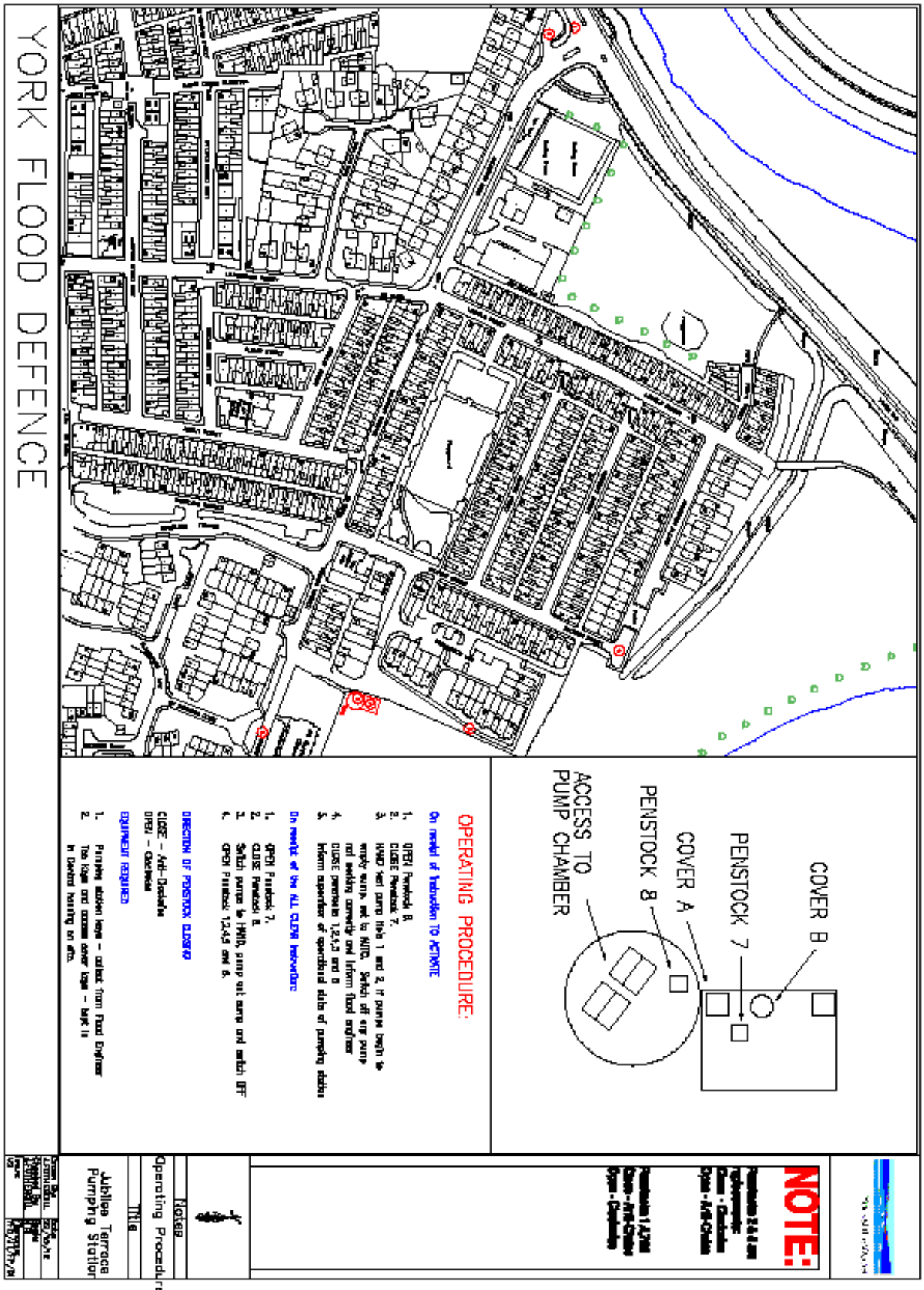
YWS have confirmed that it is fully engaged with the EA on the development of the flood defence scheme

Annex 1: Flood defence concept drawing



Annex 2: York City Council Operating Procedure

Annex 3: Information from YWS - Operating procedure



Annex 3 continued: Information from YWS – Guidance Notes

City of York
Flood Defences

Guidance Notes on the Management of the Pumping Stations and Penstocks during Periods of High River Level.

1. On receipt of a Flood Watch from the Environment Agency when a river level of 3.0 m (above normal at Ouse Bridge) is predicted, Yorkshire Water Services Sewerage Field Team Personnel will consider the need to activate our defences.

2. On receipt of a Flood Warning or in any event at least 4 hours before a flood level of 3.8 m (above normal river level at Ouse Bridge) is expected the closing down procedure must be implemented.

   Under certain circumstances the close down may be delayed but only subject to agreement of a WW Ops Contact or the Area Manager.

3. "Closing down" procedures should, where possible be organised so as to be carried out during normal working hours. This must be a 3 man team

4. Arrangements should be made for pumps and penstocks at each location to be observed and confirmed operational by the nominated personnel every 6 hours (or more frequently in the event of rain, or as directed by the Ops contacts.

   To assist in the accurate accounting of costs sustained during the incident, records of time spent on each operation should be kept and an internal order set up.

   a) Duty Manager to inform Regional Engineering Services (i.e. Derek Wild's team) in order for emergency pumps (Scargill) to be brought into a state of readiness.

5. If, at any time there is a failure of any pumps, power supply, penstocks or if very high water levels in local man holes are noted, a WW Ops Contact or the YWS Scheduling team must be informed. FLOODING OF HUNDREDS OF HOMES COULD OCCUR.

   On receipt of a report of any failure an Ops Contact in conjunction with the Environment Agency will assess the situation and decide upon the appropriate course of action. In any event a significant incident should be raised by the Duty Manager or Area Manager.

   IN ADDITION THE YWS AREA MANAGER SHOULD BE INFORMED AND CONSIDERATION MUST BE GIVEN FOR DECLARING A SEVERE FLOOD WARNING IN CONJUNCTION WITH THE ENVIRONMENT AGENCY.

6. The systems should only be restored to a non-flood configuration when the instruction is received from YWS WW Ops Contacts following consultation with the EA over current river levels. At this stage the river level at Ouse Bridge will be less than 2.5m above normal and dropping with a good forecast.

   (ALL CLEAR SITUATION)

Appendix 3.

City of York
Flood Defences

Situation in areas requiring protection by the following pumping stations:
(all levels above normal Ouse Bridge – 5.0 AOD)

1. Jubilee Terrace

   Roads are affected by floods of 3.8 m – 4.0 m
   11 Houses are affected by floods of 4.0 m – 4.2 m

2. Lower Ebor Street

   Roads are affected by floods of 3.8m – 4.0 m
   12 houses are affected by floods of 4.0m – 4.2m

3. Holgate Beck / St George's Place

   Road in Hamilton Drive East affected by floods of 4.2 m – 4.4 m
   28 houses in Beech Avenue affected by floods of 4.4 m and 4.6 m

4. Westminster Road / Bur Dike

   Roads in Water Lane are affected by floods of 3.8 m – 4.0 m
   12 houses are affected by floods of 4.8 m – 5.0 m

5. Longfield Terrace

   Roads are affected by floods of 3.8 m – 4.0 m
   5 houses are affected by floods of 4.2 m – 4.4m

6. Marygate

   Roads are affected by floods of 3.8 m – 4.0 m
   8 houses are affected by floods of 4.0 m – 4.2 m

7. North Street

   Environment Agency close barrier etc at 3.0 m (Gate 5) and at 3.50 m (Gate 1,2,3 and 4)
   YWS Sewerage Field Team operates the pumping station between 3.0 m and 3.8 m
   A.O.D.

8. Castle Mills
   Castle Mills Pumping Station to be checked to ensure that it has automatically operated – liaise with the Environment Agency Barrier Staff.

Appendix 5.

Station	No.	Item	Size	Turns	Chamber Depth(m)	Access
Jubilee Terrace	1	Penstock	225	32	3	major c/w but nr kerb
Jubilee Terrace	2	Penstock	375	25	1.9	c/w turning head
Jubilee Terrace	4	Penstock	225	35	2.8	balfour st turning head
Jubilee Terrace	5	Penstock	375	22	4	footpath os No 10
Jubilee Terrace	6	Penstock	225	32	3.5	by church in cycle path
Jubilee Terrace	7	Penstock	975	71	3.5	pump station in field
Jubilee Terrace	8	Penstock	300	35	3.5	pump station in field
Lower Ebor Street	1	Penstock	225	24	2.5	back alley
Lower Ebor Street	2	Penstock	150	12	2.8	c/w cul-de-sac de sac
Lower Ebor Street	3	Penstock	150	12	2	c/w cul-de-sac de sac
St Georges Place	1	Penstock	450	40	6	c/w cul-de-sac de sac
Wesrminster Road	1	Penstock	525	40	4	pump station in field
Wesrminster Road	2	Penstock	525	40	4	pump station in field
Wesrminster Road	3	Valve	150		3	pump station in field
Wesrminster Road	4	Valve	150		3	pump station in field
Wesrminster Road	5	Valve	225		3	pump station in field
Wesrminster Road	6	Valve	150		3	pump station in field
Longfield Terrace	1	Penstock	1200	100	4.5	pump station
Longfield Terrace	2	Penstock	375	38	4.5	pump station
Longfield Terrace	3				4.5	pump station
Longfield Terrace	4				4.5	pump station
Longfield Terrace	5				4.5	pump station

Annex 4 Minutes of CYC/EA/YWS meeting

Water End Flood Alleviation Scheme

Meeting 16 October 2012

Attendance:

CYC Mike Tavener, Brian Hebditch, Jim Cavanagh, Richard Wells
EA – Helen Tattersdale, Mark Fuller
YWS – Gary Collins

Background information

The River Ouse rose during the early part of the week commencing 24 September 2012 and peaked at 10.08m on 26/27 September measured at the Viking recorder. This was approximately the same level as in 1982 and both the overland defences and the YWS operations should have been capable of completely protecting the Leeman Road area from flooding, as has been achieved many times before, including 1982.

While the overland defences performed satisfactorily, flooding occurred through the combined sewerage system which should have been sealed from the river by a number of penstocks, with flows from the area being pumped by a flood pumping station onwards downstream. Similar flooding occurred in 2000 and 2009, and CYC have long had doubts about the operation of the defences on the sewerage system for which they had previously been responsible under the agency agreement.

The flooding affected several roads, necessitating the closure of Salisbury Road & Terrace, a major route into the City. Flooding of properties was only avoided by sandbagging. This caused major concern and disruption to the residents of the area and considerable adverse publicity in what was, elsewhere in the city, a successful operation.

Following this event, and in view of the imminent upgrading of the EA's defences, it was considered prudent to convene a meeting to:

- discuss the flood event,
- analyse why there was a failure in the defence of the area,
- use the information to inform the detailed design of the forthcoming scheme to ensure that it would not suffer failure.

Flood event and analysis

		Action
1	The river reached the same level as in 1982 but a failure of the sewerage system caused flooding. It was agreed that the cause of the flooding was ingress of river water into the sewerage system.	
2	YWS have found no clear reason for this, but acknowledge that it was the cause. Unfortunately there does not appear to be a detailed record of the status of individual penstocks made as the system was stood down, though this was suggested by CYC, which may have shed some light on the cause of the failure.	
3	YWS gave an assurance that they are clear about the operating procedure for the system and that it was followed.	
4	YWS are employing a consultant to check the penstocks and identify any remedial work required. They are considering the installation of status indicators on the penstocks. They are confident that once this is done the system will be fit for purpose.	YWS
5	Two penstocks were replaced some time ago and the direction of turn for open/close may be inconsistent with the originals. This will be checked in the survey.	YWS
6	Although YWS claimed that there was a maintenance regime in place for the penstocks and pumping station CYC engineers were not convinced based on observations and experience at other YWS flood installation locations. It would be beneficial to see evidence of this maintenance, in the form of contractor records.	YWS

7	CYC expressed concern that the pumping station may not have been operating on a duty/assist basis to maximise its output, as they understand that it is YWS policy to operate PSs on duty/standby. Due to the specific requirements of this operation this is unlikely to provide sufficient capacity, particularly if there is a rainfall event in the catchment. YWS undertook to investigate and change their procedure if necessary.	YWS
8	The PS is equipped with telemetry but YWS were unclear what action a high wet well alarm will trigger.	

The detailed design of the forthcoming scheme

9	The EA is confident that their design has taken into account all possibilities of overland flow and underground seepage and therefore the new defence will seal the river from the Leeman Road housing area. It is absolutely essential that the defences are not compromised by the sewerage system and that the opportunity should be taken to review the design with the experience of the flood still clear.	
10	CYC expressed doubts that the proposed upgrading of the penstocks in connection with the scheme would be effective based on their understanding of the sewerage system and experience in operating it as YWS agents prior to 1998. They requested that the design be reviewed in detail by EA/YWS to ensure that there will be no chance of failure when the defences are upgraded. EA agreed that this is necessary and EA/YWS have arranged a meeting to discuss this in detail. GC will ensure that YWS is appropriately represented so that decisions can be made. CYC are willing to attend if requested.	EA/YWS (CYC?)
11	CYC were also concerned that the pumping station may not be satisfactory under the increased river design head. There have also been changes in the catchment since the PS was built 30+ years ago which may have increased flows. They would like YWS to check the capacity of the PS and model the catchment. YWS will consider.	YWS
12	Even with the assurances that the sewerage system would operate satisfactorily under flood conditions CYC requested that YWS look at including in their operating procedure a contingency for emergency pumping, identifying suitable locations and pump requirements. It would be unacceptable for a repeat of the September event to occur.	YWS

Other

13	CYC is preparing a report into the flooding under s19 of the Flood and Water Management Act to formally identify the reason for flooding, the responsible flood risk management authorities and solutions. The above discussions will form the basis of the report.	

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City of York Council
18 October 2012