

APPENDIX A

# June 2009 Floods

## Flood Investigations Final Report

**Produced by: Streetpride Drainage Team,  
Environment & Development Services**

*Progress Report April 2010 - June 2009 Floods*

**Date: April 2010**

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## Executive Summary

On Wednesday 10 June 2009, Rotherham was affected by flash flooding. Aston, Swallownest, Aughton, Todwick, Treeton and Laughton Common were particularly badly hit but there was also significant flooding in Herringthorpe, Thurcroft, Clifton, Holmes and Thrybergh. Shortly after the floods the Council carried out preliminary investigations. These investigations demonstrated the need for a more detailed study to establish the cause of the flooding and to indicate possible solutions and/or improvements needed to existing drainage systems.

The Council has committed £70,000 of Capital funding for the completion of the drainage investigation and feasibility works after the June 2009 floods.

Topographical surveys were carried out in all affected areas. Surveys of the existing drainage infrastructure, including CCTV surveys, were carried out as necessary. Many residents were interviewed to obtain eye witness accounts of the flooding.

Where minor defects or blockages in the existing drainage systems were identified during the investigations, these were rectified to ensure that the existing infrastructure is working to its full capacity.

Possible works to reduce future flood risks have been identified. Plans have been included for each area, which in some cases show potential flood alleviation works. These are indicative only and may change during detailed design.

Most of the works identified are over and above the responsibilities of the land owners or property owners. A landowner has a duty as riparian owner to maintain flows within a watercourse which crosses their land, but has no obligation to carry out, or consent to, betterment works such as the creation of flood storage areas. In many cases, these additional works can only be done in private land and only with the consent of the landowners, which include Rotherham MBC, Aston Parish Council and several private individuals.

Funding for any of the proposed works would have to be obtained on a scheme specific basis. Bids for funding from organisations such as Defra are assessed on the basis of cost against benefit. Where flooding has affected properties which have not flooded previously, and unless there is a simple solution available, works are unlikely to be cost effective and are, therefore, unlikely to be successful in obtaining funding. Consideration of the funding available is beyond the scope of this report.

Successful applications were submitted by the Council to Defra for funding from Defra's "Early Action Bids for Tackling Surface Water Flooding" scheme. The bids cover two temporary flood water storage facilities and highway re-alignment at Lodge Lane to Heron Hill, Aston, and a flood relief ditch at Kensington Close, Laughton Common. See sections 2.19, 2.20 and 3.1.

Improvements to the public sewer network are the responsibility of Yorkshire Water. Yorkshire Water are not funded to make improvements to the public sewer system if flooding is calculated to occur only during rainfall events exceeding the design capacity of the system, i.e. with a return period exceeding 30 years.

Applications were submitted by the Council to Defra for funding in accordance with Defra's "Property Level Flood Protection and Resilience Grant". The grants provide for property flood defences such as flood gates to doors, air vent covers etc. The areas covered by this report where these bids were approved are Herringthorpe Valley Road North and Middle Lane, Clifton. See sections 3.4 and 3.8.

A number of bids have recently been made for the funding of further drainage improvements from the Council's own Capital Maintenance allocation and will be considered alongside other Council-wide priorities.

Ongoing discussions are taking place between the Environment Agency and Streetpride Drainage Team, into the possibility of piloting a pluvial flood warning system in Aston, Swallownest and Aughton.

The Council has carried out various drainage improvement works to reduce the risk of flooding in high risk areas. These works include:- ditching works to Windle Court area, Treeton; replacement of a highway drain at Lodge Lane, Aston: relieving blockages to drains in the Hepworth Drive area, Aston and excavation works to a culvert in Rother Valley Country Park.

The Council also increased its gully cleansing frequency in areas of high flood risk.

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# PROGRESS REPORT OF INVESTIGATIONS INTO THE CAUSES OF THE FLOODING

## ENVIRONMENT & DEVELOPMENT SERVICES

### STREETPRIDE

## 1 INTRODUCTION

On Wednesday June 10 2009 from 17:00 hours onwards, it was recorded that in the Sheffield centre area, 82mm of rain fell in 6 hours, and 51mm of rain fell in 1 hour. Maximum intensity recorded was 177 mm per hour. The storm then travelled eastwards and areas in Rotherham such as Aston, Swallownest and Aughton, experienced similar amounts of intense rainfall.

Based on the rainfall recorded in Sheffield, it is likely that the rainfall at Aston, Aughton and Swallownest was equivalent to a storm with a return period of in excess of 100 years. Although other areas experienced heavy rainfall, the very intense rainfall was very localised and as little as 1 or 2km away from the line of the centre of the storm, the amount of flooding recorded suggests that significantly less rain fell.

On Monday 15 June 2009 at 12:00 hours it was reported that approximately 20 to 40mm of rain fell in 2 hours, on a previously saturated catchment, but only a small amount of flooding occurred.

The high intensity of rain falling in a short period of time (sometimes known as 'flash floods'), caused major flooding to properties and highways. None of the flooding in Rotherham was caused by rivers, most of the flooding was caused by overland flows (i.e. surface water run off from fields etc.). Approximately 175 properties were flooded internally and 8 roads were closed or flooded throughout the Borough of Rotherham.

Shortly after the floods the Council carried out initial drainage investigation surveys. These investigations demonstrated the need for a more detailed study to establish the cause of the flooding and to indicate possible solutions and/or improvements needed to existing drainage systems.

Topographical surveys were carried out in all affected areas. Surveys of the existing drainage infrastructure, including CCTV surveys, were carried out as necessary. Many residents were interviewed to obtain eye witness accounts of the flooding.

It has been determined that Yorkshire Water public sewers are critical to the effectiveness of the drainage system in several areas. Yorkshire Water have carried out their own investigations and the results of these have been incorporated into this report.

Possible works to reduce future flood risks have been identified. Plans have been included for each area, which in some cases show potential flood alleviation works. These are indicative only and may change during detailed design.

Funding for any of the proposed works would have to be obtained on a scheme specific basis. Bids for funding from organisations such as Defra are assessed on the basis of cost against benefit. Where flooding has affected properties which have not flooded previously, and unless there is a simple solution available, works are unlikely to be cost effective and are, therefore, unlikely to be successful in obtaining funding. Consideration of the funding available is beyond the scope of this report.

Most of the works identified are over and above the responsibilities of the land owners or property owners. A landowner has a duty as riparian owner to maintain flows within a watercourse which crosses their land, but has no obligation to carry out, or consent to, betterment works such as the creation of flood storage areas. In many cases, these additional works can only be done in private land and only with the consent of the landowners, which include Rotherham MBC, Aston Parish Council and several private individuals.

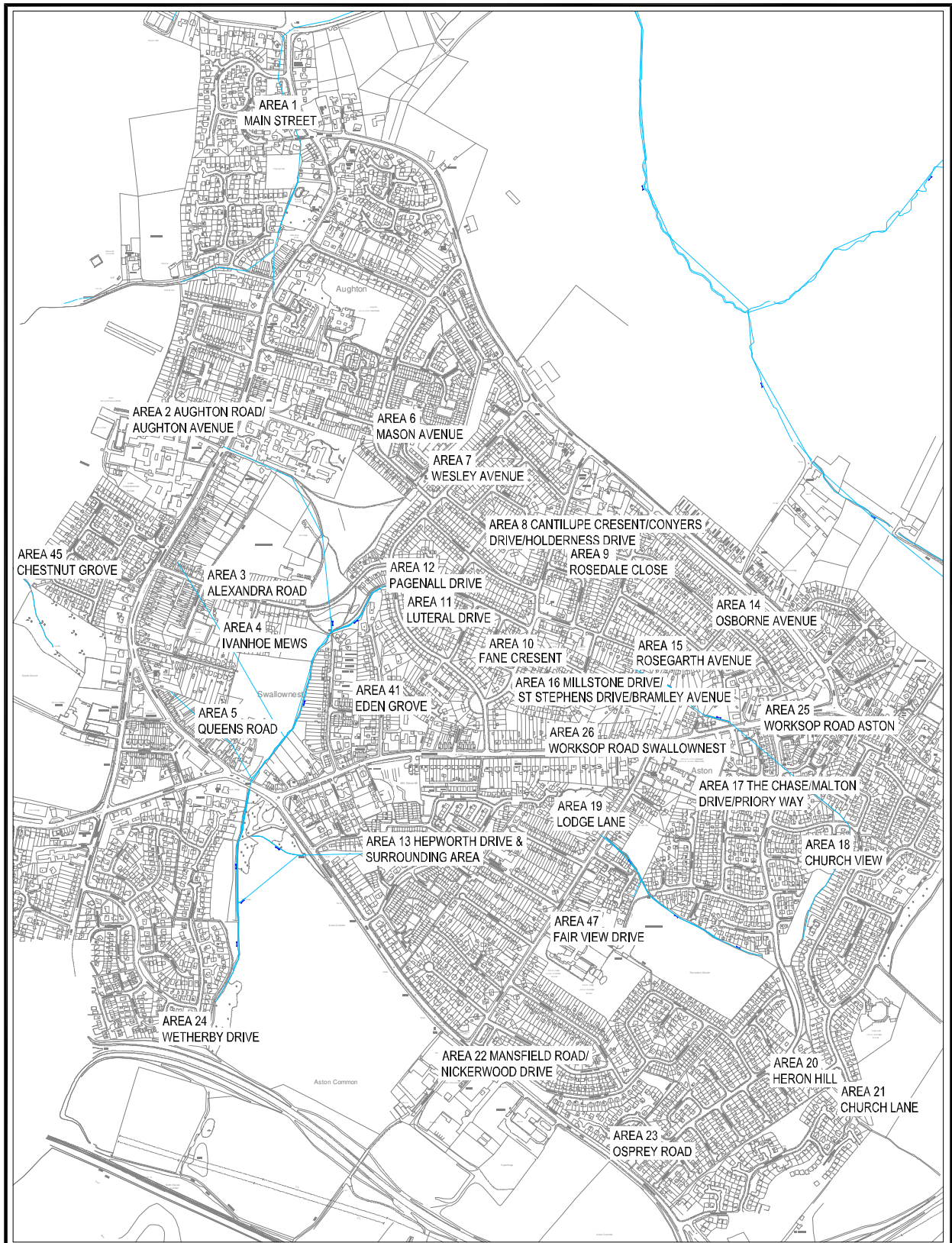
Improvements to the public sewer network are the responsibility of Yorkshire Water. It is extremely unlikely that Yorkshire Water would make improvements to the public sewer system if flooding is calculated only to occur during an event with a return period exceeding 30 years.

Successful applications were submitted by the Council to Defra for funding in accordance with Defra's "Early Action Bids for Tackling Surface Water Flooding". The bids cover two temporary flood water storage facilities, highway re-alignment at Lodge Lane to Heron Hill, Aston, and a flood relief ditch to intercept water from the agricultural catchment which flows overland along a railway cutting at Kensington Close, Laughton Common. See sections 2.19, 2.20 and 3.1

Applications were submitted by the Council to Defra for funding in accordance with Defra's "Property Level Flood Protection and Resilience Grant". The grants provide for property flood defences such as flood gates to doors, air vent covers etc, to properties flooded internally by the June 2007 and/or 2009 floods. The areas covered by this report where these bids were approved are Herringthorpe Valley Road North and Clifton Lane. See sections 3.4 and 3.8.

Ongoing discussions are taking place between the Environment Agency and Streetpride Drainage Team, into the possibility of piloting a pluvial flood warning system in Aston, Swallownest and Aughton.

2 FINDINGS BY AREA, ASTON AUGHTON AND SWALLOWNEST



<p>Rotherham Metropolitan Borough Council Environment &amp; Development Services Bailey House, Rawmarsh Road, Rotherham S60 1TD</p>	<p>Title AREAS IN ASTON AUGHTON SWALLOWNEST AFFECTED BY FLOODING IN JUNE 2009</p>	
	<p>Dwg. No. 187/43/DR02</p>	<p>Rev. Scales NTS</p>
<p>Strategic Director: Karl Batterby Bsc (Hons) MPhil, MRTPI</p>	<p>Drawn ATB</p>	<p>Date MARCH 2010</p>
<p>Rev.</p>	<p>Description</p>	<p>Date</p>
<p>Chd. by SL</p>		

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## **2.1 Area 1 Main Street, Aughton**

### **2.1.1 Flooding History and Mechanism**

A natural valley runs along the rear boundary of properties on Main Street, Aughton, including Aughton Nursery School. Water flowed overland along the natural valley, flooding several properties on Main Street. Water flowed onto the highway, overwhelming an already overloaded system and water then flooded from the highway back towards the properties.

There were also other localised flooding problems further south on Main Street, affecting the post office and the cellars of the houses opposite. These three incidents were not related.

### **2.1.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Additional road gully cleansing works were carried out by the Council along Main Street, shortly after the storm.
- Yorkshire Water have confirmed that there was a problem with a surface water attenuation tank at Ambler Rise which may not have been working to maximum efficiency. The standard criterion for design of such tanks is a 30 year return period, so it is likely that the tank would have overflowed even if it was operating correctly.

### **2.1.3 Possible Solution**

There are no areas of land within the flow path of water (at the rear) that are suitable as temporary storage facilities. The lowest point is mostly on the boundary of properties with significant differences in levels, leaving no room to install any bunding or similar type of protection. The prospect of carrying out any works on the flow path would be a logistical challenge due to the complexity of ownership and the lack of space.

Along Main Street (the front of numbers 113 – 135) the pathway is approximately 200-300mm lower than the road and is the natural flow path for excessive overland flow. The only way to stop ingress into these properties is to stop the water getting onto the footway, which, with the limited amount of space available, would mean restricting the flow to the highway, increased capacity in the system and greater access to this capacity. It is unlikely that flood risk in this area can be reduced to an acceptable level so property level flood protection should be considered.



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## **2.2 Area 2 Aughton Road/Aughton Avenue, Aughton**

### **2.2.1 Flooding History and Mechanism**

Flooding affects the properties on the south side of Aughton Avenue, some on Aughton Road and the northern boundary of Aston Comprehensive School. Several properties in Aughton Avenue and Aughton Road were flooded internally.

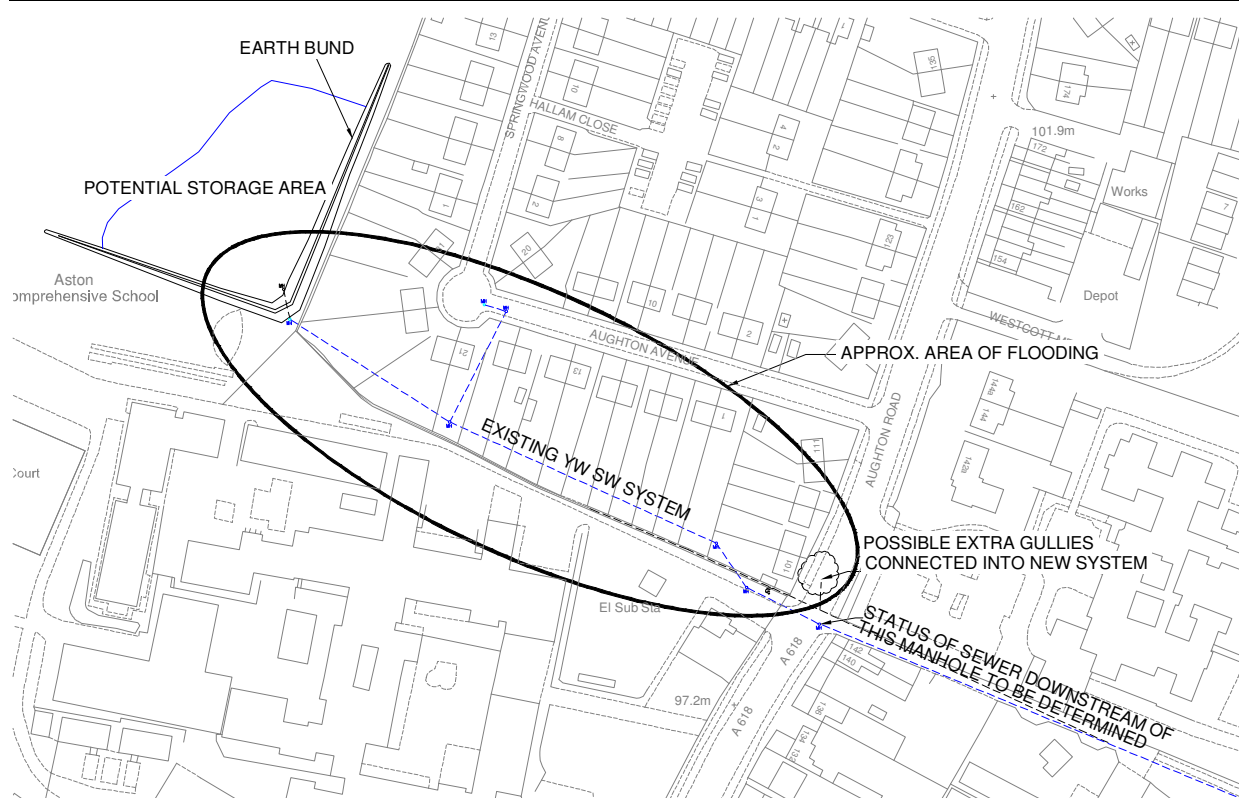
There is a 225mm diameter public surface water sewer running to the rear of Aughton Avenue and a 225mm diameter combined sewer in Aughton Road. These public sewers are owned and maintained by Yorkshire Water. These drainage systems are not designed to drain all the land in the area, including the surface water run off.

It was reported that surface water ran off the Aston Comprehensive School playing field towards the houses in Aughton Avenue and Aughton Road.

Several properties in this area also flooded in June 2007.

### **2.2.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Additional cleansing of road gullies was carried out in Aughton Road shortly after the storm.
- An extensive topographical survey of Aston Comprehensive has been received to aid the investigation and design process.
- Investigations have identified that the surface water sewer from this area does not connect to the combined sewer as shown on the public sewer records, but drains via an uncharted surface water sewer beneath Aughton Road which then runs down the track to the east. This sewer ultimately outfalls to the open watercourse south of Alexandra Road. This sewer has been traced and CCTV surveyed. The condition of the pipe is variable, and in some places is significantly deformed, but the current condition of the pipe does not significantly reduce its capacity. The legal status of this sewer is unclear and the Council and Yorkshire Water are currently working together to resolve the issue of the legal status and ownership.
- Yorkshire Water have recorded several problems on the public combined sewers serving these properties. Most of these were caused by blockages in the sewer. These blockages were cleared by Yorkshire Water and are unrelated to the flooding incidents in this investigation.
- The houses on the west side of Aughton Road are lower than road level, and the existing surface water and combined sewers do not have sufficient capacity to allow water to drain beneath road. The road has a crossfall from east to west, causing ponding on the west side of the road, which then runs into the gardens when the level rises sufficiently.



### 2.2.3 Possible Solution

Minimising flood risk in this area can be achieved by a combination of three strategies, minimising the flows into the area, maximising the outflows and creating areas where any difference between inflow and outflow can be accommodated without causing damage to property.

#### School Playing Field

A bund on the playing field at the rear of Springwood Avenue/Aughton Avenue constructed to a maximum height of approximately one metre would be sufficient to hold back the volume of water contributed by this area of the catchment.

#### Main school buildings

When the school is redeveloped there may potential for creating additional flood storage within the school grounds. Discussions have taken place with the team currently working on the possible redevelopment of the school and flooding issues will be considered as part of any new construction.

#### Aughton Road

It has been determined that there is insufficient capacity in the surface water sewer beneath Aughton Road. To stop the water ponding on the road and effectively drain the properties, there would need to be a significant increase in the capacity of the network beneath Aughton Road, meaning a substantial financial investment for extra gullies and upsizing of the existing system.

When water ponds on the highway, it flows from the highway down the drives and paths at numbers 101 and 103 Aughton Road. At 101 the gates have been altered to minimise this flow. As an interim measure this should be replicated at 103.

A feasibility study is recommended to investigate the possibility of creating flood storage on the land south of Mason Avenue to avoid passing the additional flows downstream and hence making flooding downstream worse – see section 2.6.6 for further details.

The Council and Yorkshire Water are currently working together to resolve the issue of the legal status and ownership.

## 2.3 Area 3 Alexandra Road

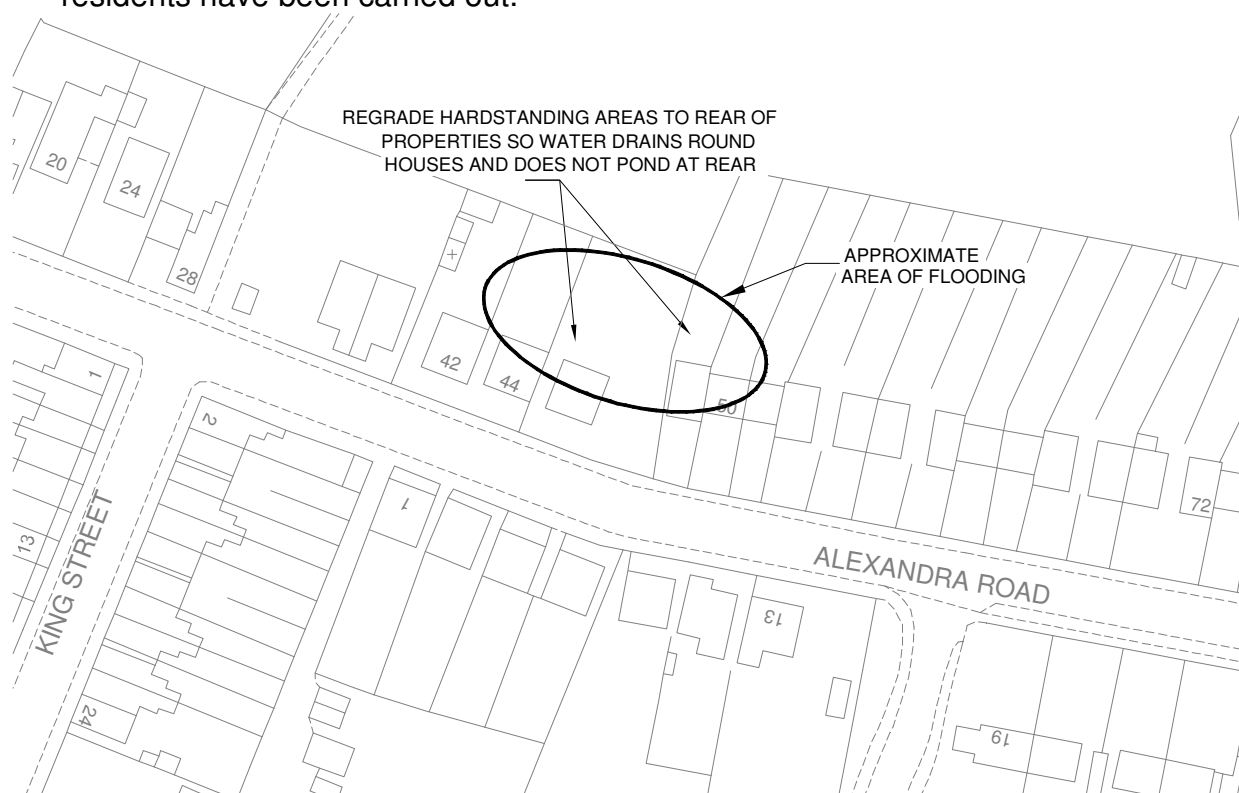
### 2.3.1 Flooding History and Mechanism

Water ran from the adjacent allotments into the gardens which slope down towards the buildings. The drains in this area usually cope, but were overwhelmed, causing water to pond around the back of the buildings because ground levels there are lower than the surrounding land. The water level rises until it flows either into or around the side of the property.

2 properties flooded internally, while one flooded in the garden and garage but because of a higher threshold and existing drainage channel (installed by the owner) they escaped internal flooding.

### 2.3.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.



### 2.3.3 Possible Solution

At numbers 48 & 50 flooding could be prevented by re-grading their rear concreted areas to prevent any standing water being trapped. Any excess water will then run around the side of number 48 and down onto the Alexandra Road. This work is the responsibility of the property owners.

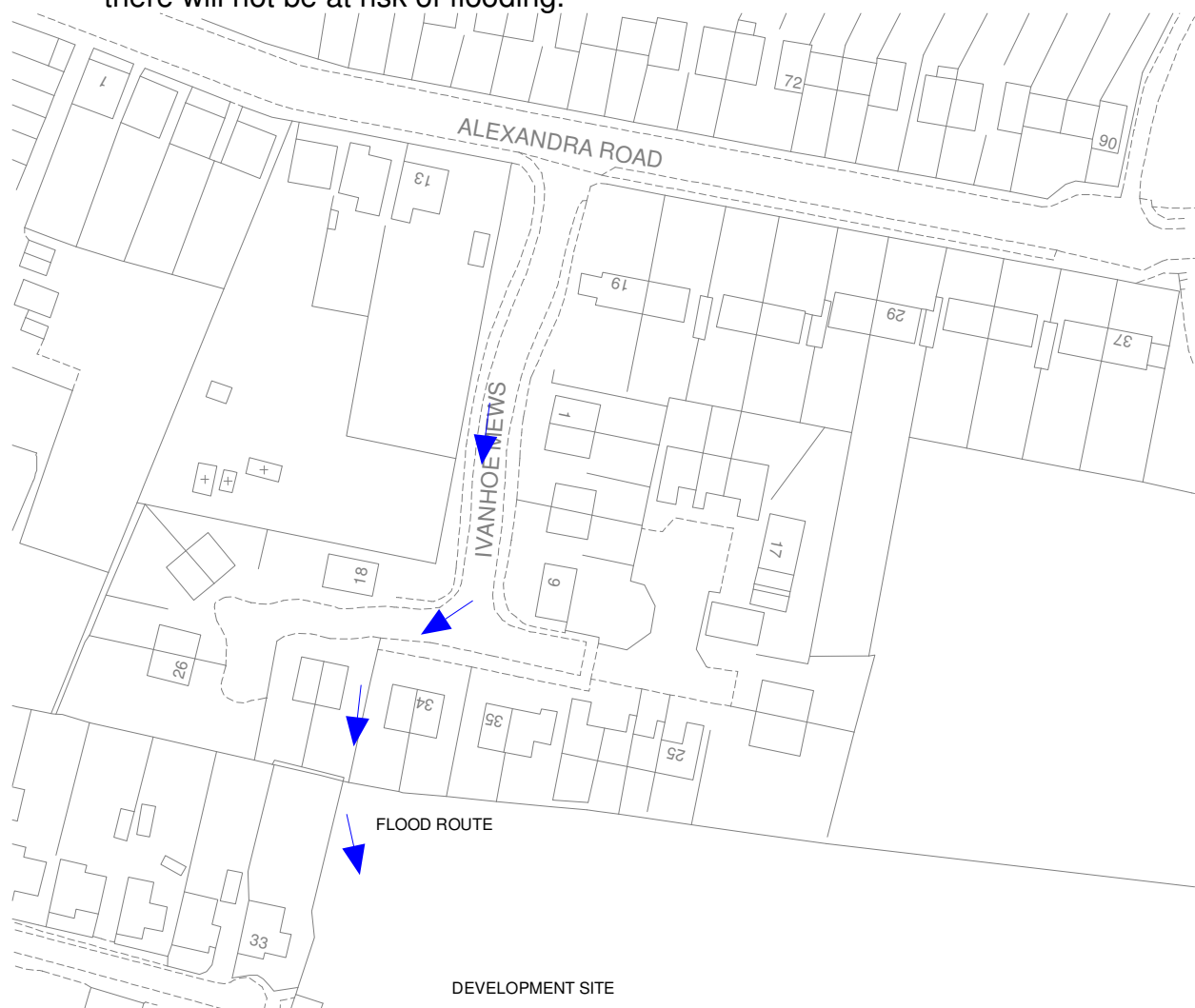
## 2.4 Area 4 Ivanhoe Mews

### 2.4.1 Flooding History and Mechanism

Houses situated at the bottom of a sloping carriageway and the natural flow path is down to the adjacent land at the end of the rear gardens. This means that water has to travel through the garages and builds up in the gardens before over topping the wall and flowing into the adjacent land.

### 2.4.2 Investigations and Actions

- The survey work has been completed. Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Discussions have taken place with the developers of the adjacent site to ensure that if flood water flows from Ivanhoe Mews onto the site, the new properties there will not be at risk of flooding.



### 2.4.3 Possible Solution

Surface water flows through these gardens only in exceptional circumstances. A flood route should be maintained by ensuring that the water can flow around the houses without obstruction.

Weep holes in the garden walls or similar improve drainage system would alleviate some of the water build up in the gardens. This work would be the responsibility of the property owners.

## 2.5 Area 5 Queens Road

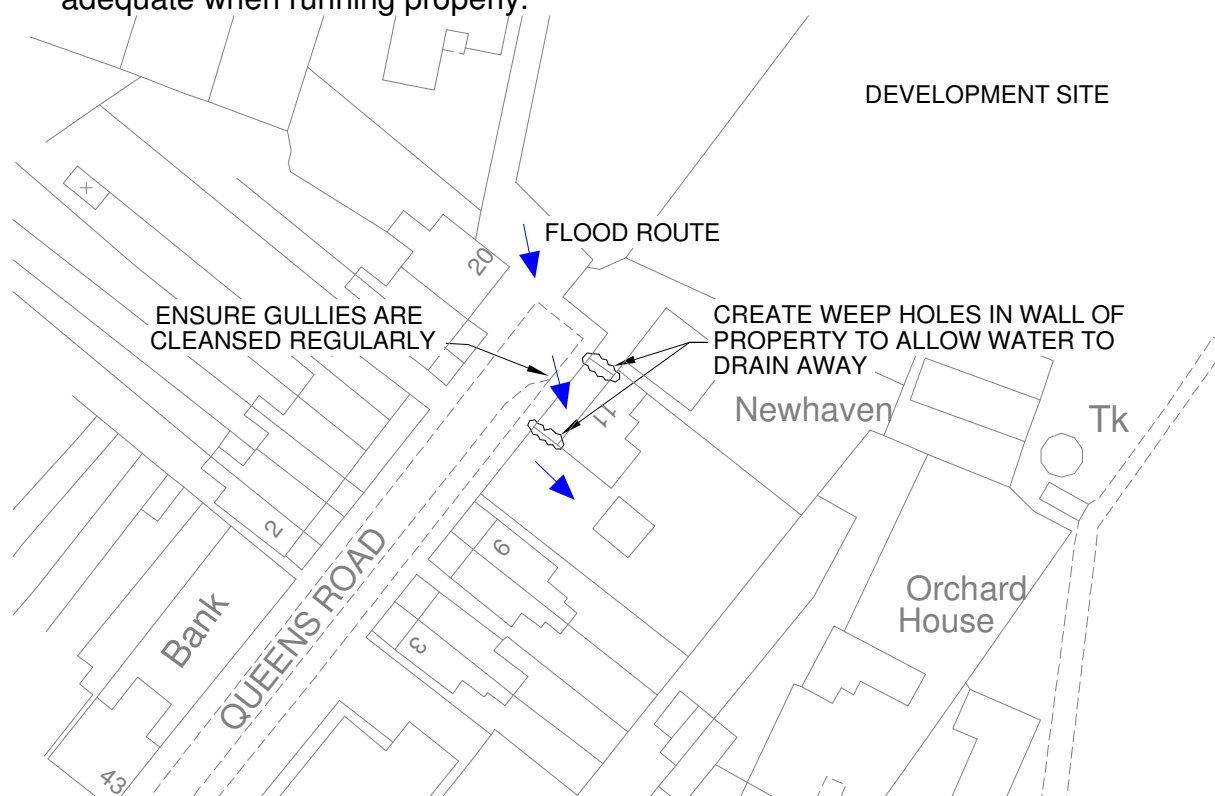
### 2.5.1 Flooding History and Mechanism

#### External flooding

The property has walled front garden that traps water with no escape route. Footways on this road are lower than carriageway level so any excess runoff immediately ponds on footways. The gully outside no. 11 was blocked but has since been cleansed.

### 2.5.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- A resident said that the water runs from the path adjacent to 22 Queens Road, then over the gully located in the pathway and across the road toward no. 11.
- At the time of the event the gully outside number 11 was not taking any flow, however, some of the water was directed toward the next gully down, which was working and accepted the additional water, which indicates the system is adequate when running properly.



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### 2.5.3 Possible Solution

Weep holes in the garden walls or similar would improve drainage and alleviate some of the water build up in the gardens. This work would be the responsibility of the property owners.

Additional gullies in front of no.11 should be considered.

## 2.6 Area 6 Mason Avenue Areas

### 2.6.1 Flooding History and Mechanism

Although the flooded properties in this area are located close to each other and there is a certain amount of interaction between them, there are several distinct issues which should be addressed separately.

#### Wharton Avenue

No's 72 & 74 suffered internal flooding due to water flowing down the grass slope at the front of the properties.

No's 44, 46, 50 & 62 suffered internal flooding due to water running into the gardens and having no escape route. Gardens are walled and slope towards the properties and have no drainage to remove the ponding water.

#### Anderson Close

The existing drainage system was unable to cope, causing overland flows which due to the ground profile are directed towards the properties.

#### Gray Avenue, Mason Avenue, Walpole Grove

Several properties on Walpole Grove and Mason Avenue had porches or outbuildings flooded.

No's 44, 46 & 50, Gray Avenue - Water flowing downhill from Wharton Avenue flooded the front gardens of these properties. Drainage in this area is limited to natural soak away through a small grassed area in front of the houses.

No's 28, 32 & 40 Gray Avenue - internal flooding due to blocked guttering and poor construction/maintenance of the structure of the properties, this has caused water to flow in through the roofs and window frames. Gardens are walled with no or insufficient drainage systems in place, meaning water builds up and has no escape route.

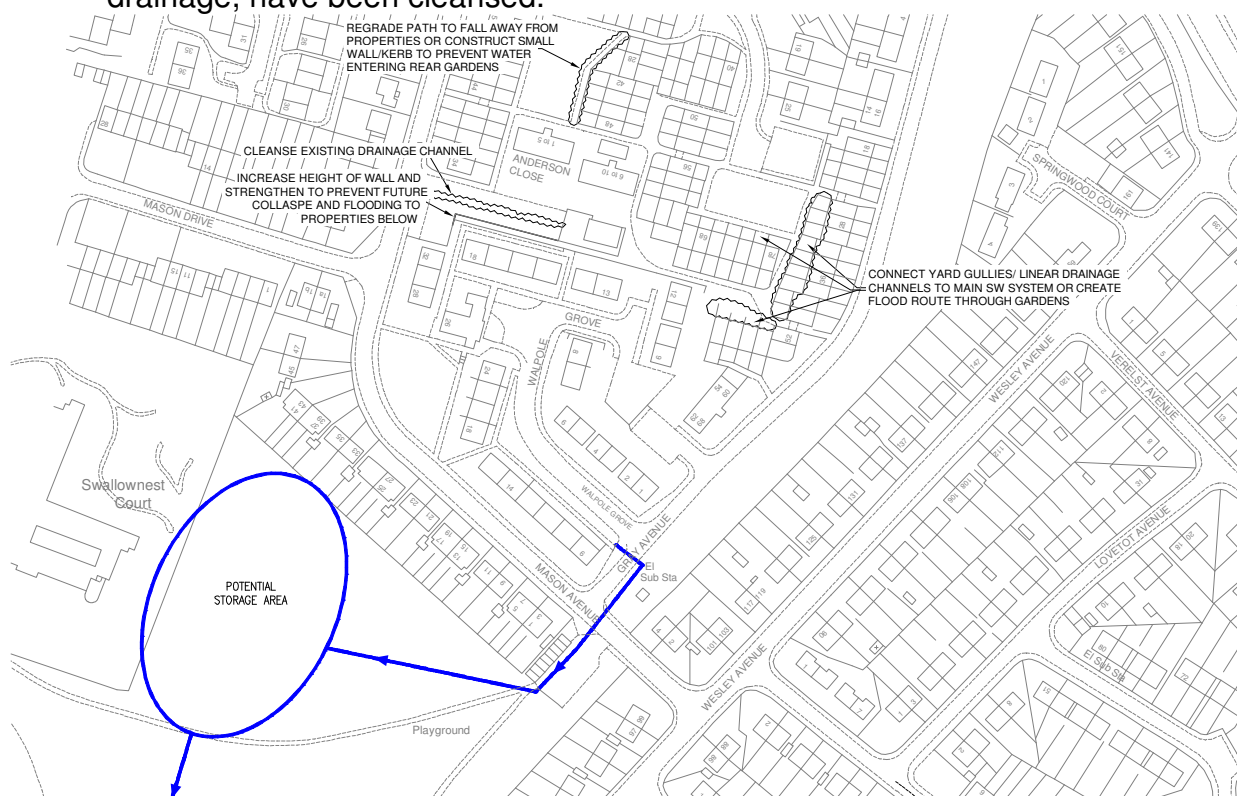
Properties at the bottom end of Mason Avenue have flooded due to insufficient capacity in the sewers. The topography of the surrounding land prevents flood water from flowing away from the properties.

Many of the blocks of properties on this estate have gardens which slope towards the dwellings. During extreme rainfall events, the drainage around the properties is inadequate. The water then starts to pond and cannot drain around the properties because outbuildings, fences or walls obstruct any possible overland drainage routes. Preventing flooding of such properties can be achieved in 2 ways, they are, diverting any overland flows away from the buildings, or ensuring that there is sufficient drainage to cope with everything which drains into the gardens. Installation of new drainage would require the cooperation of all the property owners affected and in some cases would involve the removal or alteration of outbuildings, fences or walls.

- Many gullies draining the properties are blocked and several down pipes are broken preventing water from draining into the sewers.

## 2.6.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- The condition of the drainage system in this area is poor structurally and the system was found to be blocked or partially blocked in several areas. The worst of these have now been cleared but the drains serving the parking area to the north of Walpole Grove are heavily silted.
- The foul sewers in front of Anderson Close were badly blocked and have been cleared.
- In Wharton Avenue, foul and surface water systems including the car park drainage, have been cleansed.



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### **2.6.3 Possible Solution**

The defects on the existing sewers should be repaired and all the drainage in the area should be thoroughly cleansed.

Where gardens slope down towards the properties, additional drainage will be required to intercept any overland flow. Where possible, ground levels should be altered to reroute overland flow away from properties.

#### Wharton Avenue

Proposed land drain, installation of gullies and flood routing, or similar improve drainage system would alleviate some of the water build up in the gardens. This work would be the responsibility of the property owners. It would require co-operation of adjacent property owners who may be unaffected by flooding.

#### Gray Avenue, Mason Avenue, Walpole Grove

A feasibility study is recommended to investigate the possibility of creating a flood storage area on the land south of Mason Avenue. A new surface water sewer would be required to intercept flows in the existing surface water sewers and transfer them to the flood storage.

Changes to ground levels in the garden of 1-7 Mason Avenue would prevent flooding of the properties in the event of the sewer overflowing.

## **2.7 Area 7 Wesley Avenue**

### **2.7.1 Flooding History and Mechanism**

No. 119, which sits lower than the road and surrounding properties, was flooded with water flowing from the carriageway onto driveway and front garden that slope towards the property. The drainage system, including the highway would have been overloaded during the storm.

### **2.7.2 Investigations and Actions**

- An inspection and survey has been undertaken.

### **2.7.3 Possible Solution**

The severity of flooding on Wesley Avenue does not warrant major improvements to the drainage system in this area. The possible works to Area 6 would benefit Wesley Avenue indirectly by reducing flows in the public sewers. During design of these works the possibility of extending the works to include Wesley Avenue should be considered.



## 2.8 Area 8 Cantilupe Crescent, Conyers Drive, Holderness Drive

### 2.8.1 Flooding History and Mechanism

#### Internal Flooding.

Properties owned by Counties Housing Association, private owners and the Council were flooded. The existing drainage system was overwhelmed by the rainfall intensity. Some of the properties are situated in a shallow bowl so any water in excess of the drainage systems capacity is retained in the low lying area.

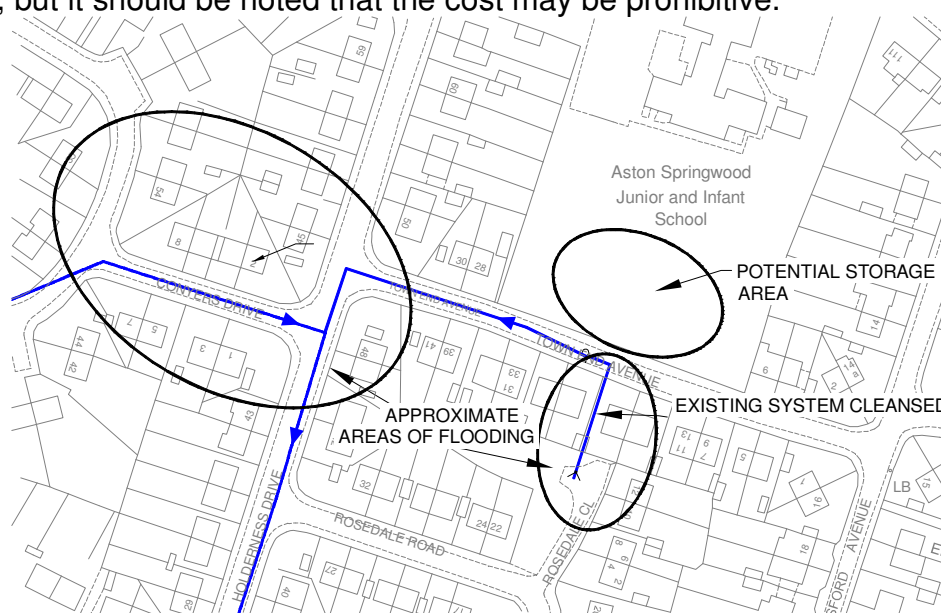
### 2.8.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system.
- Calculations suggest that the existing public sewer system is sufficient to cope with a storm with a return period of in excess of 30 years, the usual design criterion, so it is unlikely that the sewers, which are the responsibility of Yorkshire Water, will be improved. Further detailed analysis of the existing drainage system by Yorkshire Water would be required to definitively determine the capacity of the existing network.

### 2.8.3 Possible Solution

Increasing the capacity of the sewer in Holderness Drive would alleviate flooding, but would simply transfer the problem downstream exacerbating the flooding in the several areas which already have a significant flood risk.

A solution incorporating flood storage would benefit this area and those downstream. A feasibility study is recommended to investigate the possibility of creating underground storage capacity in the highway or in the grounds of Aston Springwood Junior & Infant school. The cost and effectiveness of such a scheme could then be accurately assessed, but it should be noted that the cost may be prohibitive.



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## **2.9 Area 9 Rosedale Close**

### **2.9.1 Flooding History and Mechanism**

#### **Flooding in gardens.**

The houses are in natural low point with water flowing down carriageway and slightly sloping rear garden towards properties water building up around houses. The properties were not flooded internally.

### **2.9.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out. Residents on Town end Avenue Reported that the road and some gardens had been flooded, but no buildings were affected.
- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system. Although the nearest public sewer is in Holderness Drive, it is thought that water backs up the private drainage system when the public sewers are overloaded.
- The sewer which runs from Rosedale Close to Town end Avenue, which was partially blocked, has been cleansed.

### **2.9.3 Possible Solution**

Rosedale Close drains via Town end Avenue to Holderness Drive. Flooding at Rosedale Close is therefore dependent on the flooding which affects Area 8 (see above). The properties on Rosedale Close are slightly higher than those in Area 8, and therefore the effects of flooding were less severe. Having cleansed the sewer, it is not proposed to take any further action at this location, but any works carried out to alleviate flooding in Area 8, would also benefit Town end Avenue and Rosedale Close.

## **2.10 Area 10 Fane Crescent**

### **2.10.1 Flooding History and Mechanism**

A small amount of internal flooding occurred. The property is at a low point in the road with water running down carriageway and into driveway via a dropped kerb. Water then flows down the garden and ponds around the front of the property, held by the outbuildings and ground levels.

### **2.10.2 Investigations and Actions**

- A site inspection was carried out with a discussion with the resident.

### **2.10.3 Possible Solution**

The highway drain could not cope with the intensity of the rainfall. Because no significant damage was caused even during such exceptional rainfall, no further action is proposed.

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## **2.11 Area 11 Lutere Drive**

### **2.11.1 Flooding History and Mechanism**

#### **Internal flooding**

Water flows down steeply sloping rear gardens towards the properties. Natural flood route (entries between properties) has been blocked by 'lean-to' style extensions that connect main house to out houses causing a terraced effect.

No. 18 is affected by water flowing down hill along carriageway and into driveway that slopes towards the property. At the time of the visit, there was nobody at the property so the exact mechanism and extent of the flooding here is unknown.

### **2.11.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.

### **2.11.3 Possible Solution**

Overland flows occurred during the exceptional rainfall. Because there is no record of any previous flooding and the effect of the flooding was small, no further action is proposed.

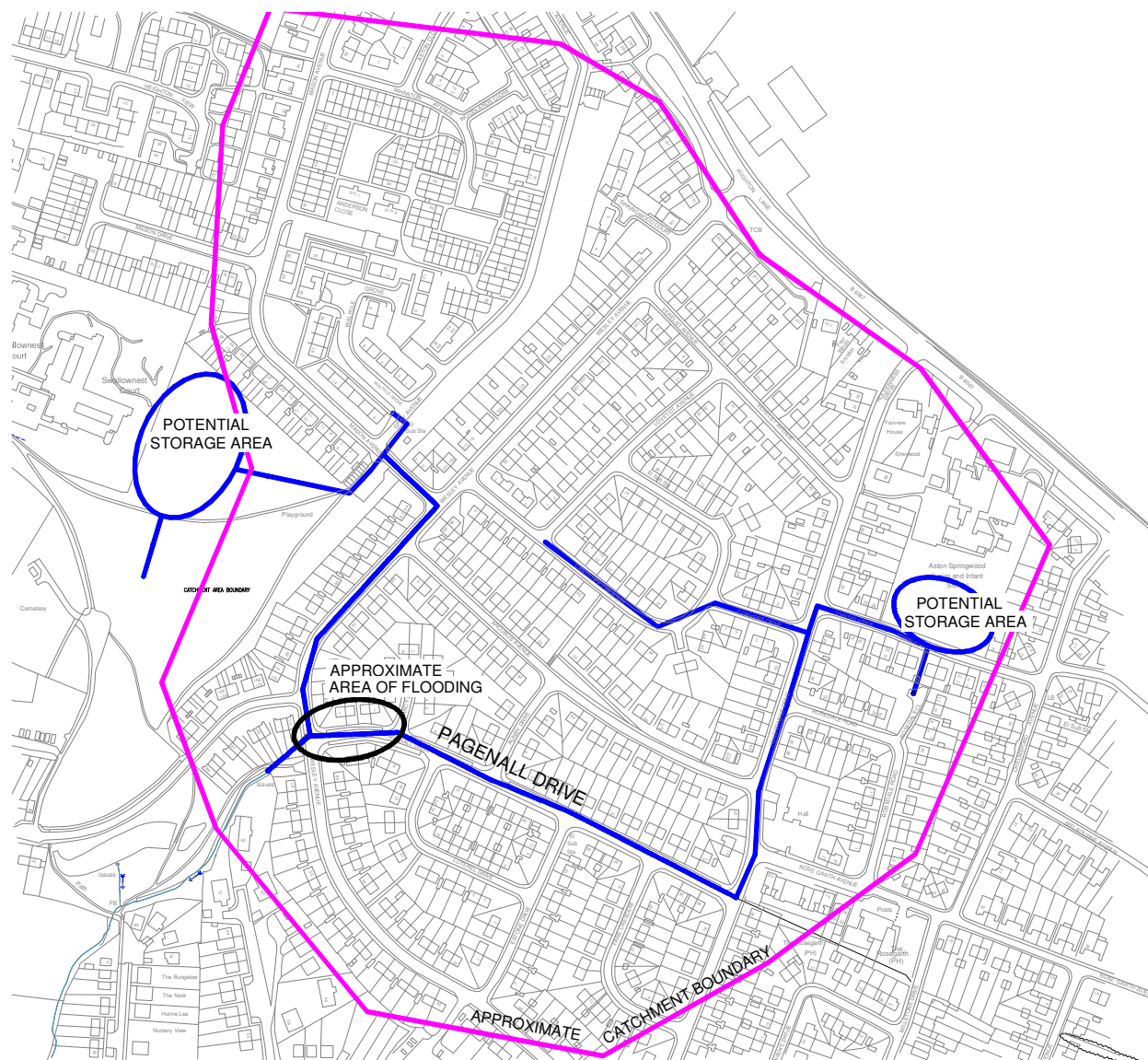
## **2.12 Area 12 Pagenall Drive**

### **2.12.1 Flooding History and Mechanism**

Houses on the north side of Pagenall Drive between Wesley Avenue and Darcy Close were flooded internally. These properties have not flooded previously. There is a large catchment upstream which is drained by public surface water sewers to the watercourse west of Wesley Avenue. The capacity of the public sewer system was exceeded, causing flooding at Pagenall Drive.

### **2.12.2 Investigations and Actions**

- The initial survey work, including surveys of flooded properties, has been carried out and some of the affected residents have been interviewed.
- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system. The effects of possible works on other areas which drain towards Pagenall Drive have been considered.



### 2.12.3 Possible Solution

Calculations suggest that the existing drainage system is sufficient to cope with a storm with a return period of in excess of 30 years, the usual design criterion, so it is unlikely that the public sewer, which is the responsibility of Yorkshire Water, will be improved. Further detailed analysis of the existing drainage system by Yorkshire Water would be required to definitively determine the capacity of the existing network. CCTV surveys of the public sewers have been carried out by Yorkshire Water and have shown that the sewers are generally in good condition and are running clear.

The possible flood storage areas for Area 6 – Mason Avenue and Area 8 Cantilupe Crescent, could redirect some of the surface water from these areas and subsequently away from Pagenall Drive.

Alterations to ground levels to the west of Wesley Avenue could create a flood route and reduce the potential flood level on Pagenall Drive. Any works on this land would require the co-operation of the landowners.

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## **2.13 Area 13 Hepworth Drive Area**

### **2.13.1 Flooding History and Mechanism**

Although the flooded properties in this area are located close to each other and there is a certain amount of interaction between them, there are several distinct issues which should be addressed separately.

Hepworth Drive, Catherine Avenue, Alison Drive, Alison Close, Florence Avenue, Beverley Close, Hilary Way, Stone Hill Drive

Approximately 70 properties were flooded internally on the estate around Hepworth Drive. The estate consists of predominantly council owned housing. The estate is served by private sewers. It is thought that some of the surface water drains to soakaways. There is a surface water culvert which serves the estate which drains towards the west, south of Stone Hill Drive, then beneath Mansfield Road to its outfall into an open watercourse which converges with the watercourse passing beneath Great Bridge, High Street, Swallownest. This watercourse runs to the east of Skipton Road / Wetherby Drive and beneath the A57 Aston Relief Road.

Many of the blocks of properties on this estate have gardens at either the front or the rear which slope towards the dwellings. During extreme rainfall events, the drainage around the properties is inadequate. The water then starts to pond and cannot drain around the properties because outbuildings, fences or walls obstruct any possible overland drainage routes. Preventing flooding of such properties can be achieved in two ways, they are, diverting any overland flows away from the buildings, or ensuring that there is sufficient drainage to cope with everything which drains into the gardens. Installation of new drainage would require the cooperation of all the property owners affected and in some cases would involve the removal or alteration of outbuildings, fences or walls.

Ashley Grove No's 58 & 60 Internal Flooding.

Properties situated at end of the cul-de-sac with carriageway significantly higher than the row of bungalows. Front gardens slope towards the houses. Existing yard gullies were overwhelmed by the rainfall intensity. The natural flood route around properties is blocked by disabled access ramp to no. 58 which is not currently required.

Florence Avenue No's 4, 6 & 12 Internal Flooding, No's 8 & 14 External Flooding Only.

The rear gardens slope towards the houses and there is insufficient or no drainage in the gardens. No.12 has very poorly constructed linear drainage channel that is badly connected to main drainage system. A rain water pipe serving four house discharges into this garden through a damaged inlet gully.

Olive Close

No. 23 has water coming up through the downstairs toilet floor during heavy rain. Water also built up in back garden.

No's 33, 35, 39, 41, 43 & 45 suffered internal flooding due to water flowing down the steeply sloping rear gardens towards the properties, this water originally comes from Elizabeth Road and spills onto the footpath that runs along the top of the gardens.

### Stone Hill Drive

Overland flows through gardens caused the collapse of a large section of a garden wall.

## 2.13.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- The critical surface water sewers have been identified and CCTV surveys of these sewers have been completed.
- A manhole in the open land between Hepworth Drive and Florence Avenue was found to contain a large amount of debris, causing a major disruption to flows. Large items found in the manhole suggest that many items were deliberately put into the manhole. This manhole has been cleared and the system is now running freely. Most of the flooded properties drain through this manhole, but many are too remote to have been directly affected by this blockage.



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### **2.13.3 Possible Solution**

Many of the blocks of properties on this estate have gardens at either the front or the rear which slope towards the dwellings. During extreme rainfall events, the drainage around the properties is inadequate. The water then starts to pond and cannot drain around the properties because outbuildings, fences or walls obstruct any possible overland drainage routes. Preventing flooding of such properties can be achieved in 2 ways, that is diverting any overland flows away from the buildings, or ensuring that there is sufficient drainage to cope with everything which drains into the gardens. Installation of new drainage would require the cooperation of all the property owners affected and in some cases would involve the removal or alteration of outbuildings, fences or walls. Minor improvements to some gardens at modest cost could reduce flood risk for some of the properties.

To avoid transferring flooding downstream, storage tanks would be required to attenuate the additional flows being passed forward. Because much of the flooding in that area was caused by water flowing through properties or water standing only to a shallow depth, the additional flows are relatively small. Further work is recommended to carry out the design of the proposed works and investigate the possibility of creating flood routes and/or storage areas within the Hepworth Drive area or creating storage on Aston Common, which would require the cooperation of the land owner(s). Several possible schemes have been identified, but accurate costing cannot be produced until the designs have been substantially completed.

The disabled access ramp at no. 58 Ashley Grove, could be removed to open up the flood route. Further minor alterations to the drainage or ground levels around the properties may be required.

Better maintenance of existing drainage would improve the situation at all locations.

## **2.14 Area 14 Osborne Avenue, Rosslyn Avenue**

### **2.14.1 Flooding History and Mechanism**

#### **Internal flooding**

Driveways slope down towards properties so any runoff from the adjacent land falls to the houses and builds up against them before breaching the thresholds.

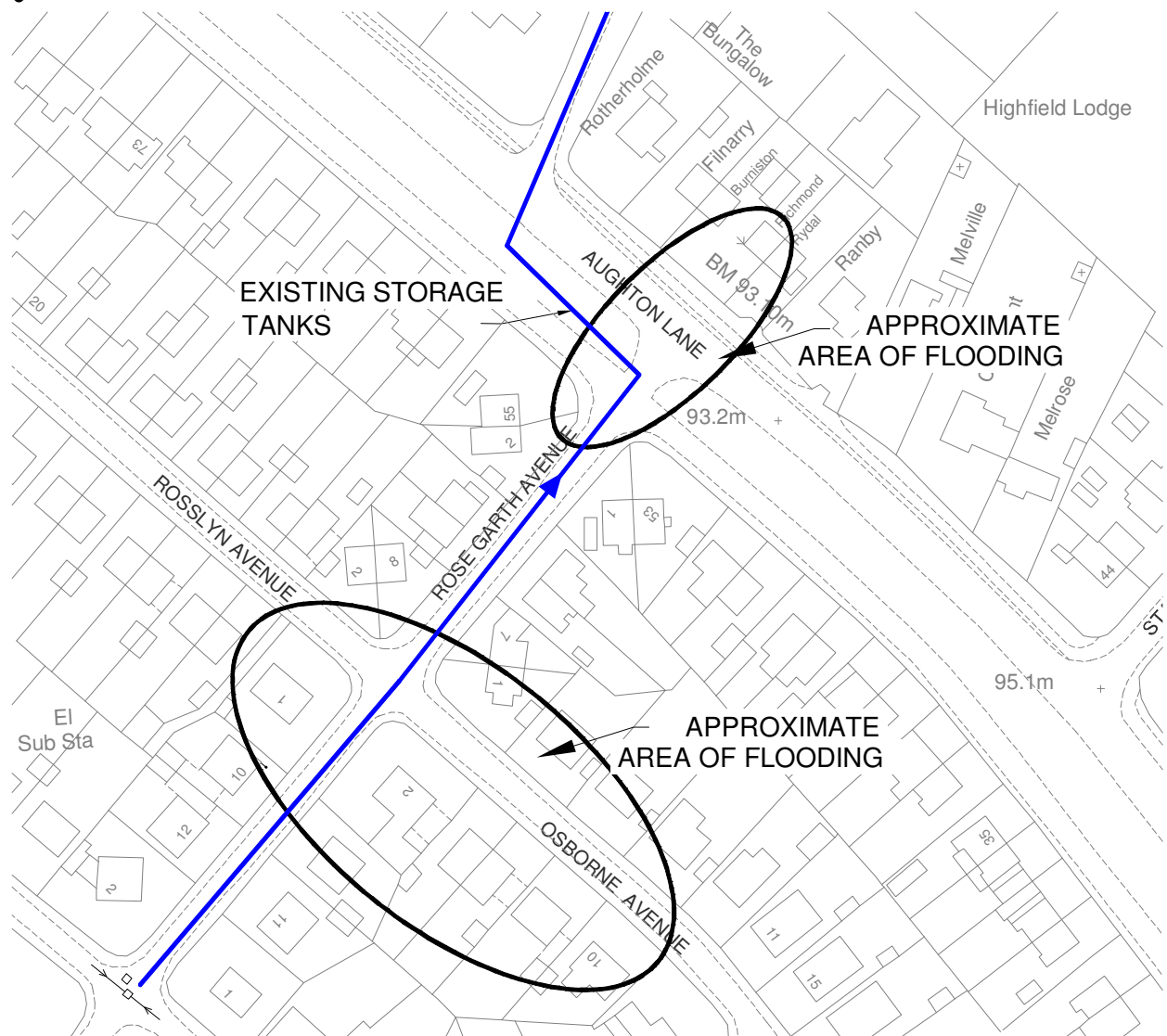
The topographical survey has shown that the land in this area has a bowl shaped surface profile, meaning that the flooded properties are surrounded by higher land on all sides. It is not feasible to create an overland flood route so effective draining of the area can only be achieved by underground drainage systems. When the capacities of the existing drainage systems are exceeded, surface flooding is inevitable.

The highway drainage within Rosegarth Avenue drains towards Aughton Lane (north east). The Yorkshire Water public combined sewer drains in the opposite direction (south west).

Flooding of Aughton Lane causes water to runoff the highway into the garden and garage of "Richmond".

### 2.14.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Drawings showing the drainage constructed when the properties were built and the more recent highway drainage improvements were obtained.
- 



### 2.14.3 Possible Solution

Possible solutions for this area involve either preventing surface flooding from occurring by increasing the size of the existing drainage system, constructing additional drainage, creating storage for the flood water or reducing the impact of surface water flooding by providing property level flood protection and using flood resilient construction.

The risk of flooding could be reduced by constructing a new surface water sewer or by increasing the capacity of the existing surface water sewer draining towards Aughton Lane. Approximately 10 years ago a storage tank was constructed in Aughton Lane. The size of this tank would have to be increased. To avoid possibly causing flooding in Aughton Lane, the system downstream of the tank would also have to be increased in



size as far as Ulley Lane. An outline design for this scheme should be prepared to enable an accurate cost estimate to be produced. However due to the likely cost of this scheme, obtaining funding may be difficult and property level flood protection may be required as a temporary or possibly permanent option.

## 2.15 Area 15 Rosegarth Avenue

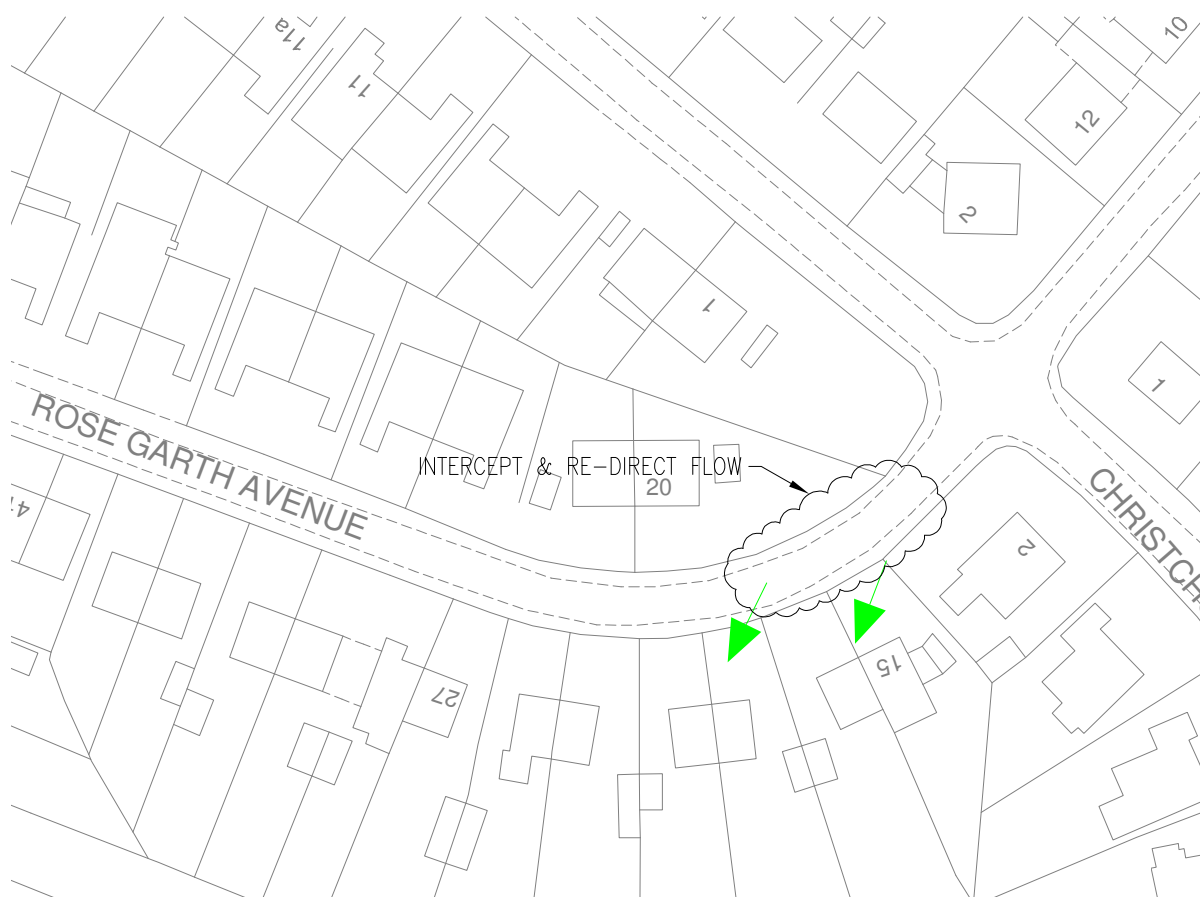
### 2.15.1 Flooding History and Mechanism

#### No. 15 Internal flooding, 17 & 19 external flooding and garage flooding

The affected properties are significantly lower than the road and the driveways slope down towards properties. There may be some runoff from the highway across vehicle access crossings, but the properties are located close to a local high point on the highway so the amount of any runoff from the carriageway must be relatively small. Runoff from the highway and the drives is unable to drain effectively around the properties due to the ground levels and the presence of walls, steps and garages.

### 2.15.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.



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### **2.15.3 Possible Solution**

Minor modifications to the footway or installation of an additional gully would prevent water flowing from the highways. Due to the steepness of the drives, raising the level of the back of the footway may create access difficulties.

Water from the drives and front gardens will still flow towards the properties and it is the property owner's responsibility to ensure that this water is intercepted by a drainage system or is able to flow round the buildings without causing flooding.

## **2.16 Area 16 Millstone Drive, St. Stephen's Drive, Bramley Avenue**

### **2.16.1 Flooding History and Mechanism**

A natural valley runs eastward from the boundary of the Rosegarth public house and the houses on St Stephen's Drive, through Millstone Drive and Bramley Avenue to Brook Close. One of the residents has stated that there is a culverted watercourse which follows the line of this valley, but no record of this has been found. The 1957 historical map shows a watercourse on this line, but it is not recorded on other historical maps. West of Brook Close there is an open watercourse which then passes through several culverts.

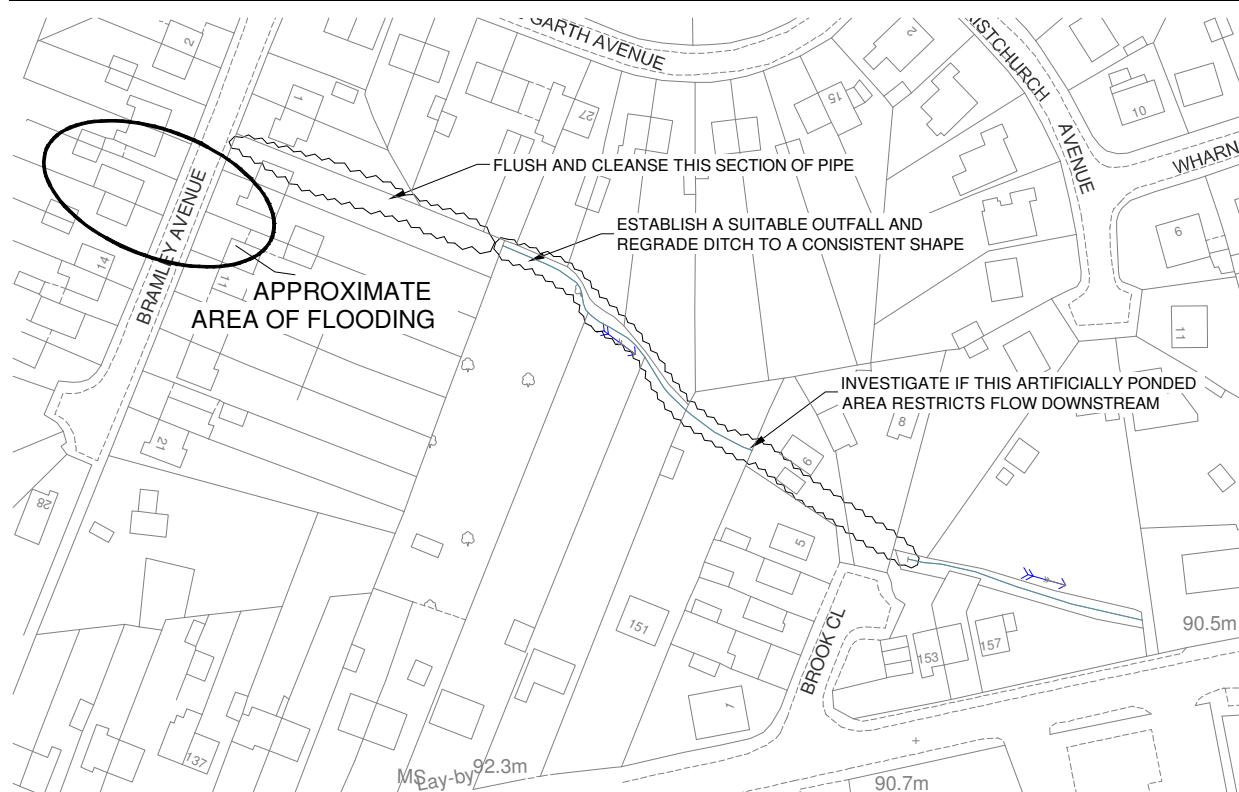
Flooding was recorded at Millstone Drive, St. Stephen's Drive and Bramley Avenue. Bramley Avenue was flooded with sewage, but it is not thought that any properties were flooded internally. Residents report that flooding of the combined sewers is a regular occurrence. The sewers in Bramley Avenue are private sewers.

Highway flooding at Bramley Avenue which occurred in 2001 is thought to have been due to a defect restricting flow which was rectified shortly after.

The public combined sewer which runs through the car park of the Rosegarth public house runs towards the west.

### **2.16.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Gullies outside 52-58 Millstone Drive have been dye tested to prove the suspected connection to the west (via the network that runs behind The Rosegarth public house), between the systems in Millstone Drive and Pagenall Drive.
- The system on Bramley Avenue was flushed and dye tested and found to flow to the east along the rear of properties Worksop Road, under Brook Close and then across Worksop Road down into The Chase.
- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system.
- A CCTV survey of the drainage system has been completed.



### 2.16.3 Possible Solution

#### Millstone Drive, St. Stephen's Drive

Yorkshire Water are to arrange cleansing of the public sewer and subsequent cyclical inspections. This work and the proposed works at Bramley Avenue will increase the effective capacity of the two drainage systems which drain independently in opposite directions.

Any flooding from the public sewer should be reported to Yorkshire Water.

#### Bramley Avenue

It is considered that the four road gullies on Bramley Avenue are sufficient to serve the highway, but cannot cope with the additional surface water from gardens.

The system that runs from Bramley Avenue, through the land belonging to no. 5 Bramley Avenue needs to be flushed and cleansed and a suitable outfall needs to be established. The subsequent channel from this outfall that runs along the rear of five gardens, 143 – 151 Worksop Road (all of which are reported to flood to some degree), needs a small amount of work to produce a consistent channel. This would require the cooperation of the land owners. Note: the ownership of the wooded land at the rear of no 143 & 145 is not confirmed.

There is a restriction in the system at the rear of no. 151 Worksop Road where the watercourse has been artificially ponded and the outfall to this is partially blocked by silt and foliage. Further investigation may be required to establish if this is restricting the forward flow and the inlet pipe needs to be opened up to allow maximum forward flow when required. This would require the cooperation of the land owner.

The culvert underneath Brook Close requires further investigation as to its current condition. Access would require the cooperation of land owners.

The effect caused by works in this area to areas downstream should be considered. Yorkshire Water investigations downstream are continuing and the findings of this report have been passed to Yorkshire Water for their consideration.

## **2.17 Area 17 Malton Drive, The Chase and Priory Way**

### **2.17.1 Flooding History and Mechanism**

Flooding is recorded in 2007 and 2009.

The topographical survey has shown that of the land in this area has a bowl shaped surface profile, meaning that the flooded properties are surrounded by higher land on all sides. It is not feasible to create an overland flood route so effective draining of the area can only be achieved by underground drainage systems. When the capacities of the existing drainage system are exceeded, surface flooding is inevitable. The ground around Malton Drive is very poorly drained and is often saturated.

### **2.17.2 Investigations and Actions**

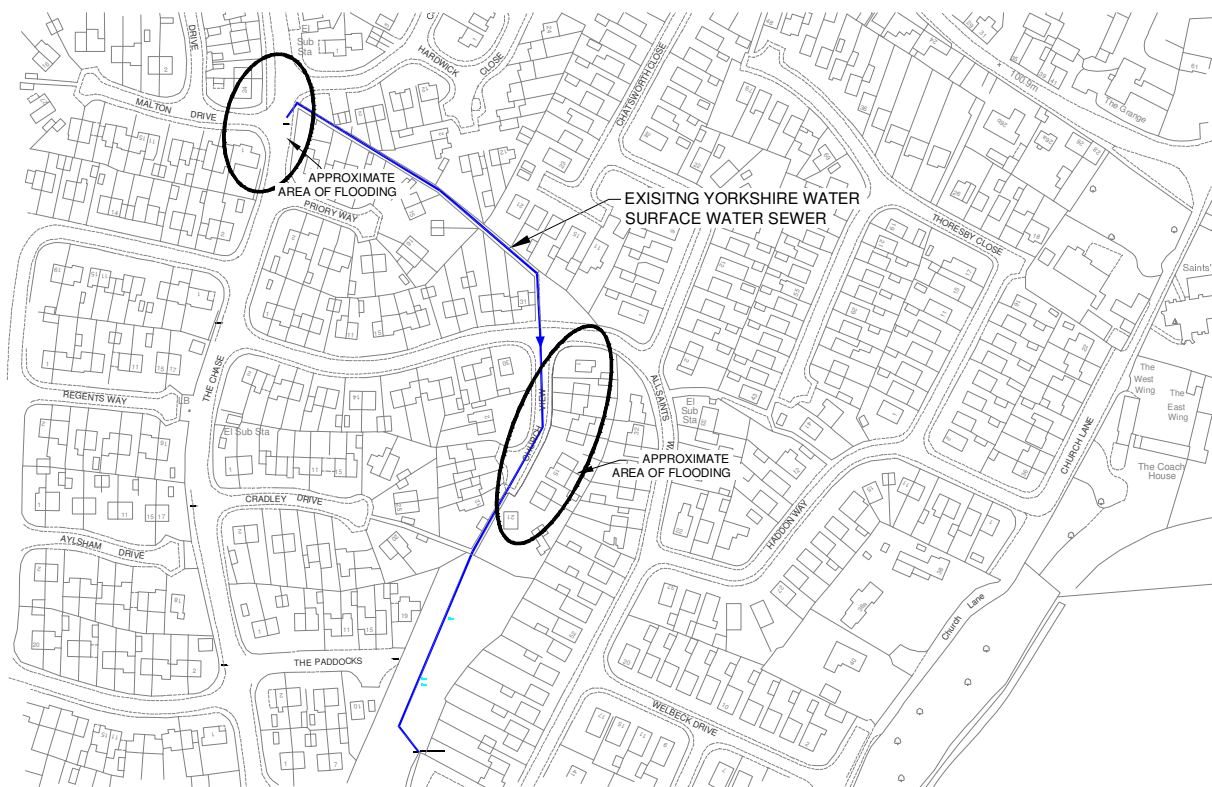
- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- The route of the watercourse from the north side of Worksop Road, beneath the road towards The Chase is not known, but it is thought to connect to the public surface water sewer system. CCTV surveys have been completed and found several incidents of partial collapse or notable degradation of the system. Upstream of Malton Drive, a branch of the sewer system was blocked with roots so the CCTV survey could not be completed.
- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system. Yorkshire Water have carried out their own surveys of the foul sewer and have found that the sewers are generally in good condition. However a drain rod was located in the sewer on Malton Drive and dropped pipe was identified on Cotswold Drive.

### **2.17.3 Possible Solution**

The surface water sewer which runs from the Chase to Church View then through Lineal Park has a number of defects which restrict its capacity. Even if it was in perfect condition, the sewer would not have sufficient capacity to prevent future flooding at the Chase and hence overland flows.

Possible solutions for this area involve either preventing surface flooding from occurring by increasing the size of the existing drainage system, constructing additional drainage systems, creating storage for the flood water or reducing the impact of surface water flooding by providing property level flood protection and using flood resilient construction.

Constructing a new sewer along The Chase is unlikely to be carried out due to the length of sewer required and the depth which would exceed 8m. Replacement of the sewer on the existing line with a larger sewer appears to be the best solution, but this sewer is the responsibility of Yorkshire Water. The results of this investigation have been passed to Yorkshire Water for their consideration.



## 2.18 Area 18 Church View

### 2.18.1 Flooding History and Mechanism

#### No's 17 & 19 Internal Flooding

Flooding in this area is predominantly caused by overland flows from Area 17 (see above). The water then flows down hill along the carriageway and into the driveways of the two properties. Driveways slope down towards the houses and then water builds up against them before breaching the thresholds. There is a public surface water sewer which starts south of Worksop Road, then follows the natural valley before discharging into the open watercourse in Lineal Park.

### 2.18.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- The possible effects of the upstream and downstream catchments and their connectivity have been investigated. CCTV surveys of the main sewers have been carried out.

- This area is among those where it has been determined that the public sewers are fundamental to the effectiveness of the drainage system. Yorkshire Water have carried out additional investigations and CCTV surveys.

### **2.18.3 Possible Solution**

The surface water sewer which runs from the Chase to Church View then through Lineal Park has a number of defects which restrict its capacity. Even if it was in perfect condition, the sewer would not have sufficient capacity to prevent future flooding at the Chase and hence overland flows. The results of this investigation have been passed to Yorkshire Water for their consideration. See Area 17 above for further details.

Overland flows caused by exceptional rainfall or a blockage would remain a possibility so it recommended that a potential flood route is maintained through the gardens

## **2.19 Area 19 Lodge Lane, Aston**

### **2.19.1 Flooding History and Mechanism**

Properties on the even number (west) side of Lodge Lane were flooded in 2007 and 2009.

Several residents were interviewed about the causes of flooding in 2007 and 2009 and it was reported that the water came from the public highway, the Parish Council field to the rear and the Yorkshire Water combined sewer at the rear of the houses.

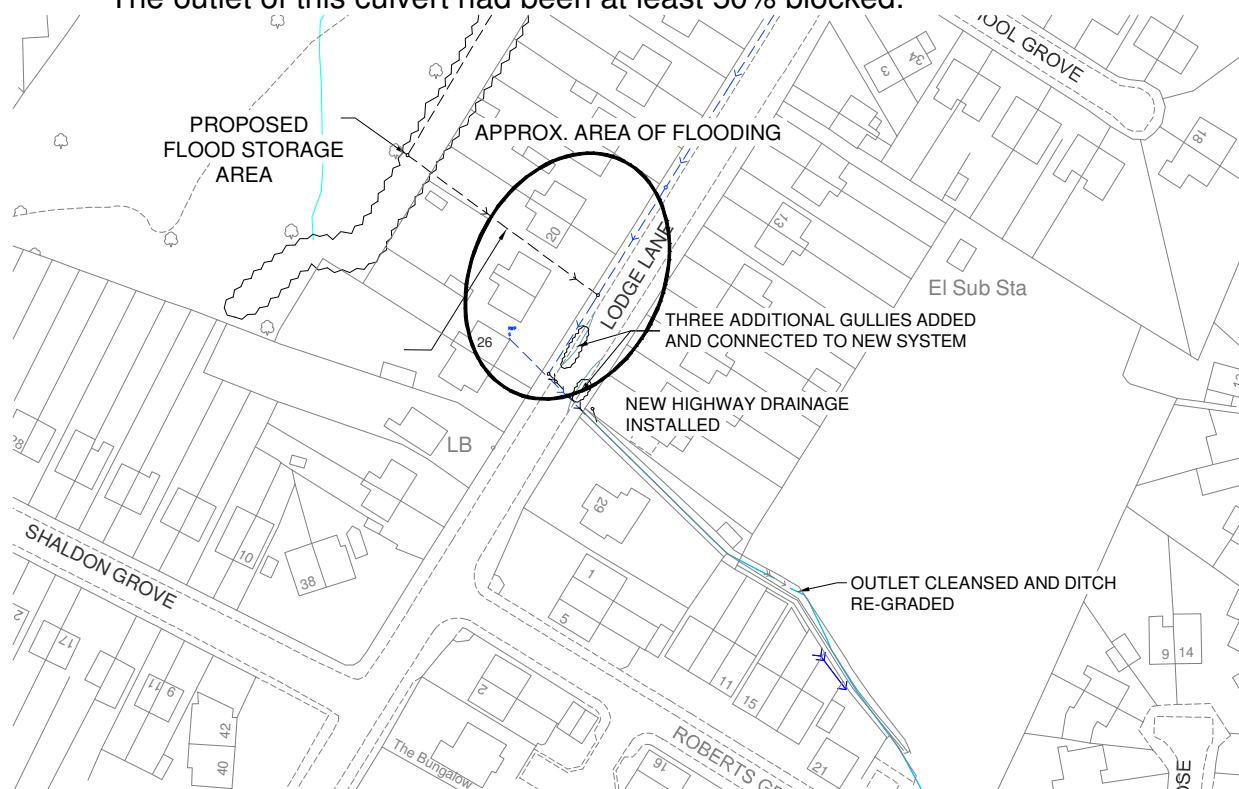
Shortly after the 2009 storm, a 150mm diameter uncharted pipe was discovered in the watercourse adjacent 27 Lodge Lane. This pipe had been buried under silt/debris but the pressure of water coming down the pipe forced the silt/debris from over the outlet of the pipe. The pipe appeared to run under Lodge Lane, however, it was not obvious what this pipe served.

25 and 27 Lodge Lane have a history of groundwater problems and have had water under the floors, but have never been flooded internally.

### **2.19.2 Investigations and Actions**

- Additional cleansing of road gullies was carried out shortly after the storm
- A detailed topographical survey has been completed.
- A CCTV survey and probing of the uncharted pipe, to establish its condition and route has been undertaken. The pipe was found to be in good condition and led to what appeared to be a buried inspection chamber in the front garden of 26 Lodge Lane. Subsequent excavations by the property owner proved that the down-pipe from the property, a land drain and the private pipe which crosses the road all converged at this point, but there was no chamber present and no evidence that any sort of inspection chamber or manhole had ever existed at that location. An inspection chamber has now been constructed and all the above pipes have been connected to it.
- Dye testing has been carried out to establish the efficiency of the gully network along Lodge Lane, which was found to be in good working order.
- The gullies along the even side of Lodge Lane have been flushed and cleansed.

- The downstream catchments have been investigated to establish any influence on Lodge Lane.
- The gully outside number 26 Lodge Lane was lowered to improve drainage of the highway locally.
- A CCTV survey of the existing 225mm diameter highway drainage system under the footway (from the manhole outside 30 Lodge Lane upstream (i.e. towards Worksop Road)) revealed no blockages in the system. There was a small amount of silt in the pipe (approximately 10% of the cross-sectional area of the pipe) which was removed from the highway drainage system (between 2 and 40 Lodge Lane) in December 2009.
- The culvert between 27 & 29 Lodge Lane and the open watercourse downstream in the land to the rear of 7 - 23 Roberts Grove has been cleared. The outlet of this culvert had been at least 50% blocked.



### 2.19.3 Possible Solution

A temporary solution has been implemented to help alleviate the flooding on Lodge Lane. This consists of:

- The installation of three new road gullies, two outside 24 Lodge Lane, the other outside 27 Lodge Lane, which connect to a new 300mm diameter highway drain which discharges into the watercourse adjacent to 27 Lodge Lane. The existing highway drain under the footway outside 2 to 30 Lodge Lane remains, however, when this pipe is overloaded at times of heavy rainfall, water will spill from the existing system to the new 300mm diameter pipe via a new chamber constructed in the footway outside 26 Lodge Lane. This work was completed at the end of March 2010.

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It was reported at the time of the 2007 floods that surface water run off came from the direction of Austen Park at the rear of 4 to 30 Lodge Lane. To deal with this it is proposed that a holding pond be constructed to intercept any overland flow across the field to prevent the flows from discharging unrestricted into the rear gardens of no's 4-28 (evens) Lodge Lane. This is Parish Council land and would require the co-operation of the Parish Council.

The scheme will be achieved by constructing an earth bund along the rear boundary of 10 – 28 Lodge Lane. This creates a natural flood plain for the entire field to drain to with the aid of additional land drains. The water that accumulates within the flood plain and earth bund will be released back into the system at a manageable rate.

### **DEFRA – Quick Win Application - Approved**

An application was made on 30/11/2009 to DEFRA under their 'Early Action Bids for Tackling Surface Water Flood Risk' scheme. Submission Value - £85,000. This bid is for various flood alleviation works between Lodge Lane and Heron Hill (see section 20). Due to a delay in the bid decision, it was decided that the Council would proceed with the improvements to the highway drain in Lodge Lane and these works have been completed. The scheme intercepts the water on the highway on the even numbers side of the road and directs it to the watercourse between numbers 27 and 29 Lodge Lane. Detailed design of the remainder of this scheme is currently ongoing and under the terms of the grant, this work must be completed before the end of March 2011.

## **2.20 Area 20 Heron Hill, Aston**

### **2.20.1 Flooding History and Mechanism**

#### **Internal Flooding No.s 22, 24, and 26**

There are 2 separate watercourses which flow into separate inlets before combining together on The Chase. One of the watercourses starts near Lodge Lane, then runs along the boundary of the parish council recreation ground, to the inlet behind 28 The Chase. The other starts on the north side of Worksop Road, runs along the rear boundaries of Hardwick Close and Priory Way, then between the rear boundaries of Church View and All Saints Way, before emerging in open channel again through the lineal park then into an inlet near to the rear of 98 All Saints Way. The combined culvert outlet is at the rear of 26 Heron Hill.

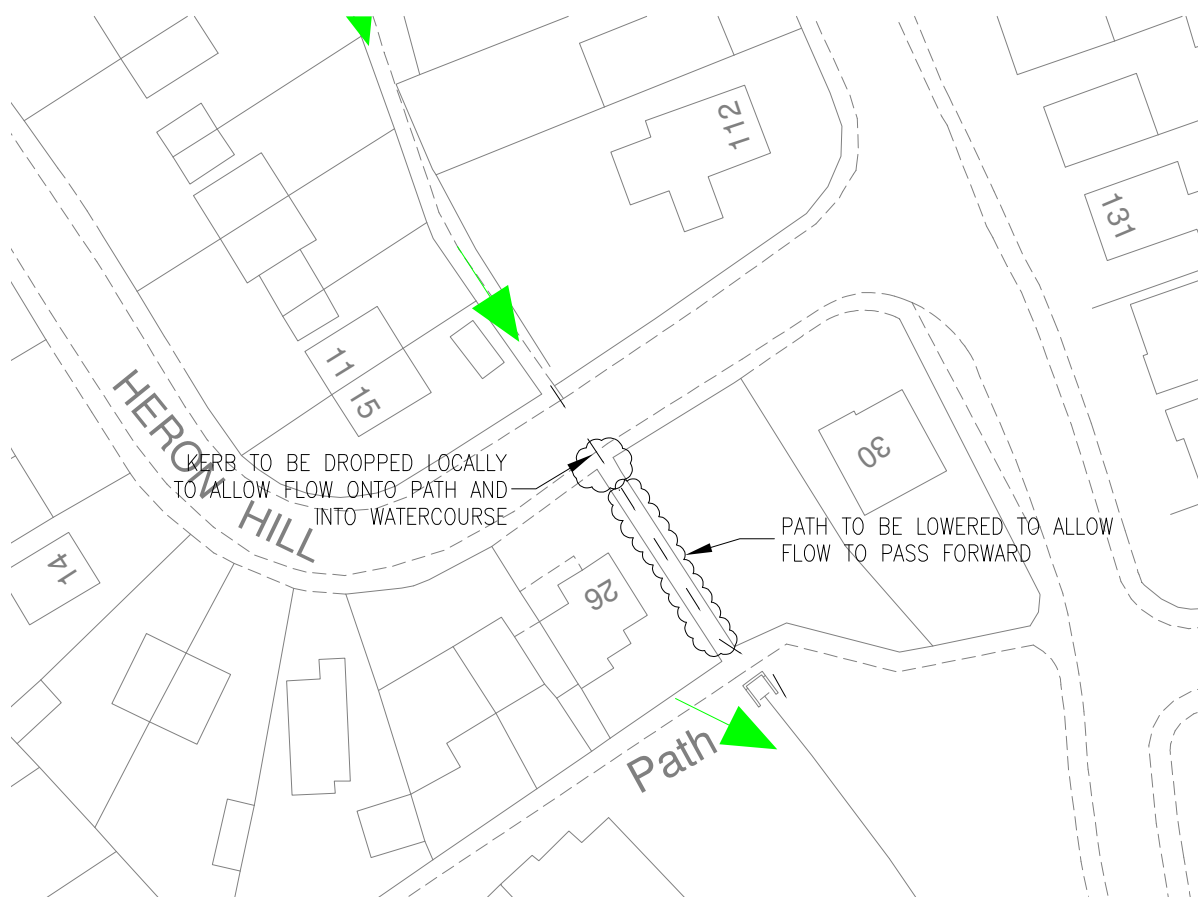
There are grills on the inlets and the outlet. It is known that the outlet grill was partially blocked and Council staff broke off the padlock to allow the grill to open increasing the flow. The condition of the inlet grill at the time of the flooding is not known, but shortly afterwards there was a large amount of debris around both inlets, which has been moved since the incidents. There is open land upstream of both inlets, owned by Aston Parish Council. Responsibility for maintenance of the watercourses in these area lies with the riparian landowners, i.e. the Parish Council and property owners. The watercourse in the recreation ground area contained a large amount of branches and logs. Many of these had been saw cut, indicating that they had been either dumped or left there intentionally.



## 2.20.2 Investigations and Actions

- Detailed topographical survey and dye testing has been undertaken.
- A significant amount of investigation has been undertaken to establish the contributions from upstream catchments and their exact points of connection.
- Investigation into providing flood storage areas upstream in the open land and provision of an emergency overland flood routes is ongoing.

Aston Parish Council employed contractors to clean and remove debris from the channel at the recreation ground, during November 2009.



## 2.20.3 Possible Solution

A possible solution has been devised to help alleviate the flooding at numbers 22, 24, and 26 Heron Hill:

- The overland flow runs down the footpath at the rear of 15 Heron Hill, across the road and onto number 26's garden. This flow could be redirected over the footpath running along the side of no.26 by lowering the kerb (outside number 26) which would drive the water straight across the road, over the lowered kerb (the new low point) and down to the open channel at the rear of 26.
- The owners of number 26 are reportedly constructing a wall at the front of their property in an effort halt any water ingress, which could assist the above solution.

Further upstream the pass forward flow can be restricted at the recreation ground by forming additional flood storage above ground.

### DEFRA – Quick Win Application - Approved

An application was made on 30/11/2009 to DEFRA under their 'Early Action Bids for Tackling Surface Water Flood Risk' scheme. Submission Value - £85,000. This bid is for various flood alleviation works between Lodge Lane and Heron Hill. Detailed design of this scheme is currently ongoing and under the terms of the grant, this work must be completed before the end of March 2011. These works will reduce flood flows in the watercourse, reducing the occurrence of overland flow. Lowering of the path at the side of 26 Heron Hill will alter the overland flood route, diverting water away from the properties when flooding does occur.

## 2.21 Area 21 Church Lane, Aston

### 2.21.1 Flooding History and Mechanism

#### External flooding

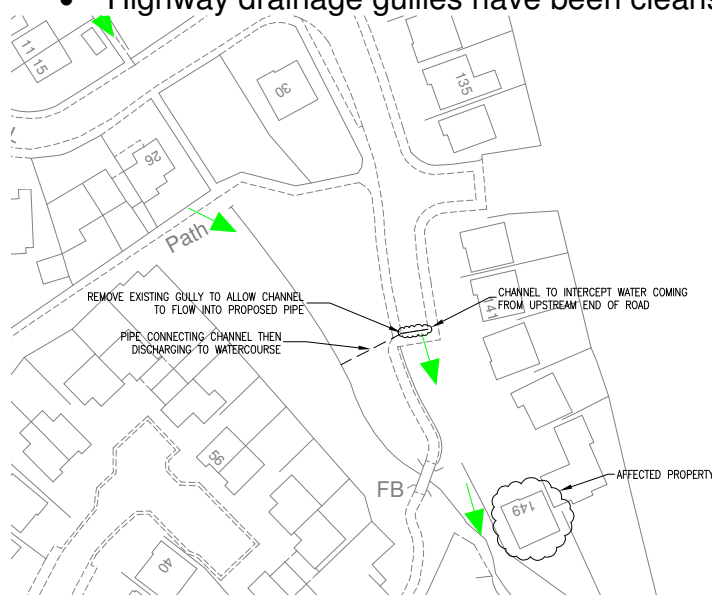
During heavy rain the foul manhole on drive way overflows. The house is situated adjacent to the downstream part of the watercourse mentioned above.

There is a private sewer system which serves this development. There is a manhole on this system situated close to the front door of no. 149. It is not known whether water from the flooding above entered this system, exacerbating the flooding.

The gullies at the end low end of Church Lane were blocked and have now been cleansed.

### 2.21.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Highway drainage gullies have been cleansed



### 2.21.3 Possible Solution

There is no indication that the sewers are not suitable for the usual criterion for design of a 30 year return period. It is inevitable that when this is exceeded, as it was in June 2009, flood water will overflow from the sewer system. The ground levels currently allow flood water to drain toward the properties. Minor alterations to ground levels in the front garden could divert this water away from the properties on the rare occasions when the sewers are overloaded.

## 2.22 Area 22 Mansfield Road

### 2.22.1 Flooding History and Mechanism

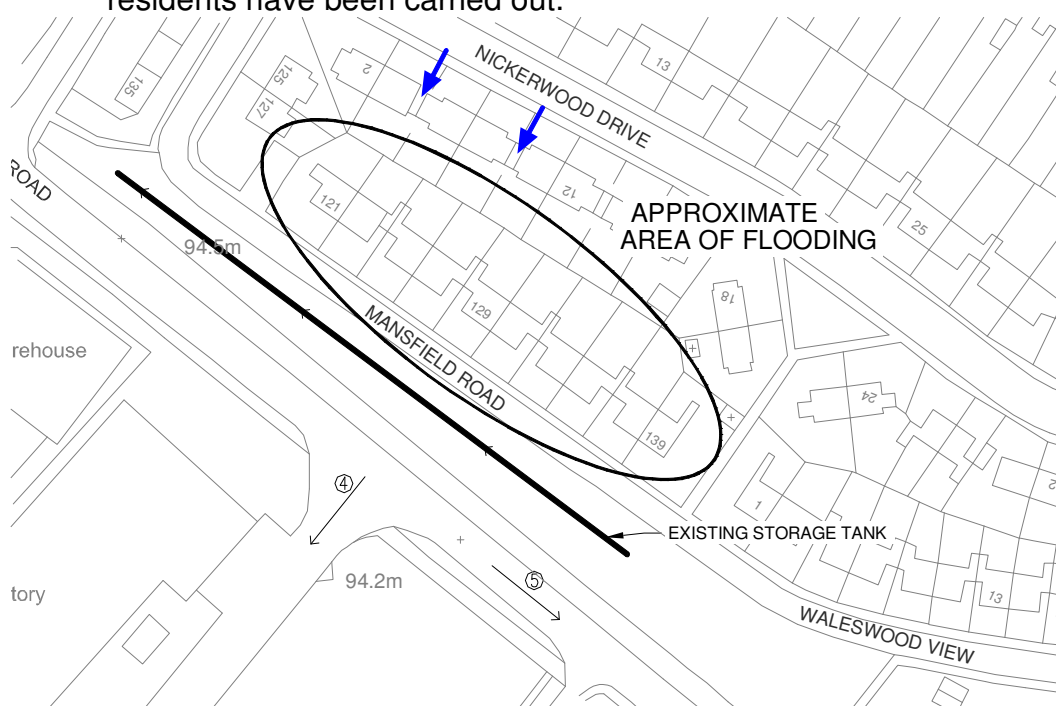
No's 121-139 all affected by external flooding with most being internally flooded.13 Nickerwood Drive External flooding

Surface water flows towards the rear gardens of Mansfield Road from Nickerwood Drive. Flows in excess of what is drained by the highway drainage runs between the houses on Nickerwood Drive and into the rear gardens of the properties on Mansfield Road. The outbuildings to the properties on Mansfield Road are attached to the houses creating a terraced effect.

The topographical survey has shown that the land in this area has a bowl shaped surface profile, meaning the flooded properties are surrounded by higher land on all sides. It is not feasible to create an overland flood route so effective draining of the area can only be achieved by underground drainage systems. When the capacities of the existing drainage systems are exceeded, surface flooding is inevitable.

### 2.22.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.



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### **2.22.3 Possible Solution**

Overland flows need to be restricted across the back gardens from Nickerwood Drive which could be addressed in part by adding additional gullies. In exceptional rainfall, the highway drainage system is overloaded, so additional gullies would not be effective.

Preventing surface water flooding would necessitate installing additional drainage from the rear to the front of the properties, then beneath the road to connect into the existing drainage. This work would involve considerable disruption to the residents and alterations or removal of existing outbuildings. In addition to the normal funding issues, any scheme is dependent on the willingness of the residents to accept the effects of such a scheme on their properties.

## **2.23 Area 23 Osprey Road**

### **2.23.1 Flooding History and Mechanism**

#### **No. 1 Garage Flooding**

Flooding of the garage at no. 1 occurs when water runs from the highway, down the drive. An inspection was carried during persistent heavy rainfall and the drainage system was observed to be working well, with no indication of any possibility of flooding. The resident reports that on rare occasions large amounts of water run down Duckham Drive, then across Osprey Road towards the dropped kerb, across the footway the down the drive.

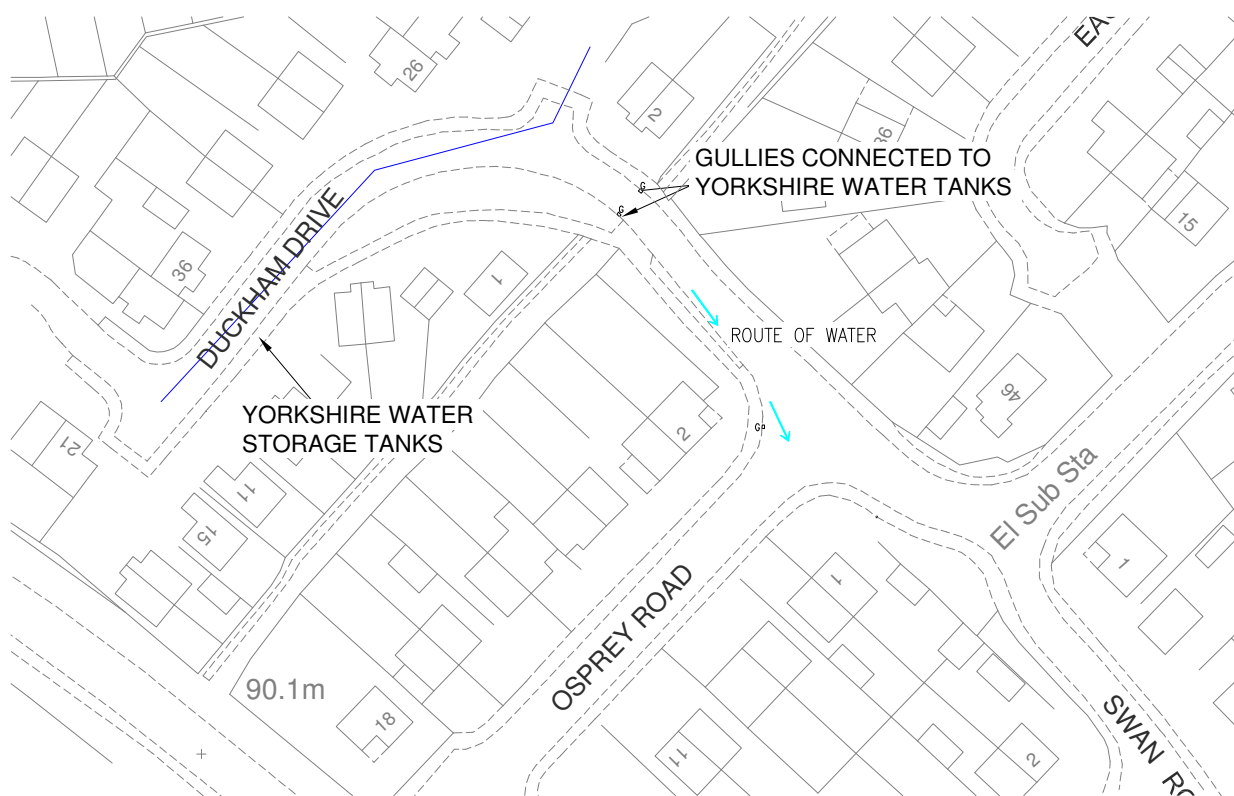
After the flooding in June 2009, there was evidence of damage to the path to the side of 2 Duckham Drive, cause by water flow, indicating overland flow from the Waleswood View / Marlborough Rise area. This water may have contributed to the flooding but is more likely to have run down the east side of the carriageway away from Osprey Road. There is a surface water storage tank which is part of the Yorkshire Water public sewer system on Duckham Drive. The June 2009 flooding was in excess of the design rainfall for this tank, so it is probable that the tank filled up during that event. The lowest point of connection to this tank is the road gully opposite no2. Duckham Drive, so when the tank is full, water would overflow from this gully. This is consistent with the gully operating effectively during heavy rainfall, but with a large flow out of the gully in exceptional rainfall. When water overflows from this gully, it is not effectively drained by the gully on the corner of Osprey Road.

There is a small drainage channel to prevent water flowing into the garage. This is effective during light rainfall, but cannot cope with large amounts of water flowing from the highway. The gullies on Osprey Road and Duckham Drive are not blocked, but cannot drain the road and the overflow from the storage tank.

There is a surface water gully at the front of the property which drains the shared down-pipe serving the front half of the roofs. This drains to a soakaway which is unable to cope with very heavy rainfall. The ground levels around the front of the property cause a small amount of ponding during moderate rainfall.

## 2.23.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Yorkshire Water has checked the public sewers in the area and has found no problems.



## 2.23.3 Possible Solution

A non return valve could be fitted to the connection to the road gully opposite no.2 Duckham Drive. Overflow from the tank would then first occur from the gully on the opposite side of the carriageway, away from Osprey Road.

A gully at the tangent point of the kerb at the side of no. 2 Osprey Road would more effectively deal with water from the direction of Duckham Drive.

Improvements to the drainage and minor alterations to the ground levels around the front of nos. 1 & 3 Osprey Road would reduce the ponding which occurs there and would provide additional protection against flooding in the most exceptional rainfall events. This would be the responsibility of the property owners.

## 2.24 Area 24 Wetherby Drive

### 2.24.1 Flooding History and Mechanism

Four properties flooded internally, with water depths in the properties of up to 2m. Electrical control gear serving Yorkshire Water sewage pumping station flooded resulting in sewage contamination of flood water.

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A watercourse runs in a deep cut to the east of Wetherby Drive. It flows into a culvert under the A57 Aston Relief Road. This culvert is a 94m long, bitumen lined corrugated steel culvert with a diameter of 1100mm. The downstream half of the culvert has been relined and has a diameter of 900mm. The culvert discharges to an open watercourse to the south which then enters another culvert beneath the railway line which extends into Rother Valley Country Park. This culvert is some 165m in length with no obvious access points. There is a landslip downstream of the railway caused by water escaping through defects in the culvert which is blocked and/or collapsed near the downstream end.

Flooding occurred upstream of the A57 culvert and also between the A57 and the railway.

Before the June 2009 flooding, the area between the A57 and the railway had been flooded. It has since been reported that this flooding lasted for several months. Because this area is private land with poor access, this flooding was not reported prior to the flooding of Wetherby Drive.

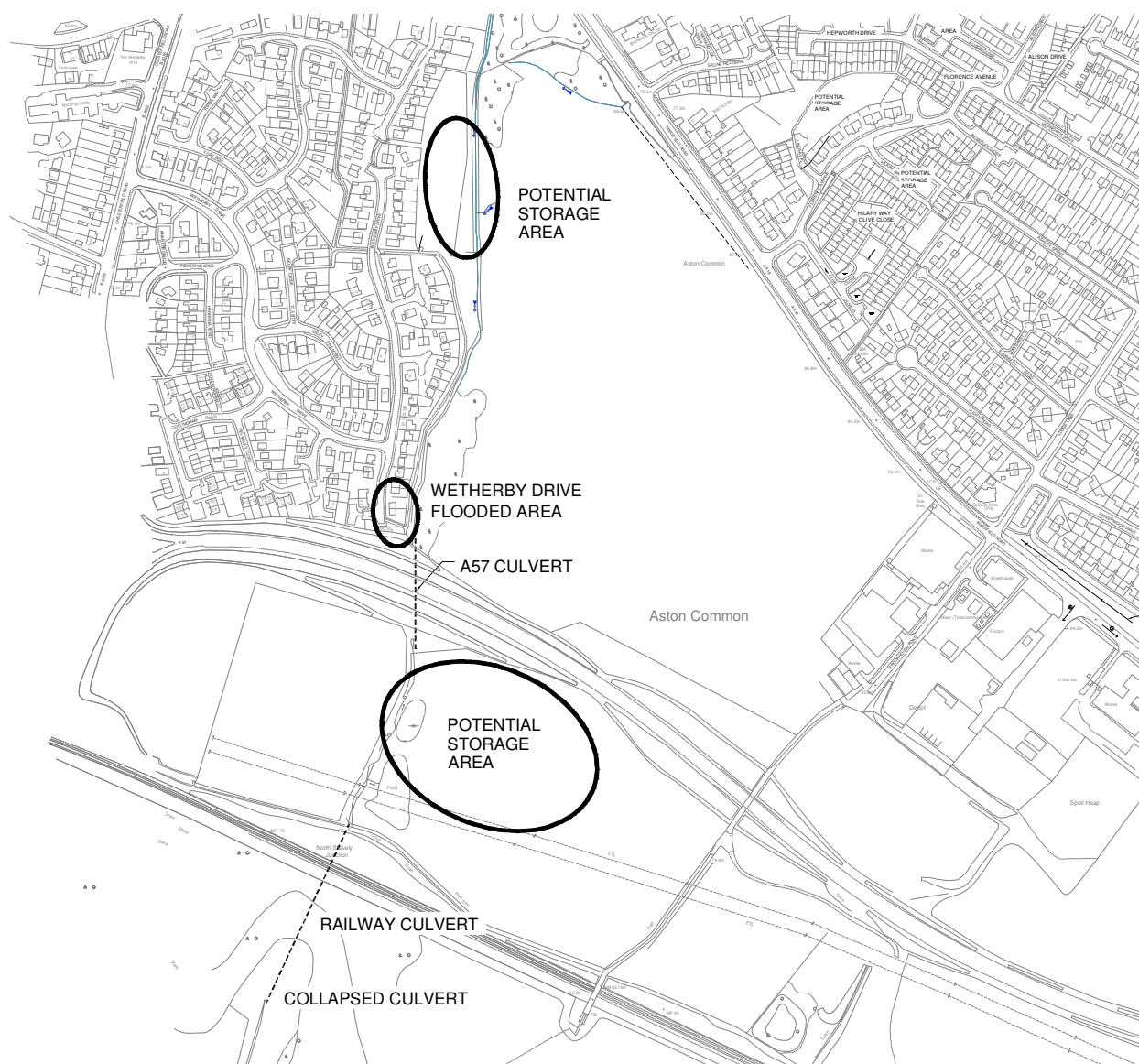
#### **2.24.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- A topographical survey was carried out on the upstream and downstream ends of both culverts, which measured ground levels and flood levels.
- An inspection of the culvert carried out in January 2010 confirmed the presence of debris within the culvert at the position of the reduction in diameter. This has been removed. It is not known whether the debris was present before the flood or whether it was washed into the culvert by the flood water. It is known that debris has been trapped at this point in the past.
- The survey also found that the upstream unlined half of the culvert is badly corroded and is in need of lining or some other sort of remedial action. If this is not carried out, collapse of the culvert and associated flooding is a significant risk. Due to the height of the embankment, dealing with a culvert collapse would be an extremely difficult, disruptive and costly operation.
- Excavation works to locate the downstream end of the railway culvert within Rother Valley Country Park were commenced in December 2009. At the position where water was flowing up through the ground, approximately 30m upstream of the assumed outfall, the top of the culvert was located within the excavation, but due to its depth (approximately 4m) and the high water levels, it was not possible to fully expose the culvert. Works were then suspended due to very wet ground conditions. Works recommenced in March 2010 and the downstream end of the culvert was located approximately 2m below the existing bed level of the downstream watercourse.

The open watercourse downstream of the culvert contains large amount of material washed down from the landslip above and possibly elsewhere, raising bed levels.

Both culverts had an effect on the flooding of Wetherby Drive. The restriction to flow caused by the culvert beneath the railway caused water to stand above the outfall of the A57 culvert. This would have reduced the effective capacity of the culvert.

If both culverts had been clear, with free outfall, flooding would still have occurred on 10 June, but the peak level would have been lower.



### 2.24.3 Possible Solution

The downstream watercourse in Rother Valley Country Park should be cleared to restore a clear outfall for the culvert. This involves removing a depth of up to 2m of silt across the width of the watercourse for a length in excess of 100m.

When a free outfall has been established, the culvert can be investigated and cleared working upstream from the downstream end. When the blockage or collapse has been rectified, the culvert which is currently full of water will drain and a full inspection is then recommended.

The upstream unlined section of the A57 culvert should be relined. The diameter of the upstream lining should be no less than the diameter of the already lined section. A trash screen should be installed at the inlet to prevent debris entering the culvert.

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Protecting the properties on Wetherby Drive to an acceptable level would involve either increasing the flow capacity beneath the A57, probably by forming a new culvert and creating flood storage downstream, or by reducing the flow within the watercourse by creating flood storage upstream. Possible flood storage areas have been identified to the north and south of the A57 embankment. Both potential flood storage areas would involve works on private land so would require the consent of the landowners.

Both these options require a full feasibility study and preliminary design to be carried out to produce a workable scheme, acceptable to all parties. Funding for the feasibility and design would be required prior to seeking funding for the works.

## **2.25 Worksop Road, Aston**

### **2.25.1 Flooding History and Mechanism**

2 no. properties and 1 no. garage were flooded internally due to surface water running off the public highway. It would appear that the public sewer in Worksop Road was overloaded and water was issuing out of the road gullies, indicating that the public sewer was surcharged and backing up the drainage systems before overflowing from the gullies.

### **2.25.2 Investigations and Actions**

- The survey work and site investigations have been completed.

### **2.25.3 Possible Solution**

Alterations to the kerbline could prevent water flow from the highway. A flood route should be maintained around the properties to minimise flooding in extreme events.

## **2.26 Worksop Road, Swallownest**

### **2.26.1 Flooding History and Mechanism**

Several gardens were flooded due to surface water running off the public highway.

### **2.26.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Cleansing works and additional investigation works (including a CCTV survey) have revealed a defect to the highway drainage system serving the road gullies and footway gullies.

### **2.26.3 Possible Solution**

A repair to the highway drain is currently programmed to be carried out May 2010.



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## **3 OTHER AREAS WITHIN THE BOROUGH OF ROTHERHAM**

### **3.1 Kensington Close, Laughton Common**

#### **3.1.1 Flooding History and Mechanism**

In June 2007, water flowed from the railway onto Kensington Close. There were problems with the railway drainage which has since been cleared out. Water still ponds on the railway, even during relatively dry conditions. In January 2008 after the flood study had been completed, during heavy rainfall, water from the railway again flowed onto Kensington Close causing flooding to the garden of number 22. No properties were damaged during that event. Several properties flooded again in June 2009.

Ensuring the railway drainage is kept clear is a priority for alleviating future flooding, but will not eliminate flooding. The railway drainage is designed to drain the railway, but is unlikely to cope if large amounts of water flow onto the railway from adjacent land.

The railway drain on the east of the track crosses under the railway to discharge to the west. There is no known positive drainage from the railway into the new estate, but it is likely that before the area was developed, excess water from the railway would run naturally onto this land.

During the heavy rainfall in January 2008, it was observed that there was a large quantity of water flowing above ground down the railway land. The land on the housing estate is generally just higher than the railway land, but adjacent to Kensington Close, there is a dip in the ground profile, allowing the water to flow onto the estate.

#### **3.1.2 Investigations and Actions**

Improvements to the drainage by construction of a new ditch draining to Eel Mires Dike have been agreed with Network Rail.

#### **3.1.3 Possible Solution**

##### **DEFRA – Quick Win Application - Approved**

An application was made on 30/11/2009 to DEFRA under their 'Early Action Bids for Tackling Surface Water Flood Risk' scheme.

300m of flood relief ditch will be constructed to intercept water from the agricultural catchment upstream which flows overland along the railway cutting, before flowing onto the adjacent housing estate. Submission Value - £30,000.

These works commenced in April 2010.

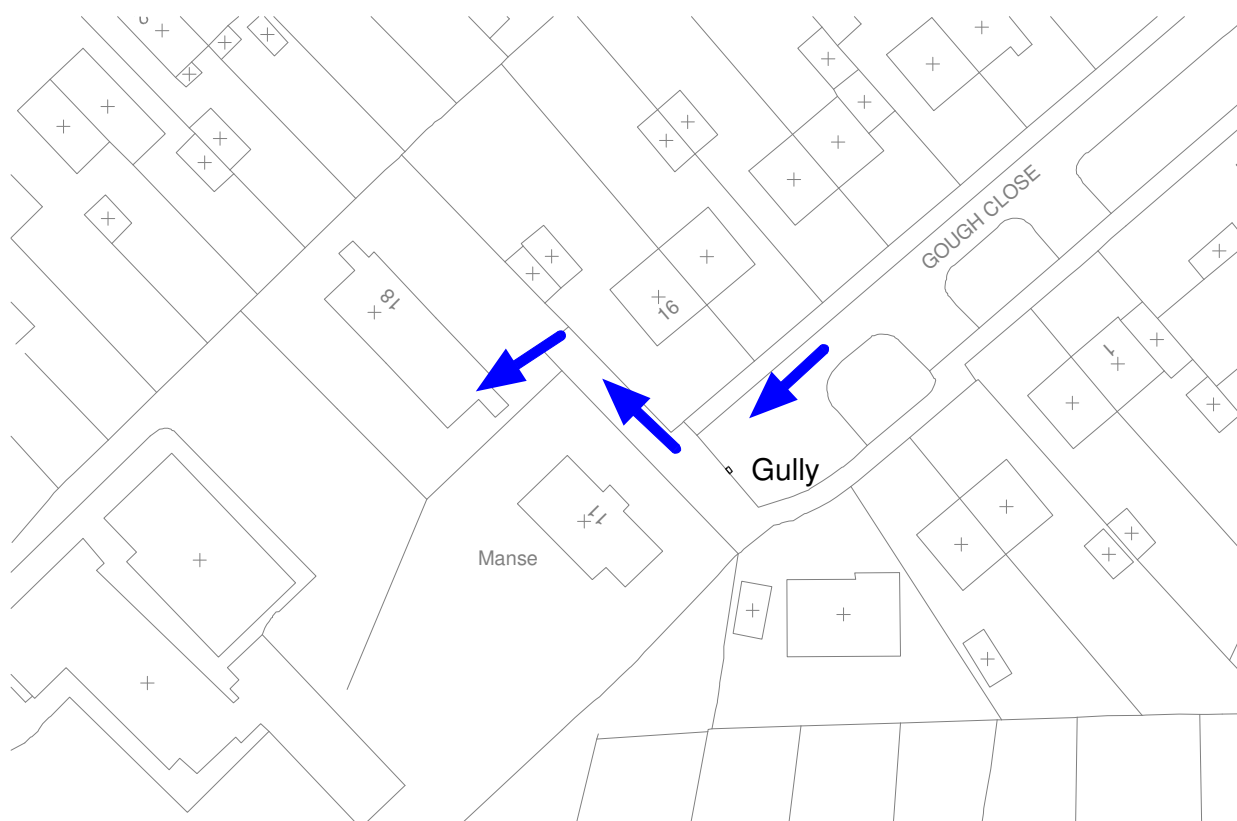
## 3.2 Gough Close, Herringthorpe

### 3.2.1 Flooding History and Mechanism

Gough Close is a cul-de-sac which slopes steeply down towards the hammerhead end. There is a dropped kerb along the full width of the hammerhead and the gullies do not adequately intercept the water, allowing it to run across the footway towards no 11. The residents report that this is a longstanding problem. Recently no 11 has been extended on both sides and a new wall has been constructed along the front boundary. Some of the water still flows into no 11 affecting the garage, but the wall has diverted much of the water towards no 18. The drive of no 18 slopes towards the integral garage and there is a small drainage channel to prevent water flowing into the garage. This is effective during light rainfall, but cannot cope with large amounts of water flowing from the highway.

### 3.2.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.



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### **3.2.3 Possible Solution**

The kerb at the end of the hammerhead should be raised slightly to drain the road more effectively.

The owner of no 18 should investigate forming a flood route or additional drainage along the side of the property to prevent the garage flooding during exceptional rainfall.

## **3.3 Goose Carr Lane and The Pastures, Todwick**

### **3.3.1 Flooding History and Mechanism**

Road and two gardens affected. Further damage was avoided by a resident forming an emergency flood route through his garden.

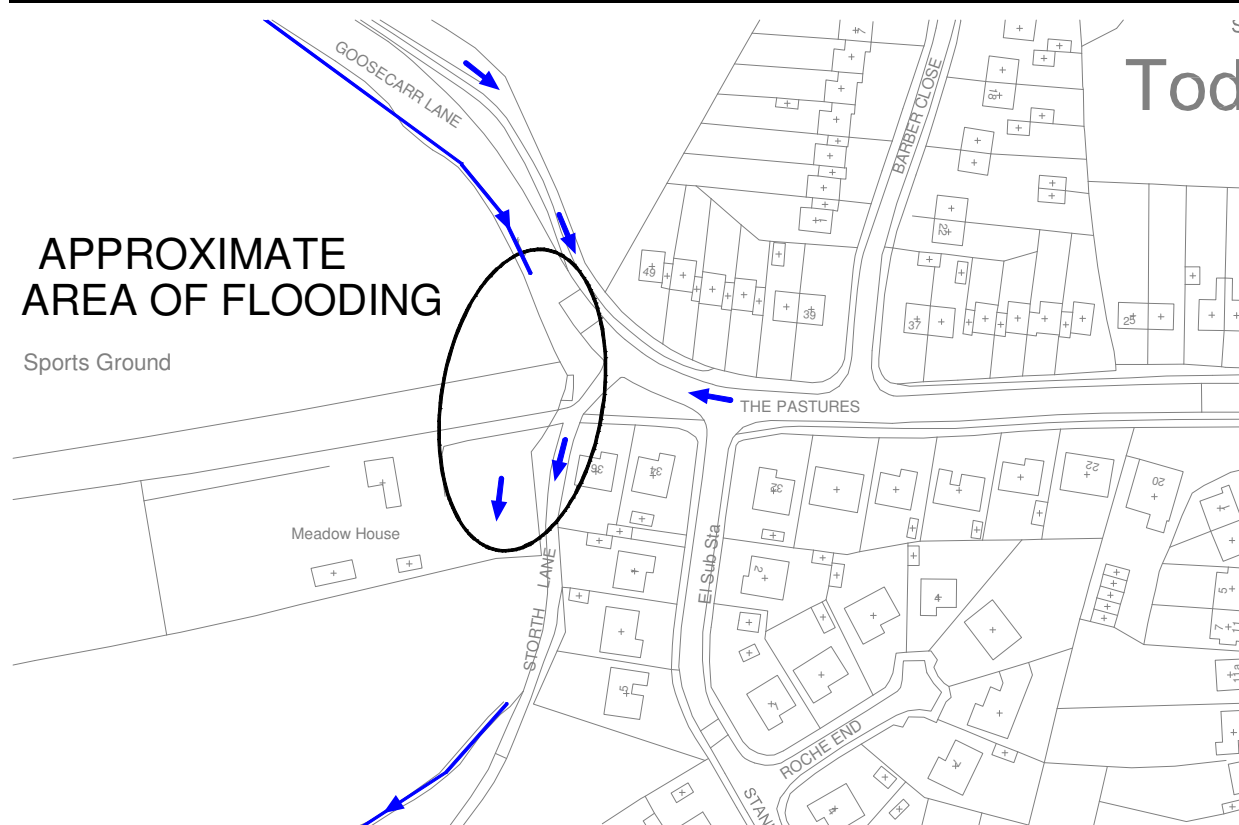
On open ditch on the west side of Goose Carr Lane enters a culvert 30m north of the corner where the road changes to The Pastures. The culvert, which is approximately 100m long, passes between Meadow House, Goose Carr Lane and 36 The Pastures. A 900mm diameter public surface water sewer runs down The Pastures and discharges to the culvert.

The grill on the culvert inlet was 80% blocked. The excess water, which could not get into the culvert, flooded the road and the recreation ground, before flowing overland along Storth Lane and across the gardens to flow back into the open watercourse downstream. It is suspected but unconfirmed that water flooded onto Goose Carr Lane near the entrance to the allotments due to the capacity of a small culvert under the road being exceeded. This water then ran down the road as far as the corner where it added to the flooding.

The culvert inlet and first 40m are within adopted highway. There are other smaller culverts upstream, some of which appear to serve no purpose and require further investigation. These are also within adopted highway. The grill and culverts are not on a maintenance schedule.

### **3.3.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out. Photographs of previous flooding have been obtained.
- The culvert inlet has been cleared and it has been added to a regular maintenance schedule.
- A surface water drain running from the verge adjacent to no 49 has been discovered and the previously buried inlet has been uncovered.



### 3.3.3 Possible Solution

The flooding which affects Goose Carr Lane is predominantly due to runoff from adjacent agricultural land. There are a number of piped sections of drains which were unrecorded and therefore were not regularly maintained. Blockages in these pipes caused water to drain onto the carriageway of Goose Carr Lane and there was insufficient drainage of the carriageway to effectively drain this water back into the existing drainage systems. The culvert inlet on the west side of Goose Carr Lane has now been added to the Council's schedule for regular inspection and maintenance.

The previously buried inlet to a pipe which runs from near number 49, beneath Goose Carr Lane to connect into the public surface water sewer has been uncovered. To prevent this inlet silting up again, the area upstream of the inlet should be cleared and a proper inlet structure should be constructed. Additional gullies on the West side of Goose Carr Lane and cleansing of the public surface water sewer would also increase the effectiveness of the existing drainage system and therefore minimise flooding of the road, and reduce the possible risk of flooding of the adjacent properties.

## 3.4 Herringthorpe Valley Road (North), Mowbray Street

### 3.4.1 Flooding History and Mechanism

Herringthorpe Valley road near Mowbray Gardens library flooded in June 2009 and the water was very close to flooding the library. In June 2007, the road flooded on 2 occasions, and 2 properties on Mowbray Street were flooded internally. In 2009, neither the library nor any of the residential properties flooded internally.

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The 2009 incident has not been investigated separately, but evidence from 2007 suggests that the public sewer system is inadequate to cope with intense rainfall events. There is a watercourse which enters a culvert in Valley Park which discharges into the public surface water sewer near the allotments.

### **3.4.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents were carried out after the 2007 floods.

### **3.4.3 Possible Solution**

The recorded flooding incidents in this area have been due to rainfall events considered as exceptional by Yorkshire Water and therefore no action is proposed.

Applications were submitted by the Council to Defra for funding in accordance with Defra's "Property Level Flood Protection and Resilience Grant". The grants provide for property flood defences such as flood gates to doors, air vent covers etc. Property level grants are available for this area and individual property owners will be contacted when full details of the grant scheme have been received from Defra.

## **3.5 Herringthorpe Valley Road (South) and Broom Lane**

### **3.5.1 Flooding History and Mechanism**

Herringthorpe Valley Road, Broom Lane and Worrygoose roundabout were flooded causing traffic problems and flooding 5 gardens. The extent of the flooding is such that an elderly disabled resident is unable to access or leave his property and his carer was only able to enter his property by climbing over a garden wall.

Flooding of the area has long been a problem and approximately 15 years ago, a new sewer was laid in Worrygoose Lane by Yorkshire Water, which was intended to alleviate the problem. The surface water sewer overflowed at the junction of Worrygoose Lane and Moorhouse Lane, causing extensive damage to the highway surface. There is also a partially culverted watercourse east of Worrygoose Lane. The extent of the interaction between the surface water sewer and the watercourse is not known.

The footways in front of the affected gardens are not high enough to contain the standing water on the roundabout, so water runs across the footways flooding the gardens. The gardens are lower than the surrounding land, so once flooded, the gardens stay underwater for several days.

### **3.5.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.

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### **3.5.3 Possible Solution**

Minor alterations to the footway should be made to reduce the incidence of water running off the highway.

Additional drainage within the gardens should be considered to drain floodwater from the gardens.

The highway gullies should be inspected regularly to ensure that the system is working to its maximum capacity.

## **3.6 Josephine Road, Holmes**

### **3.6.1 Flooding History and Mechanism**

Cellar flooded due to blocked gully. Cars are often parked over the gully preventing it being cleansed. There is a build-out in the carriageway which prevents the water continuing down the carriageway when the gully is blocked.

### **3.6.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.

### **3.6.3 Recommendation**

Additional gully cleansing required with the co-operation of the residents. Alterations to the build-out could prevent flooding if the gully blocks again.

## **3.7 Meadow Street, Laughton Common**

Flooding of over 40 properties on Meadow Street occurred in 2007. The investigations carried out as a consequence of that flooding, identified 2 culverts downstream as critical to the flows in the downstream watercourse and therefore as critical to minimising future flood risk. The culvert which created the largest restriction to flows was beneath Monksbridge Road and therefore the responsibility of the Council, as Highway Authority. This old stone culvert has recently been replaced with a much larger reinforced concrete box section. The other culvert is within private land and is therefore the responsibility of the landowner, who has already carried out extensive clearance of the sections of open watercourse. The Council is currently working with the landowner with a view to ensuring that this culvert is improved.

## **3.8 Middle Lane, Clifton**

### **3.8.1 Flooding History and Mechanism**

Two separate flooding incidents were recorded on Middle Lane. Water from the highway ran over the footways, into the cellar of no 110 and into the gardens of nos. 10 and 12.

The road gullies were clear so it is thought that there is a capacity problem with the sewers to which the gullies drain.

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### **3.8.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, and level surveys have been carried out.
- The gullies affecting these areas have been scheduled for an additional cleansing operation as a result of this investigation.

### **3.8.3 Possible Solution**

The system along the entire length of Middle Lane, from Doncaster Road to Wickersley Road, has been cleansed and flushed where required.

Applications were submitted by the Council to Defra for funding in accordance with Defra's "Property Level Flood Protection and Resilience Grant". The grants provide for property flood defences such as flood gates to doors & air vent covers etc. Property level grants are available for this area and individual property owners will be contacted when full details of the grant scheme have been received from Defra.

## **3.9 Staple Green, Thrybergh**

### **3.9.1 Flooding History and Mechanism**

Two Properties affected. No internal flooding.

Water runs from the adjacent land down the slope towards the properties. The tenants report that this has been a problem for a few years. In the past, water has caused problems with the gardens, but the water could run around the houses preventing a build up.

A concrete access ramp has been constructed to no. 22, which prevents the overland flow of water. As levels build up, the water will eventually flow the other way round the two properties along the path at the side of no. 24. Part of this path has been recently repaired and there is a gully in the path, which the tenant has confirmed is effective. However the surface profile of the path is such that water is held back by a high spot before the gully. It is therefore impossible to access to no 24 during heavy rainfall without paddling through water or using a neighbour's garden.

This property did not flood internally, and, because there is a route for the water to drain once it reaches a certain level, future internal flooding is unlikely. If the path is re-laid, it is important that the finished levels are not raised to an extent that would prevent flow of water from front to rear.

### **3.9.2 Investigations and Actions**

A site survey, drainage survey and discussions with residents have been carried out.

### **3.9.3 Possible Solution**

To resolve the problems at this location would require the following.

- 1 Install a land drain across the front of the properties.

- 2 Form an opening through the concrete ramp to permit water to flow through.
- 3 Re-lay the path at the front and side of no.24 to shed water towards the existing drainage.
- 4 A land drainage scheme addressing all the drainage problems on the land upstream.

Without item 4, water from the surrounding land would still drain towards the property during heavy rain, but would then drain away without causing a problem.

### 3.10 Sycamore Drive, Thurcroft

#### 3.10.1 Flooding History and Mechanism

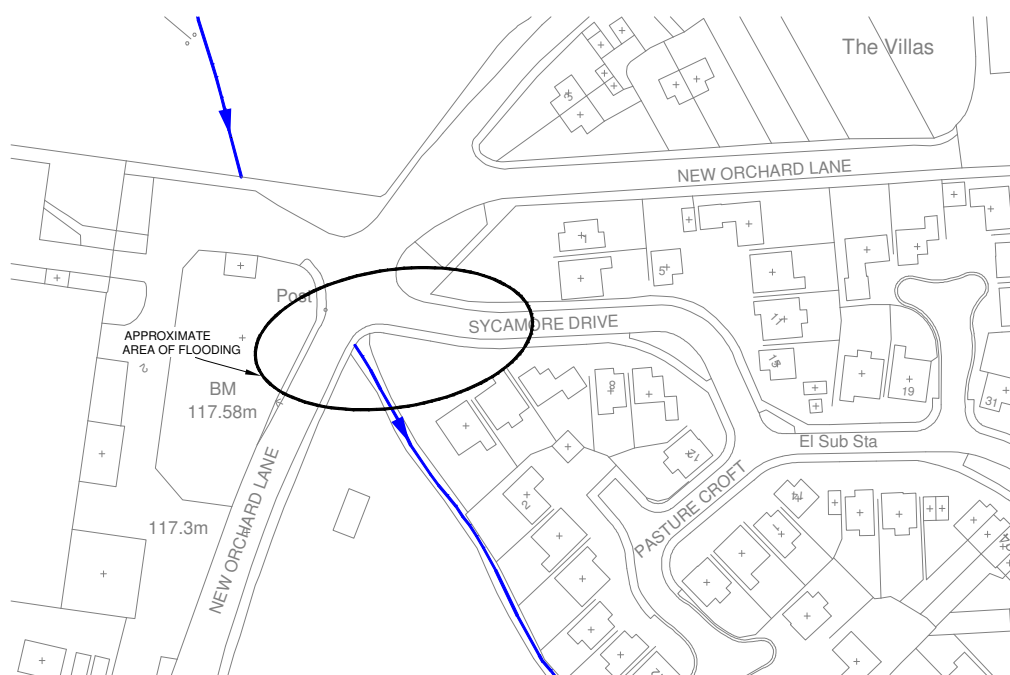
An un-named watercourse runs from the north, through a culvert under New Orchard Lane, then between the houses on Sycamore Drive and the cricket field to Brookhouse Dike.

During heavy rainfall, the culvert is unable to cope and water runs overland. Due to the topography of the junction, water runs from New Orchard Lane onto Sycamore Drive. There is a low spot on the road near the drives on nos. 2 and 4, where water builds up until it runs down the drives towards the houses. The residents have carried out works within their gardens to direct the flood water back into the watercourse, and combined with sandbagging across the ends of the drives, internal flooding of the properties was avoided, but the garages were flooded.

When flooding occurred in 2007, there may have been a partial blockage of the culvert outfall, but it is thought that this was clear in 2009.

#### 3.10.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.





### **3.10.3 Possible Solution**

The watercourse downstream of the culvert appears to have sufficient capacity. Maintenance of the culvert is required by the riparian owners, in this case the adjacent factory and the Council.

Additional drainage from the highway via gullies draining to the watercourse would prevent water standing on the highway and therefore prevent water flowing from the highway towards the properties.

## **3.11 105 The Meadows, Todwick**

### **3.11.1 Flooding History and Mechanism**

Water from the fields behind the property and the adjacent properties ran across the gardens and flooded the lower ground floor of no. 105. There is a longstanding problem with the private drainage and the resident said there may be a problem with tree roots in the private drainage system.

The garage has been converted and is at a lower level than the rest of the property. Water from the land at the rear ran across the garden, down the path at the side of the house and flooded the lower level room.

### **3.11.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.

### **3.11.3 Possible Solution**

The private drain should be checked to ensure it is working effectively, but is unlikely to significantly affect the flooding because any overflow from this would run down the steeply sloping drive away from the property.

There is a bund at the rear of the property which may or may not have been formed purposely, limiting the possibility of water running off the field at the rear and onto the garden. Minor alterations to the path and gate would minimise flows adjacent to the house and therefore minimise flooding.

## **3.12 Windle Court and Shorland Drive, Treeton**

### **3.12.1 Flooding History and Mechanism**

Surface water ran off land adjacent to 7A Windle Court. 5 properties were flooded internally and 15 gardens flooded. Residents reported water overflowing from 2 ditches (one either side of the path which leads up the hill away from the houses, on Council owned land) and a ditch at the rear of 9 Windle Court. The adjacent land slopes steeply towards the houses and it was reported that there was a blockage at the inlet to the culvert.

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### **3.12.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.

### **3.12.3 Possible Solution**

The Council has carried out maintenance works to the inlet of the culvert and constructed a connecting pipe between the ditch at the rear of 9 Windle Court and a nearby drainage system.

Further investigation works are required to prevent surface water run off from the adjacent hillside. Some of the land is owned by the Council.

Investigate the possibility of providing flood storage areas in the upstream open land and provision of an emergency overland flood route.

Investigate the possibility of carrying out flood resilience works to protect the properties (e.g. flood gates etc).

## **4 PROPERTIES ADDED TO LIST SINCE SEPTEMBER 2009**

The following areas were added to the investigations as they were reported to the Council and are beyond the scope of the original remit. Investigations in some of these areas are still ongoing.

### **4.1 Eden Grove, Swallownest**

#### **4.1.1 Flooding History and Mechanism**

(2009) Flooding from overflowing drain in road (blocked) outside number 29 and 31 Eden Grove.

(2007 & 2009) Flooding due to inadequate drainage from SW sewer outside numbers 15-19 Eden Grove.

15 – 19 are situated at the low point of the catchment of Eden Grove/Eden Glade. Property was flooded, but there is a natural slope across the properties from front to back and water stands in both the rear and front gardens.

The owner of number 47 Manvers Road stated that water runs off Eden Grove and runs along Manvers Close through the gardens of 37 – 49 Manvers Road to the stream at the rear of Manvers Road. The outfall was located and observed to be submerged and effectively buried in silt. The stream currently floods a number of gardens at the rear of Manvers Road approximately 4 times a year.

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In June 2009 there was only surface water present, but in previous events sewage was observed.

#### **4.1.2 Investigations and Actions**

- The survey work has been completed.
- Site investigations have been completed.
- Yorkshire Water have CCTV surveyed their sewers and found no defects.
- The Council have, previously considered replacing the running underneath numbers 45 & 47, but this did not happen due to land ownership issues.

#### **4.1.3 Possible Solution**

Investigations in this area are ongoing.

### **4.2 12 Windle Court, Treeton**

#### **4.2.1 Flooding History and Mechanism**

Six properties currently at risk of receiving significant overland flow from the adjacent fields during periods of heavy rainfall as the lie of the land naturally flows towards this property.

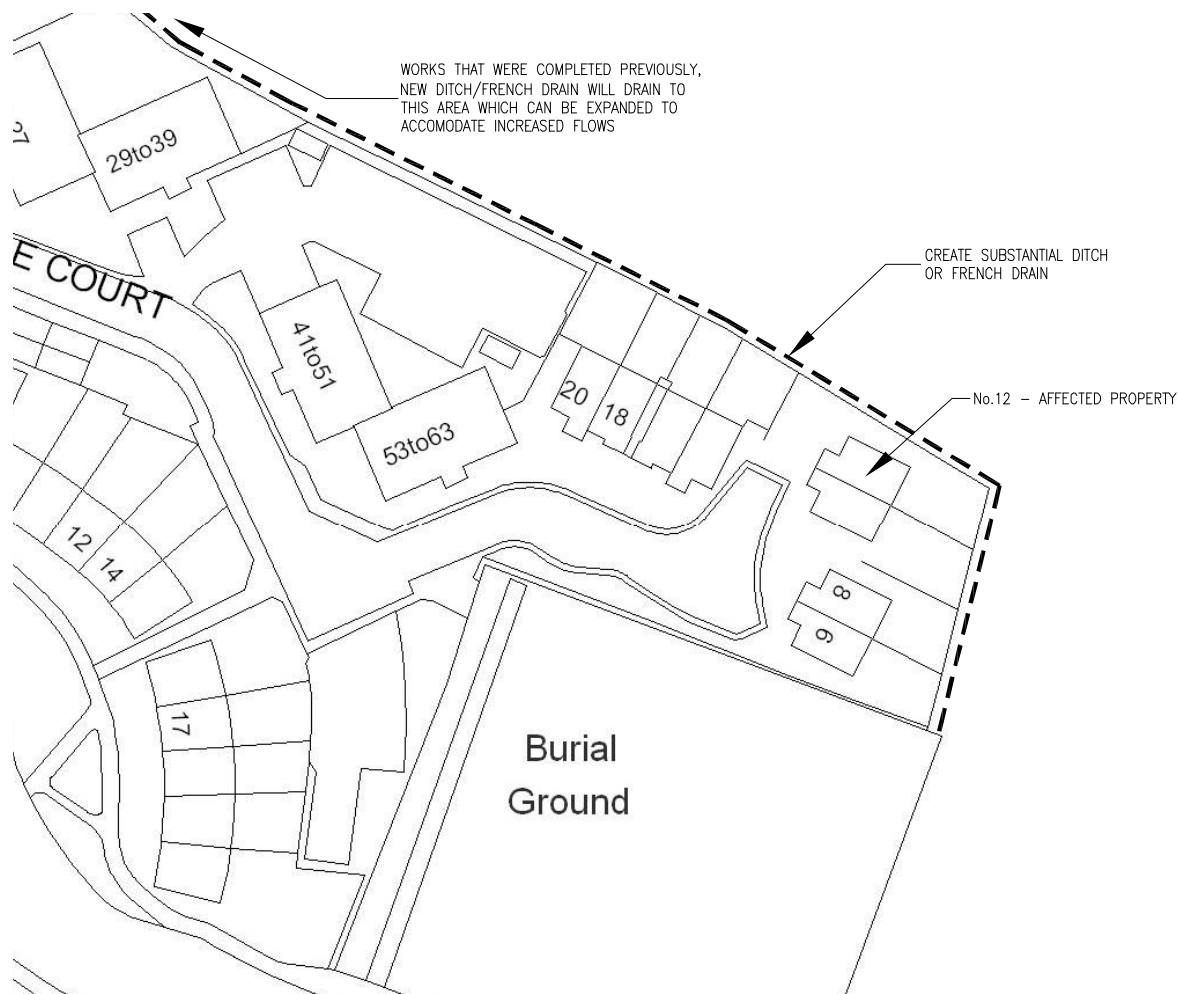
#### **4.2.2 Investigations and Actions**

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- There are no visible signs to indicate there are any drainage systems along the flow path at the rear of the affected properties on Windle Court.
- Historical records indicate that there the area around Windle Court has not previously had any drainage systems in place.

#### **4.2.3 Possible Solution**

Flooding in this area is caused by overland flow, which currently takes the natural flow path following the low ground down the shallow valley. There is not a significant amount of standing flood water. To prevent flooding of the gardens the water should be diverted around the boundary. The simplest way to do this would be to install land drainage or to form a ditch within the farmland which would require the cooperation of the land owner and/or tenant. Alternatively, the works could be done in the gardens, which would be more expensive and disruptive.

This scheme would not pass forward any additional flow, or cause any additional flooding downstream.



## 4.3 Brookside Farm, Common Road, North Anston

### 4.3.1 Flooding History and Mechanism

A home (built in 1995) is situated on a plot of land just off Common Road and is surrounded by three substantial land drains that converge at the rear of the property (Eel Mires is culverted on one side and is an open channel on two others). There are also three ponds of varying sizes adjacent the property (including Strait Mile Fishery) and when we visited there were areas on the surrounding fields that had significant standing water.

### 4.3.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- This property was constructed in 1995 and has suffered a number of incidents since.
- It is apparent from the flat nature of the area and from the size of the catchments contributing to the land drainage system, it is highly likely that this area has been suffering from regular flooding incidents for many years, but, being uninhabited, these events were not reported or even noticed.
- The property is shown as being within the 1% per annum flood risk zone on the Environment Agency's Flood Map.

### 4.3.3 Possible Solution

Due to the topography of the area and the level of the property relative to the watercourses, it is unlikely that flooding can be effectively prevented in this location. Property level flood protection should therefore be considered. This would be the responsibility of property owner.

## 4.4 23 Wentworth Avenue, Aston

The resident reported that flooding has been an issue for approximately 25 years to varying degrees.

Water runs down the road and is not drained adequately by the gullies. Water floods from the manhole, indicating that the system to which the gullies drain is overloaded.

At first water ran around or through what is now the garage, but water now enters the house in times of heavy rainfall. None of the surrounding properties are affected by the flooding

Further investigation of the existing drainage systems in this area is required.

## 4.5 Chestnut Road, Swallownest

### 4.5.1 Flooding History and Mechanism

Flooding from the highway drainage system affects 2 discrete locations, numbers 31 and 45&49 (there is no number 47).

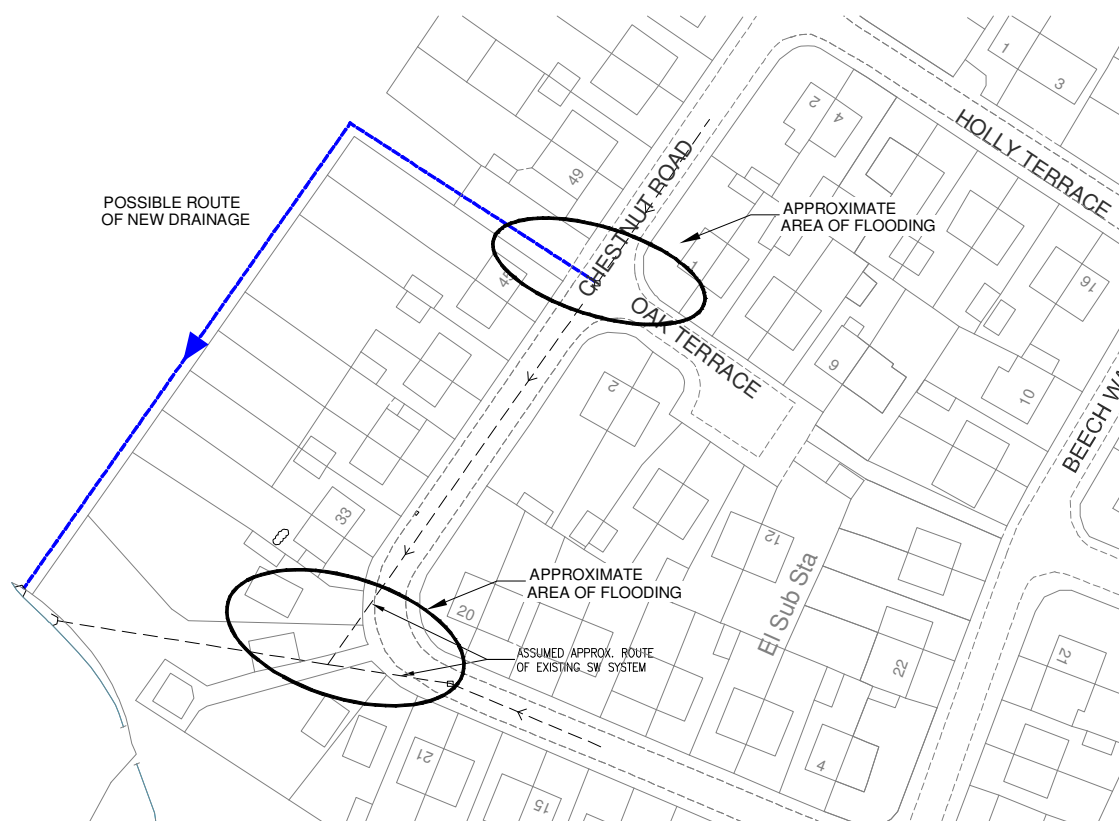
45 and 49 properties lie at a low point along Chestnut Road and water overflows from the gullies in Chestnut Road and flows down Oak Terrace. Ground levels then rise before falling steeply towards the corner where number 31 is situated.

Several instances of flooding have been reported in recent years.

The gully outside number 31 Chestnut Road regularly overtops and water flows down the driveway.

### 4.5.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.
- Water cannot move across the front of number 31 as the driveway is sealed in by a boundary wall and the natural escape route through the garage area is blocked by a door – the owner did however say that when the water builds up he stands at the back of the garage area and holds the door open to let the water escape.
- Following earlier flooding a hydraulic model was constructed which confirmed that the highway drainage system has insufficient capacity.



### 4.5.3 Possible Solution

With the co-operation of the landowner, a new highway drain could be constructed through the land between 45 and 49 used as access to the field, then down the edge of the field to discharge to the watercourse at the rear of number 27. Preliminary discussions with the landowner have taken place.

This scheme would reduce the flows towards number 31, so would also alleviate flooding there. Flooding caused by exceptional rainfall or a blockage in the highway drain would remain a possibility so it would be prudent to maintain a potential flood route along the drive.

Lowering of the kerb and footway in front of the field access would minimise the potential for water to stand on the highway before running into the adjacent properties.

It is understood that the residents at 45 and 49 have already taken action to improve drainage of their properties locally

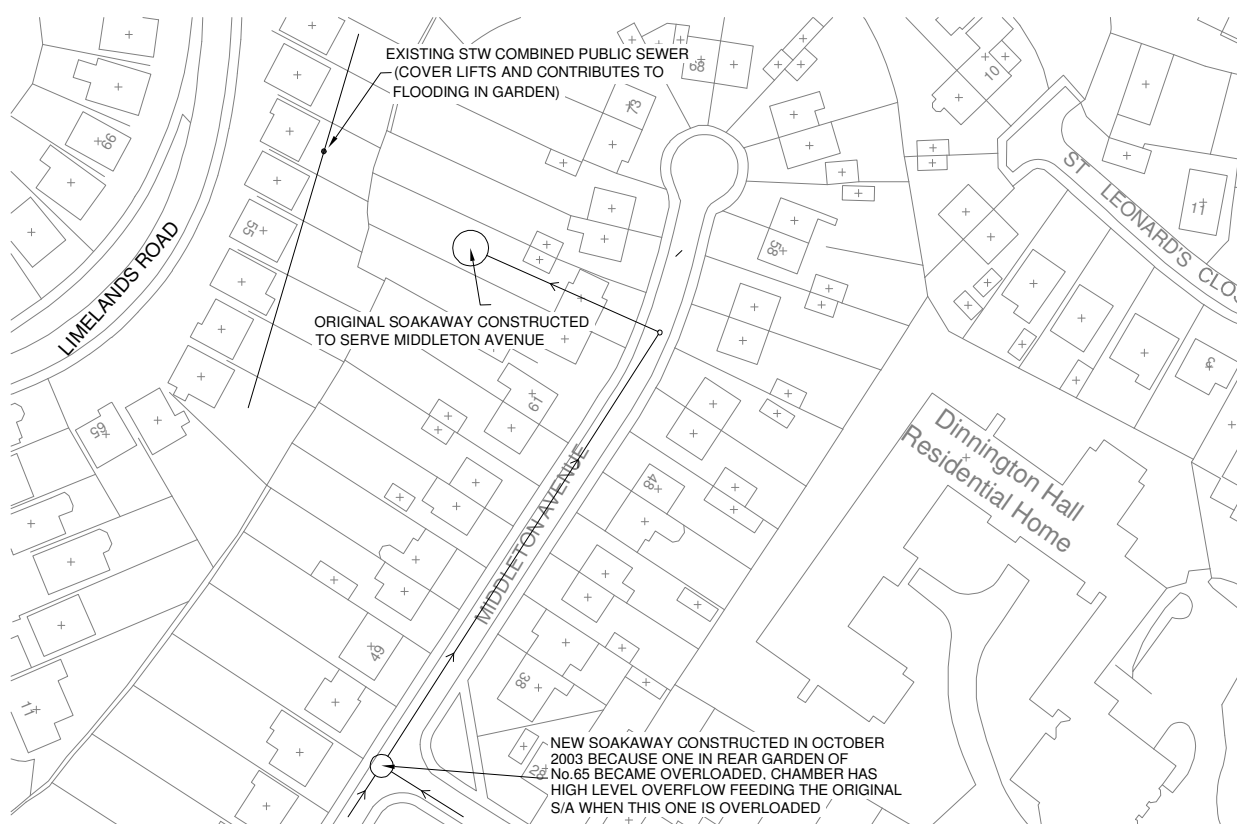
## 4.6 51 Limelands Road, Dinnington

### 4.6.1 Flooding History and Mechanism

Flooding from an overwhelmed soakaway in the rear garden of 65 Middleton Avenue & from the public combined sewer manhole in the rear garden of 51 Limelands Road flooded the rear garden of 51 Limelands Road on 10 June 2009 and 15 June 2009. The resident reported that it would have flooded the house internally had they not been in. The resident redirected the floodwater away from the house.

### 4.6.2 Investigations and Actions

- Inspections, a survey of the existing drainage, level surveys and interviews with residents have been carried out.



### 4.6.3 Possible Solution

There are currently two soakaways in Middleton Avenue. The second soakaway was constructed to alleviate previous flooding and had been effective until June 2009. Soakaways become ineffective when the ground surrounding them becomes saturated. The operation of the public sewer is therefore critical during very heavy rainfall. It is unlikely that Severn Trent Water would take action to improve the sewer unless properties were flooded internally. All incidents of flooding from the sewer should be reported to them as the frequency and severity of flooding as reported to them are critical factors in prioritising works.

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## **4.7 Fair View Drive, Swallownest**

### **4.7.1 Flooding History and Mechanism**

Numbers 5, 7 & 9 were reported (in October 2009) to have suffered from external flooding during the events of June 2009.

### **4.7.2 Investigations and Actions**

- When visited on 04 March 2010 all three property owners were present and gave an explanation of the events of June 2009.
- According to the residents:
  - A 'wave' of water ran down Fair View Drive from the direction of Lodge Lane and in the space of five minutes had left standing water on each garden.
  - Water did not enter any of the properties.
- The fact that each of the properties are at different levels, with the lowest property, number 5, significantly lower than its neighbour, and each one suffered a similar fate (that being standing water to similar depths), indicates that this was a single, very quick incident with no prolonged contribution.
- If this had been a sustained event number five would have sustained internal flooding, being at the lowest point.
- However, the residents did point out that the road regularly suffers from significant ponding, (none of which enters any of the properties), most probably from runoff from the school opposite, and there have been talks with the council in the past about putting a drainage channel in the hedgerow boundary with the school (the south side of the road), discharging onto the Recreation Ground.
- It was also noted that this ponding effect had worsened significantly outside number nine, since the car park of the adjacent pavilion on the Recreation Ground was given a permanent surface.

### **4.7.3 Possible Solution**

The ponding on the private road is an issue to be addressed by the owners of the road. Because no significant damage was caused even during such exceptional rainfall, no further action is proposed.



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## 5 RECOMMENDATIONS

Many of the flooding incidents were caused by underground drainage being overwhelmed, leading to overland flows. Where improvements to the underground drainage are proposed, it should be recognised that a risk of future overland flow will always remain. Where improvements to underground drainage and changes to overland flood routes are proposed, the cost effectiveness of these should be assessed against the reduction in flood risk they provide both separately and when used in combination.

All flooding incidents related to public sewers should be reported to the Water Companies (Yorkshire Water or Severn Trent) as their records of frequency and severity of flooding are a critical consideration when prioritising improvement works.

It should be recognised that the recommendations within this report would cost several million pounds to implement and that money is not readily available. £172,000 has been obtained from Defra for flood alleviation schemes in Aston and Laughton Common and properly level flood protection in Eastwood and East Dene. Several bids to the Councils Capital Programme have been made.

Riparian owners have a duty to maintain flows within their land and if necessary can be compelled to take action. No landowner or other organisation has a general responsibility for carrying out or funding flood alleviation works beyond those associated with riparian ownership. Funding for flood defence works is usually obtained from central government and is allocated on a scheme specific basis.

Flood storage areas could be created, but this would require the agreement of the landowner and for a source of funding to be obtained.

Possible sources of funding are government departments such as Defra, or government agencies such as the Environment Agency or Yorkshire Forward. Applications to bodies such as these would require a certain amount of feasibility work to have been carried out. The cost of the feasibility works would have to be borne by the Council, but may be eligible to be reclaimed if funding was approved.

A number of bids have recently been made for the funding of further drainage improvements from the Council's own Capital Maintenance allocation and will be considered alongside other Council-wide priorities.

The Floods and Water Management Act is currently going through parliament. This Act imposes additional statutory duties on the Council and the recommendations of this report should be considered together with the requirements of complying with the new act.