

FERNDALE AVENUE
FLOOD RISK INVESTIGATION



London Borough
of Hounslow

PREPARED FOR THE LONDON BOROUGH OF HOUNSLOW

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Date: July 2021
Version: 1.2

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REVISION HISTORY

Version	Date	Description	Prepared	Approved
1.0	May 2021	Draft for client review	LB	MM
1.1	June 2021	Draft for RMA review	LB	MM
1.2	July 2021	Final Issue	LB	MM

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EXECUTIVE SUMMARY

Under Section 19 of the Flood and Water Management Act 2010 a Lead Local Flood Authority (LLFA) must, to the extent that it considers it necessary or appropriate, investigate which Risk Management Authorities (RMAs) have relevant flood risk management functions, and whether each of those RMAs exercised, or is proposing to exercise, those functions in response to the flood.

The flood risk investigation for Ferndale Avenue was triggered due to multiple reports of flooding. The first report was received was in 2013, and the most recent in 2019. Ferndale Avenue is located within Hounslow West and is not within one of the London Borough of Hounslow's Critical Drainage Areas.

This investigation showed that the site is at risk of surface water flooding, however rainfall analysis indicated that rainfall recorded during flood incidents approximates to less than a 1 in 5 year event (20% probability of rainfall of that intensity occurring in a given year). Consequently, flooding at the site is exacerbated by other factors including limited surface water drainage and blockages in the foul and surface water systems. Hounslow Highways also indicated that the foul sewer serving the properties at the end of Ferndale Avenue acts as a combined sewer which could also be contributing to the flooding with the addition of increased surface water flows during such events.

The RMAs responsible for managing the risks of flooding associated with this localised incident are Thames Water Utilities (TWUL), Hounslow Highways and Hounslow Council (as the LLFA). TWUL have found multiple root causes of flooding including blockages to the foul and surface water sewers which they have investigated and, where necessary, resolved following each incident. TWUL have also reported that there have been issues with road gullies which are the responsibility of Hounslow Highways. Following reports to Hounslow Highways and Hounslow LLFA, Hounslow Highways have raised reports for the necessary cleansing and have installed a non-return valve in the surface water system that leads to the soakaway.

Each of the RMAs with responsibilities have processes in place for the reporting of flood events and encourage residents to utilise these on becoming aware of a flood to help maintain a clear picture of flooding in the area.

This investigation has identified the following recommendations to provide further clarity around the causes of the flooding experienced at Ferndale Avenue:

- Hounslow Highways review the connections into, the capacity and the condition of the soakaway. This should include investigating the infiltration potential and determine the need for a soakaway maintenance programme to be implemented.
- Hounslow Highways undertake groundwater monitoring to determine whether groundwater does have an influence on flood risk at Ferndale Avenue, including the potential for surcharging of the gullies and soakaway due to groundwater ingress.
- Hounslow Highways, with support from TWUL and Hounslow LLFA as required, review the drainage requirements in the topographical low point of Ferndale Avenue where the water pools as currently there is only one, privately owned gully (located on the road leading to the garages) meaning that it can take a long time for water to drain away.

- Hounslow LLFA liaise with the private landowner of the private road and garages to investigate the drainage system there to determine connections and ensure that it is being suitably maintained.
- Hounslow LLFA, with support from Hounslow Council's Planning department, investigate the surface water drainage assets built for the development at the eastern end of Ferndale Avenue to determine whether or not surface water drains into the foul system. The investigation should also determine what drainage strategy (if any) was approved through planning permission for the development and compare against that implemented during its construction.
- Following a resident's verbal account of flooding since the summer of 2019 given during the site visit, it is recommended that Hounslow LLFA clarify whether residents on Ferndale Avenue have experienced flooding since June 2019.
- During a flood incident, testing of flood waters should be undertaken to determine the likely source.
- Hounslow LLFA continue to educate residents on who to report flooding to during an event and encourage residents to report flooding to their [Flood Reporting Survey](#).

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
FWMA	Flood and Water Management Act 2010
EA	Environment Agency
FOGs	Fats, oils and grease
Hounslow Council	London Borough of Hounslow
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
TBR	Tipping Bucket Rain gauge
TfL	Transport for London
TWUL	Thames Water Utilities Limited

1 INTRODUCTION

1.1 Background policy and information

As a unitary authority, the London Borough of Hounslow (Hounslow Council) is a Lead Local Flood Authority (LLFA). LLFAs are defined as a Risk Management Authority (RMA) under Section 6 of the Flood and Water Management Act (FWMA) 2010. Other RMAs, including those relevant to this flood investigation, are summarised in *Chapter 4* of this report.

As part of their role as a LLFA and a RMA, under Section 19 of the FWMA 2010, Hounslow Council is required to act when flooding occurs in the borough. Section 19 of the FWMA 2010 states that:

On becoming aware of a flood in its area, a LLFA must, to the extent that it considers it necessary or appropriate, investigate

- a) which RMAs have relevant flood risk management functions, and*
- b) whether each of those RMAs exercised, or is proposing to exercise, those functions in response to the flood.*

Where an authority carries out an investigation under Section 19 of the FWMA 2010, it must

- a) publish the results of its investigation, and*
- b) notify any relevant RMAs.*

LLFAs define the threshold where Section 19 investigations occur, but they can decide to investigate flood incidents outside of this threshold. At the time of writing, Hounslow Council did not have a trigger for when to undertake a Section 19. Instead, this investigation was commissioned by the LLFA based on the frequency of flooding and the number of flood events on a given road or in close proximity.

1.2 Location

Ferndale Avenue (Figure 1-1) is in Hounslow West, south of the Great West Road and located in the central region of the borough. Ferndale Avenue is not located in a Critical Drainage Area (taken from Hounslow Council's 2011 Surface Water Management Plan (SWMP)) and is located in Catchment 5 of the newly updated 2021 SWMP (yet to be adopted at the time of writing this flood investigation).

1.3 Methodology

The first step in this flood investigation was a data collection exercise. Data was requested from a number of sources (outlined in Table 1-1). A social media search was also carried out to verify the analysis conducted and to gather further information on the flood incidents. To better understand the potential cause(s) of the flooding, the data was collected and analysed as part of a desktop study to identify the flood mechanisms for the local area. The available historical, topographical, drainage asset, geological and land use data was used to explore all potential flood risk sources relevant to this area of the borough (*Chapter 3*). The data was also used to establish the hydrological catchment and the area's primary overland flow route(s), showing where water flows in relation to the flooded site. The different RMAs were then identified alongside their responsibilities for the different relevant flood risks posed to properties nearby (*Chapter 4*). A site visit was undertaken in April 2021 with a Hounslow LLFA officer and Hounslow Highways' Network Steward for the area to validate the study's findings.

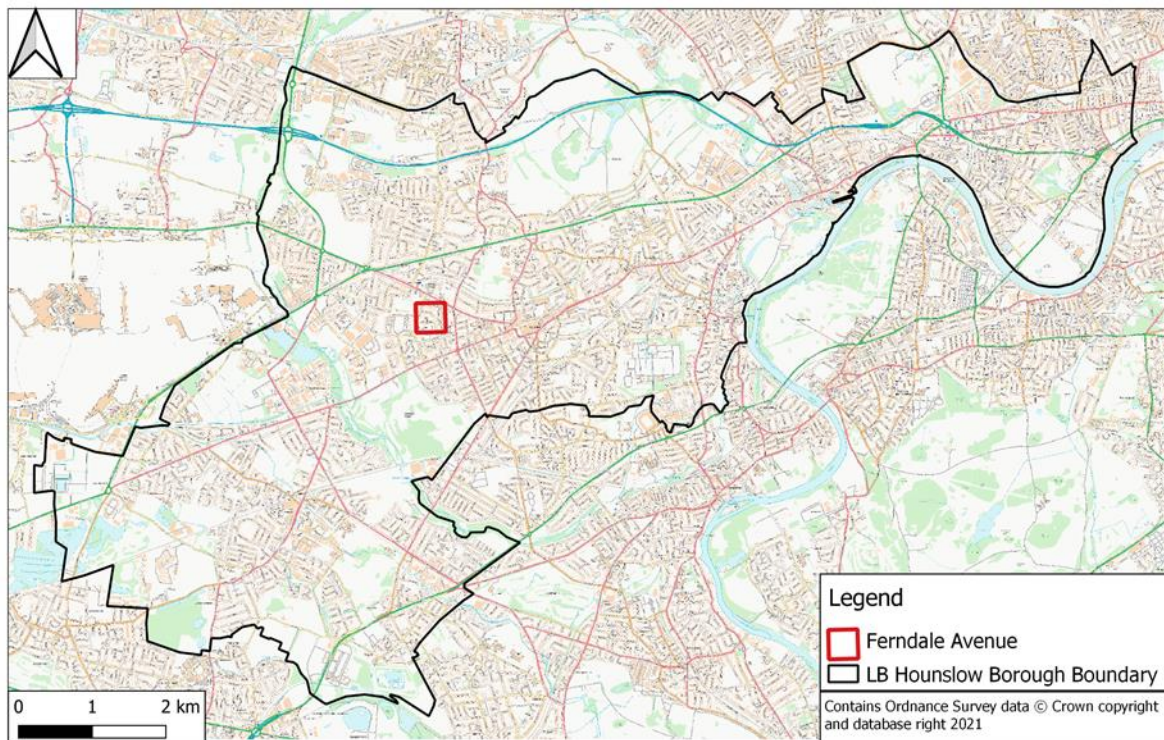


Figure 1-1 Location of Ferndale Avenue within the London Borough of Hounslow

Table 1-1 Data Sources

Data	Source
Rainfall data for historic events	Environment Agency (EA)
Light Detection and Ranging topographical data (LiDAR)	EA
Watercourse locations	EA
Historic flood records	Hounslow LLFA
Photographs of the flooded sites	Hounslow LLFA
Assets significant to flood risk (including the sewer network)	EA, Hounslow LLFA, Hounslow Highways, TWUL
Surface water, fluvial and artificial flood maps	EA, Hounslow LLFA
Groundwater information	EA
Geology information	British Geological Survey (BGS)

2 FLOOD INCIDENT DETAILS

Hounslow LLFA have a database of flood incidents with ten reports of flooding at Ferndale Avenue dating back to 2013 (when LLFA recording started). Due to a change in the way information has been reported, the information provided on flood incidents prior to 2018 is limited (received via Hounslow Highways rather than direct reporting to the LLFA) and therefore is included for anecdotal purposes only.

Reports have also been provided by Hounslow Highways and Thames Water Utilities Limited (TWUL). There is little consistency in these flood reports suggesting that there are multiple contributing factors to flooding at Ferndale Avenue.

2.1 December 2018 and June 2019

Reports of flooding by one local resident were received to the Hounslow LLFA flooding inbox on 7th and 21st December 2018, and again on 10th June 2019. The reports stated flooding to the carriageway and footway following rainfall affected the residents at the eastern end of Ferndale Avenue. The flood water is reported to have entered the private garages located behind the houses.

The flooding on 21st December 2018 and June 2019 were also reported to TWUL although it is unclear if these reports came from residents or were referred from Hounslow Highways or Hounslow LLFA.

Photographs provided by a resident, taken on 10th and 13th June 2019, show the flood water ponding at the end of the Ferndale Avenue cul-de-sac and extending towards the garages (Figure 2-1). No information on flood depth was provided at the time as part of the reports, however photographs show water up to, and in some instances, over topping the curb.

2.2 Additional Reports

In addition to the reports of flooding received in December 2018 and June 2019, additional reports of flooding were reported to TWUL, Hounslow Highways and Hounslow LLFA. These are summarised in Table 2-1.

Hounslow LLFA have received reports of incidents back to November 2013. Reports suggested that, since the additional houses were built at the end of Ferndale Avenue and the road extended, manholes and/or gullies surcharge due to the filling up of the soakaway located in Ferndale Avenue. Other reports received by Hounslow Highways suggested that flooding has occurred since the road was resurfaced.

Additional reports to TWUL indicate that incidents were believed to be caused by blockages of fats, oils and grease (FOGs) in the foul water sewer or silt build up in the surface water sewer. Since June 2019, only TWUL have received reports and were called to Ferndale Avenue three times to investigate blockages of the foul water sewer during 2020.

During a site visit conducted in April 2021 a resident suggested that there had been flood incidents since June 2019. However, neither Hounslow Highways or the Hounslow LLFA have received any reports of flooding since June 2019, and during the site visit in April 2021 the Hounslow Highways Network Steward for the area confirmed that there have been no further incidents. Consequently, it is suggested that this is clarified, if possible, with local residents.



Figure 2-1 Flooding on Ferndale Avenue on 10th and 13th June 2019 respectively
Source: Resident of Ferndale Avenue

Table 2-1 Summary of flood reports received*

Date of Report	Reported by	Reported to	Extent	Further Information
Unknown	Member of Public	Hounslow LLFA	Unknown	Flooding has occurred since the new houses were built.
Unknown	Member of Public	Hounslow LLFA	Unknown	During periods of heavy rain, the 'overflow tank' fills up and water surcharges from two manholes opposite 33 Ferndale Avenue
8 th November 2013	Member of Public	Hounslow LLFA	Unknown	Flooding has occurred since the road was resurfaced (date of resurfacing is unknown).
10 th November 2013	Member of Public	Hounslow LLFA, Hounslow Highways (phone call)	Unknown	Flooding has occurred since the road was resurfaced (date of resurfacing is unknown).
31 st December 2013	Member of Public	Hounslow LLFA	Unknown	2 manholes opposite 33 Ferndale Avenue are reported to overflow during rainfall
27 th December 2014	Member of Public	Hounslow LLFA	Unknown	2 manholes opposite 33 Ferndale Avenue are reported to overflow during rainfall
17 th January 2016	Member of Public	TWUL via Hounslow Highways	Flooding to footway and carriageway.	During heavy rain, the footway and carriageway floods with sewage water affecting the houses at the eastern end of Ferndale Avenue

Date of Report	Reported by	Reported to	Extent	Further Information
07 th December 2018	Member of Public	Hounslow LLFA, Hounslow Highways	Flooding to garages, footway and carriageway.	A bad stench was reported.
21 st December 2018	Member of Public	Hounslow LLFA, Hounslow Highways, TWUL	Flooding to garages, footway and carriageway.	TWUL assets free flowing, issue with groundwater and road gullies.
09 th February 2019	Unknown	TWUL	Unknown	Surface water flooding caused by a build-up of silt in the surface water line
14 th March 2019	Member of Public	Hounslow LLFA	Flooded garage	
27 th March 2019	Member of Public	TWUL	Unknown	Foul water line blockage
10 th -13 th June 2019	Member of Public	Hounslow LLFA, Hounslow Highways, TWUL	Flooding to garages, footway and carriageway	Residents reported trouble accessing houses and cars. Water is reported to have entered nearby garages. TWUL reported clearing multiple blockages.
17 th July 2019	Member of Public	TWUL	Unknown	No blockages or issues found
30 th July 2019	Member of Public	TWUL	Unknown	Issue with surface water soakaway

*Information in Table 2-1 has been taken from reports provided to the RMAs as identified. This information has not been verified.

3 FLOOD MECHANISMS

3.1 Local Flood Risk

3.1.1 Hydrological catchment

To better understand the possible causes of flooding at Ferndale Avenue the hydrological catchment area was defined. A catchment is an area of land where rain falls and drains towards the same waterbody, flow path or topographical low point. The hydrological catchment was established through an analysis of the wider area's topography. LiDAR data was used to help define the catchment, a surveying method that measures distance to a target by using light and sensors to make 3-D representations of target areas. Analysis of the area using a Geographic Information System (GIS) provided several outputs, including defined hydrological catchments and primary flow paths. The primary flow paths represent the most pronounced overland surface water flow routes.

Ferndale Avenue is located in Catchment 5 of the recently updated SWMP, however given that the scale of this investigation is much smaller than that used for the SWMP, analysis showed that the hydrological catchment identified during this investigation which contributes to Ferndale Avenue is relatively small (Figure 3-1). Ferndale Avenue is not located on a primary overland flow path (Figure 3-1), instead, the primary flow path flow along Heathdale Avenue, south of Ferndale Avenue. There is a small flow path that begins in the south eastern corner of Ferndale Avenue where it joins the main overland flow path in Heathdale Avenue. This route corresponds to the areas at greatest risk of surface water flooding in the surrounding area (Figure 3-1).

Analysis of the area's topography shows that the eastern end of Ferndale Avenue is a topographical low point. This suggests that water has an increased potential for accumulating in this corner of Ferndale Avenue were a local drainage network not in existence or not functioning properly.

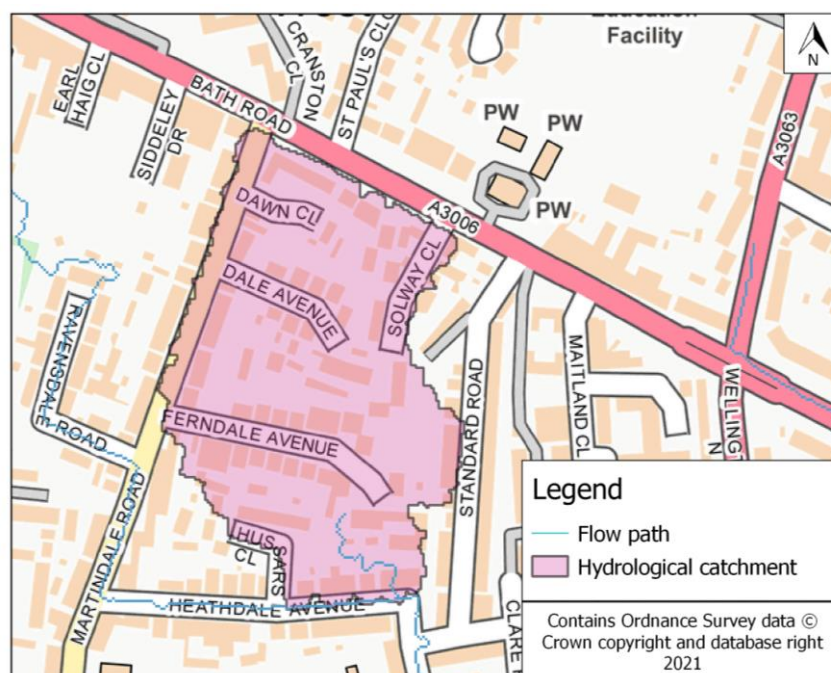


Figure 3-1 Hydrological catchment for Ferndale Avenue

3.1.2 Fluvial flood risk

Fluvial flooding can arise due to heavy or prolonged periods of precipitation causing watercourses to exceed their hydraulic capacity. This source of flooding comes from watercourses that are designated as Main Rivers by the EA. The risk of fluvial flooding can be viewed on the EA's online [long term risk of flooding map](#).

The flood risk is defined as the following:

- High: Each year the area has a chance of flooding of greater than 3.3%
- Medium: Each year the area has a chance of flooding of between 1% and 3.3%
- Low: Each year the area has a chance of flooding of between 0.1% and 1%
- Very low: Each year the area has a chance of flooding of less than 0.1%

Ferndale Avenue is located in Flood Zone 1, the closest Main River being the River Crane which flows eastwards, south of Ferndale Avenue, to its confluence with the River Thames at Isleworth (Figure 3-2). The Duke of Northumberland's River is a heavily modified Main River which flows northwards from the River Crane in Twickenham, through TWUL's Mogden Sewage Treatment Works before joining the River Thames approximately 600m north of the River Crane's confluence with the River Thames.

Consequently, fluvial flood risk at Ferndale Avenue is very low, with less than a 0.1% annual probability of fluvial flooding.

3.1.3 Ordinary Watercourses

Flooding from Ordinary Watercourses can occur when heavy or prolonged periods of precipitation causes smaller watercourses (those not defined as Main Rivers) to exceed their hydraulic capacity. When such watercourses rise above their banks or retaining structures, they can overflow onto land and can cause flooding.

Ordinary Watercourse flood risk is included in the EA's RoFSW map. The nearest unnamed Ordinary Watercourse is approximately 1km south west of Ferndale Avenue (Figure 3-2). Therefore, Ferndale Avenue is not at risk of flooding from such a source.

3.1.4 Surface Water flood risk

Surface water flooding typically occurs due to the accumulation of water on the surface of the ground following heavy or prolonged periods of rainfall. Flooding is exacerbated when surface water cannot be drained away at a sufficient rate by a watercourse, sewer network or via infiltration, causing water to pond in topographical low points.

The EA's online [Risk of Flooding from Surface Water](#) (RoFSW) map shows the eastern end of Ferndale Avenue to be at high risk of surface water flooding, but the remainder of Ferndale Avenue is predicted to have a very low risk of surface water flooding (Figure 3-3).

The flood risk is defined as the following:

- High: Each year the area has a chance of flooding of greater than 3.3%
- Medium: Each year the area has a chance of flooding of between 1% and 3.3%
- Low: Each year the area has a chance of flooding of between 0.1% and 1%
- Very low: Each year the area has a chance of flooding of less than 0.1%

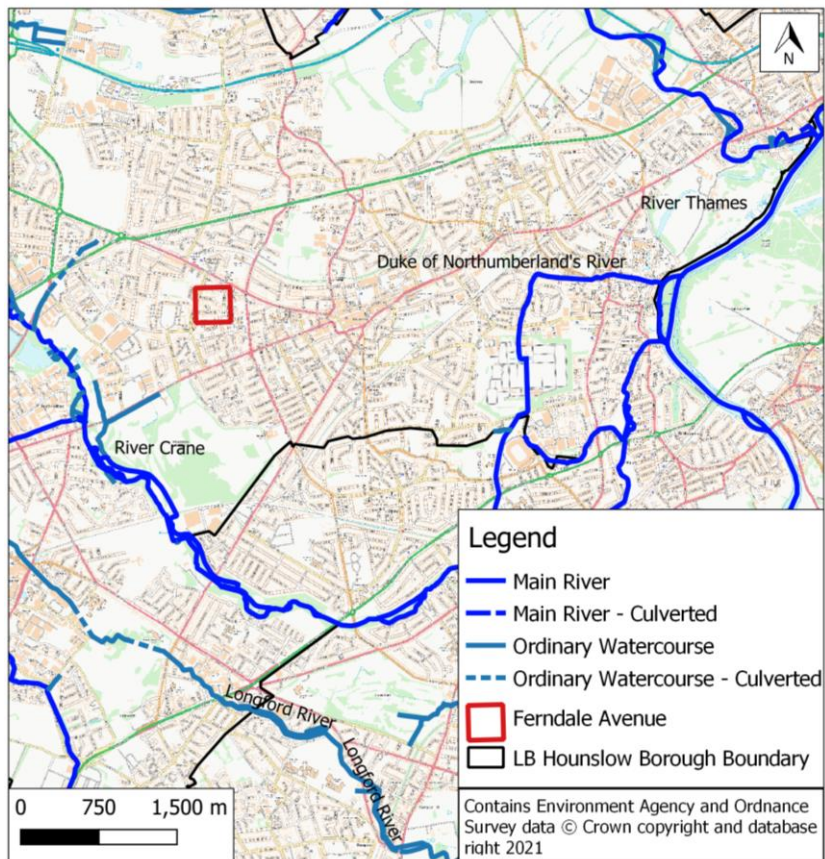


Figure 3-2 Main rivers and Ordinary Watercourses in London Borough of Hounslow

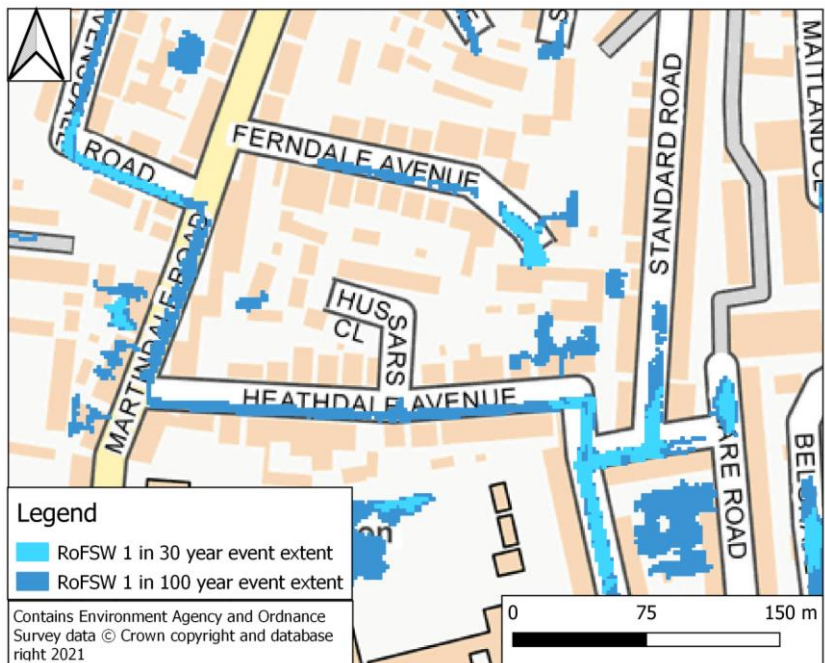


Figure 3-3 RoFSW at Ferndale Avenue

3.1.5 Groundwater flood risk

Groundwater flooding occurs when the local water table rises. In extreme circumstances, water can emerge through the ground and cause flooding. This source of flooding tends to occur after

extensive periods of heavy rainfall but may not be visible straightaway. The effects can be further exacerbated based on an area's ground composition and the presence of aquifers, which are significant influences on the potential rate of groundwater flooding. The effects of groundwater flooding tend to take longer to occur than surface water flooding and can have more of a prolonged impact while the water table lowers.

Data from the British Geological Survey indicates that the site is underlain by superficial deposits of Langley Silt (clay and silt), with a bedrock geology of the London Clay formation, again comprising of silt and clay, suggesting that groundwater flooding is less likely at Ferndale Avenue. Verbal reports from residents during the site visit suggested there is the potential for a groundwater influence (they reported that the flooding seemed to originate from the grass verge) and TWUL suggested that groundwater was potentially an issue (potential interaction with the highway drainage network). However, there have been no reports of basement or subsurface level flooding at or around Ferndale Avenue.

3.1.6 Sewer flood risk

Sewer flooding can occur due to heavy rainfall or precipitation causing increased flow and volume of water to enter a sewer system. This increase can cause the sewer to exceed its hydraulic capacity, resulting in the system surcharging and flooding over land. Blockages or collapses within sewer pipes or at sewer outfall points can cause water to back up in a sewer system, causing flooding.

TWUL are the RMA responsible for the surface water and foul water sewers within the borough. Figure 3-4 shows both the surface and foul water sewer networks in the vicinity of Ferndale Avenue. The surface water network starts outside No. 33 Ferndale Avenue and does not extend into the newer development at the eastern end of the highway. The surface water network drains west towards Martindale Road where it joins a surface water sewer of the same size (225mm diameter) and flows south. The foul water network extends along the entirety of Ferndale Avenue, flowing west where it joins a larger 225mm diameter pipe in Martindale Road, flowing north to Bath Road.

TWUL have advised that they have little evidence of sewer flood risk for the area, but capacity mapping (carried out as part of their Drainage and Wastewater Management Plan investigations) showed that the area was not at risk of surcharging (overflowing due to insufficient capacity). TWUL have provided reports of flood incidents (both foul and surface water) at Ferndale Avenue but report that these have been caused by blockages and are not a result of capacity issues.

Hounslow Highways have suggested that the foul water sewer which services the eastern end of Ferndale Avenue actually acts as a combined sewer and receives surface water runoff as well as foul discharges from the development built more recently (Figure 3-5). Residents also reported surcharging manholes with a "bad stench" further suggesting that the system is acting as a combined system and is unable to cope sufficiently with rainfall events. One highway gully remains where the old kerb was located on the bend of Ferndale Avenue and two gullies are located where the highway slopes down towards to the topographical low point. Hounslow Highways have confirmed that the two gullies on the extended section of road do not drain to the TWUL surface water sewer and instead drain to a soakaway located on the grass verge (Figure 3-5). According to reports and the area's Network Steward during times of rainfall these gullies surcharge. Apart from these two gullies, there is no visible evidence of additional provision for surface water drainage for

the newer Ferndale Avenue development except for one gully located on the privately owned road leading to the garages behind Ferndale Avenue. This gully is privately owned and maintained.



Figure 3-4 Surface and foul water sewer networks in Ferndale Avenue

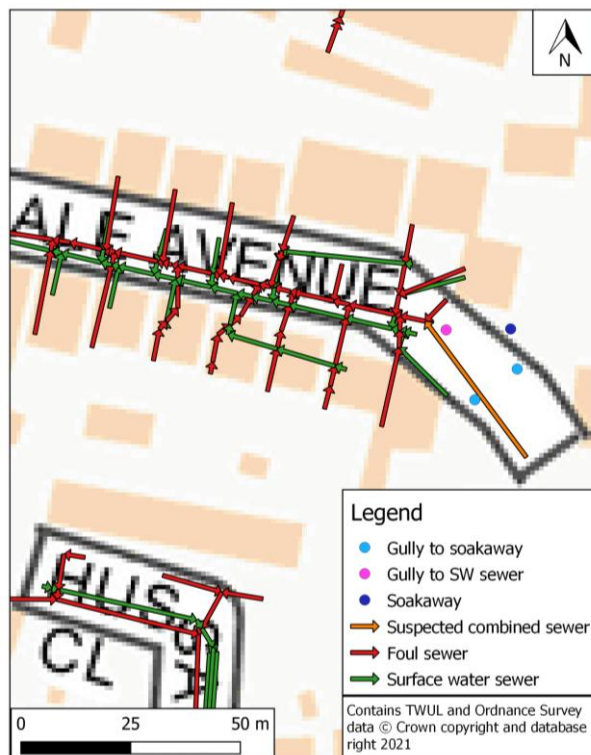


Figure 3-5 Drainage network on Ferndale Avenue

3.1.7 Other flood risk sources

There are no artificial watercourses in the vicinity of the site and the EA's online [Risk of Flooding from Reservoirs](#) map shows that the site is not predicted to be at risk of flooding from reservoirs.

Note: to view flood risk from reservoirs please select reservoirs from the drop-down menu when following the link above.

3.2 Rainfall data

In addition to the lack of detail provided in the historic flooding reports, there was also limited rainfall data for this Section 19 investigation. There is only being one rain gauge, at Heathrow Airport, within 5 km of Ferndale Avenue which was used to assess the intensity of rainfall that occurred during two of the reported flood incidents. The events assessed, the 7th December 2018 and 10th June 2019, were agreed with Hounslow LLFA and chosen to reflect both a winter and summer rainfall event.

Table 3-1 summarises the rainfall events. A very small amount of rainfall was recorded on 7th December 2018 with only 6mm recorded across an event which lasted just over 3 hours. On 10th June 2019, the Met Office issued an amber warning for rain in London and the South East of England, stating that areas could see 50-60mm falling in the space of 4-6 hours. During this timeframe rainfall recorded at Heathrow Airport totalled 33mm across an 18-hour rainfall event. Analysis indicates that the peak rainfall return period for the two flood incidents approximates to less than a 1 in 5 year event (20% probability of rainfall of that intensity occurring in a given year). Consequently, extreme rainfall is not believed to be the cause of the flooding at Ferndale Avenue.

The tipping bucket rain gauge (TBR) results at Heathrow Airport for the reviewed rainfall events have been labelled as 'good and complete' by the EA. This means that the TBR was operational during the events and can be used herein to accurately record rainfall on the dates shown. Further information on the rainfall return period estimations can be found in Appendix A.

Table 3-1 Summary of rainfall events

Rainfall Event	Rainfall Period	Peak Rainfall (in any 15-minute period)	Total Rainfall
7 th December 2018	06:45 to 10:00 GMT on 7 th December	0.6mm	6mm
10 th June 2019	06:00 to 00:45 GMT on 10 th & 11 th June	2.2mm	33mm

3.3 Local flood mechanism findings

The analysis of the best available data has shown that the rainfall experienced during the flood incident is of less than a 1 in 5 year return period event, and therefore extreme rainfall is not thought to be the predominant cause of flooding in Ferndale Avenue. Instead, several potential contributing factors have been identified and are outlined below.

- Any potential blockages found in the TWUL sewer systems such as those found on 27th March 2019 and 10th-13th June 2019 (further details on blockages identified can be found in *Chapter 4.4.2*) would reduce the capacity of the surface water and foul (/ combined) pipework causing flows to back up and cause the surcharging of manholes during rainfall events.
- As the newer development at the end of Ferndale Avenue does not have known surface water drainage, during times of rainfall, the foul sewer which is allegedly acting as a combined sewer would need to deal with additional runoff from the houses at the eastern

end of Ferndale Avenue. This would increase the amount of water entering the system, potentially causing the system to become overwhelmed and the manholes to surcharge.

- Two gullies drain to a soakaway which has been reported as becoming overwhelmed, causing the gullies to surcharge. Due to the topography, the gradient on the system may also mean that surface water is unable to drain to the soakaway effectively.
- There is one privately owned gully located near to the grass verge which is the only visible surface water drain at the topographical low point on Ferndale Avenue, which limits the ability of flood water to drain away.

4 RISK MANAGEMENT AUTHORITIES

Section 6(13) of the FWMA 2010 defines the parties responsible for the management of the different risks of flooding. LLFAs are one of several parties who are responsible for managing the risks posed by flooding. Other RMAs as defined by the FWMA 2010 are:

- the EA
- a district council for an area for which there is no unitary authority
- an internal drainage board
- a water company, and
- a highway authority.

Relevant RMAs in the borough are identified in Table 4-1. Their responsibilities are defined in *sections 4.1 - 4.4* in addition to the actions taken before, during and after reported flood incidents at Ferndale Avenue.

Table 4-1 Relevant Flood Risk Management Authorities

Risk Management Authority	Authority	Risk Management Responsibilities
EA	EA	Main rivers, the sea, and reservoirs
LLFA	Hounslow Council	Surface water, ordinary watercourses, and groundwater
Water & sewerage company	TWUL	Surface water and foul / combined sewer systems
Highway Authority	Hounslow Council	Highway drainage
Highway Authority	Highways England	Highway drainage
Highway Authority	Transport for London	Highway drainage

4.1 Environment Agency

The EA have strategic overview of all sources of flooding and coastal erosion and are the RMA responsible for managing flood risk from designated Main Rivers, reservoirs, estuaries, and the sea. The EA does not have any assets in the vicinity of Ferndale Avenue and the identified flood risk sources for Ferndale Avenue are not from fluvial, reservoir or coastal sources. Therefore, the EA does not have direct responsibilities as an RMA to manage flood risk for Ferndale Avenue.

4.2 London Borough of Hounslow – LLFA

4.2.1 Responsibilities

As a unitary authority LLFA, Hounslow has the lead responsibility for managing flood risk from surface water, Ordinary Watercourse, and groundwater sources. They have local flood risk management functions and are responsible for:

- Developing, applying, maintaining, and monitoring local flood risk management strategies
- Maintaining a register of structures / features that have a significant effect on flood risk
- Preparing and maintaining preliminary flood risk assessments, flood hazard maps, flood risk maps and flood risk management plans
- Statutory consultee review of surface water management proposals (major development)
- Undertaking Section 19 flood risk investigations as per the FWMA 2010

Other RMAs have a duty to cooperate with LLFAs where necessary to undertake the above responsibilities. Hounslow LLFA can also carry out work to help alleviate surface water, groundwater and Ordinary Watercourse flooding in collaboration with other RMAs.

4.2.2 Actions

No actions were taken by Hounslow LLFA in the vicinity of Ferndale Avenue before or during the flood incidents. The LLFA do, however, maintain a database of reported incidents, and as per their statutory duties have commissioned this investigation into the flood incidents.

Hounslow LLFA encourage residents to report flood events through their [Flood Reporting Survey](#) with as much information as possible, including photographs and an estimation of the flood's area and depth to ensure flood incidents are reported in a consistent way and investigated where needed.

4.3 London Borough of Hounslow – Highway Authority

4.3.1 Responsibilities

As a highway authority, Hounslow Council, through their highways service provider Hounslow Highways, are responsible for providing and maintaining highway drainage that is not managed by Transport for London (TfL) or Highways England. They are responsible for routine works on highway assets on adopted roads and are responsible for the drainage of these carriageways and footways.

The cleansing of gullies is managed by Hounslow Highways which includes reactive cleansing in the event of a flooding incident or resident report.

4.3.2 Actions

Before

Limited information was provided by Hounslow Highways on actions taken by Hounslow Highways prior to flood incidents. However, on 14th March 2016 Hounslow Highways were called to clear a blocked gully outside of 33 Ferndale Avenue which was caused by a build-up of debris following building work. This is not believed to have been in relation to a flood incident.

During

During the site visit in April 2021, the Network Steward for the area confirmed that they had conducted site visits during flood incidents. No further details of these visits were provided.

After

Hounslow Highways have requested the cleansing of gullies in response to enquiries. Note, the dates correspond to when the report was logged.

- 26th June 2016 – Hounslow Highways cleared two gullies and their connections
- 24th October 2017 – a blocked gully was cleared on the western end of Ferndale Avenue
- 07th December 2018 – no further details were provided
- 21st December 2018 – job raised for the cleansing of gullies on 4th January 2019
- 6th February 2019 – a blocked gully was reported opposite 34 Ferndale Avenue

Following reports of foul sewer flooding on 17th January 2016 Hounslow Highways also forwarded the report on to TWUL (who are responsible for managing the flood risk from sewers). TWUL have not provided any evidence of actions taken following this report.

Following the recurring flood incidents, in the summer of 2019 (after the 10th June 2019 incident) Hounslow Highways fitted a non-return valve in the surface water system which drains to the soakaway to prevent backflow during times of rainfall. No flood incidents at Ferndale Avenue have been reported to Hounslow since the installation of the non-return valve.

4.4 Thames Water Utilities Limited

4.4.1 Responsibilities

TWUL are the regional water and sewerage company who are responsible for managing the risk of flooding from public sewers. This includes surface water, foul and combined sewer systems. Section 94 of the Water Resources Act (1991) places a duty on sewerage companies to maintain their sewers to ensure that their area is sufficiently drained. Their key responsibilities include undertaking inspections, maintenance, repair and any required works on their drainage assets.

TWUL should work closely with the LLFA to advise about any works being undertaken and provide a platform for which sewer flooding incidents can be reported by residents. This platform is available [online](#) and should be completed each time residents experience a flood.

In Hounslow, TWUL are also responsible for the supply of clean water and for mitigating mains water leaks when they occur.

4.4.2 Actions

Before

No known actions were taken by TWUL prior to the flood incidents.

During

No known actions were taken by TWUL during the flood incidents.

After

TWUL have been called out to flooding on Ferndale Avenue ten times since 2018 and have undertaken the following actions:

- 21st December 2018 – TWUL attended site and found their assets to be free flowing. The issue was found to be with road gullies and groundwater.
- 9th February 2019 – Jetted the surface water system to remove silt.
- 27th May 2019 – A blockage in the foul water sewer pipe was cleared.
- 17th July 2019 - TWUL attended site and checked both foul and surface water manholes and found no blockages or issues.
- 30th July 2019 - TWUL attended site and no problems were found with the TWUL network. A problem was found with the surface water system that leads to the soakaway. No further information was provided by TWUL or Hounslow Highways on this incident.
- 2020 – Three blockages were rectified within the foul water sewer pipe.

TWUL visits have found multiple causes of flooding which include blockages to the foul and surface water systems believed to be caused by FOGs in the foul water sewer or silt build up in the surface water sewer. They also suggested that there were issues with the surface water system that leads to the soakaway.

Hounslow Highways stated that TWUL have provided residents with information on how to reduce the number of blockages occurring in the foul water sewer system. TWUL also have a [Sewer Flooding Questionnaire](#) and recommend that this is filled in every time a resident experiences a flood to ensure that the appropriate work can be carried out.

4.5 Highways England

Highways England are responsible for managing the operation of England's Motorways and major A-roads. They do not have direct responsibilities as an RMA to manage flood risk for Ferndale Avenue.

4.6 Transport for London

TfL are responsible for managing the operation of the public transport network across London and the Strategic Road Network. TfL's Strategic Road Network includes red routes, and they are responsible for the management of drainage from these roads. Ferndale Avenue is not a red route and therefore TfL does not have direct responsibilities as an RMA to manage flood risk for Ferndale Avenue.

4.7 Emergency Services

Emergency services are Category One responders under the Civil Contingencies Act (2004). They include the organisations responsible for responding to emergencies. Services such as the Metropolitan police and the London fire Brigade are the most relevant responders with regards to flood incidents.

None of the information received from the residents of Ferndale Avenue or the area's Network Steward suggested that the flooding necessitated a response from a Category One responder and so they were not contacted as part of this investigation.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A flood risk investigation was commissioned by Hounslow LLFA due to the number of reported flood incidents that have occurred at Ferndale Avenue. The first report was received in 2013, and the most recent was received in June 2019.

The data collection, investigation and site visit established that the site is partially at high risk of surface water flooding due to the topography of Ferndale Avenue. Analysis of rainfall events using TBR gauge data for two incidents (December 2018 and June 2019) suggest that extreme rainfall was not the primary cause.

From the investigation it is concluded that flooding experienced at the site is exacerbated due to:

- The topography which causes water to pond at the eastern end of Ferndale Avenue
- A lack of surface water drainage at the eastern end of Ferndale Avenue, meaning water cannot drain away
- Insufficient capacity or poor condition of the soakaway
- Blockages in the foul water sewer caused by the disposal of FOGs
- A potential groundwater influence

The RMAs who are responsible for managing the potential risks of flooding are TWUL, Hounslow Highways and Hounslow LLFA. TWUL have found multiple root causes of flooding including blockages to the foul and surface water sewers which they have investigated and, where necessary, resolved following each incident. TWUL have also reported that there have been issues with road gullies which are the responsibility of Hounslow Highways. Following reports to Hounslow Highways and Hounslow LLFA, Hounslow Highways have raised reports for the necessary cleansing and have installed a non-return valve in the surface water system that leads to the soakaway.

Each of the RMAs with responsibilities have processes in place for the reporting of flood events and encourage residents to utilise these on becoming aware of a flood to help maintain a clear picture of flooding in the area.

5.2 Recommendations

Following the flood risk investigation carried out on behalf of Hounslow LLFA for Ferndale Avenue, it is recommended that the following actions are taken:

- Hounslow Highways review the connections into, the capacity and the condition of the soakaway. This should include investigating the infiltration potential and, determine the need for a soakaway maintenance programme to be implemented.
- Hounslow Highways undertake groundwater monitoring to determine whether groundwater does have an influence on flood risk at Ferndale Avenue, including the potential for surcharging of the gullies and soakaway due to groundwater ingress.
- Hounslow Highways, with support from TWUL and Hounslow LLFA as required, review the drainage requirements in the topographical low point of Ferndale Avenue where the water pools as currently there is only one, privately owned gully (located on the road leading to the garages) meaning that it can take a long time for water to drain away.

- Hounslow LLFA liaise with the landowner of the private road and garages to investigate the drainage system there to determine connections and ensure that it is being suitably maintained.
- Hounslow LLFA, with support from Hounslow Council's Planning department, investigate the surface water drainage assets built for the development at the eastern end of Ferndale Avenue to determine whether or not surface water drains into the foul system. The investigation should also determine what drainage strategy (if any) was approved through planning permission for the development and compare against that implemented during its construction.
- Following a resident's verbal account of flooding since the summer of 2019 given during the site visit, it is recommended that Hounslow LLFA clarify whether residents on Ferndale Avenue have experienced flooding since June 2019.
- During a flood incident, testing of flood waters should be undertaken to determine the likely source.
- Hounslow LLFA continue to educate residents on who to report flooding to during an event and encourage residents to report flooding to their [Flood Reporting Survey](#).

APPENDICES

Appendix 1- Return Period Estimation Methodology (FEH)

The following methodology, based on the FEH method, was used to estimate the return period for two rainfall events.

Step 1 – Obtain Tipping-Gauge Rainfall Station Data

Rainfall data was obtained from the EA for the days where flooding is known to have occurred. Information about rain gauges and their locations is available [online](#).

Step 2 – Establish the sites catchment area

The watershed analysis tool in GIS was used to determine the catchment area of the site and the overland flow path of water in the catchment.

Step 3 – Obtain Flood Estimation Handbook (FEH) Data for the Catchment

Catchment data from the FEH website was obtained and downloaded.

Step 4 – Obtain Rainfall Profile Data

The FEH data was used to obtain the rainfall profile. To do this, the FEH was loaded into XP STORM to create rainfall scenarios. A set of different scenarios was selected based on the following criteria:

- Return period
- Rainfall duration

The rainfall durations were selected to match continuous rainfall periods from the E'As tipping-gauge rainfall station data. A range of different return periods were selected to establish what best matches the EA rainfall data.

Step 5 – Analyse Rainfall Profile Data against EA Rainfall Data

Suitable rainfall averages for the FEH Rainfall Profile Data were obtained, including:

- Duration average
- Peak average (15 minutes)
- Peak average (1 hour)

This information was compared against the EA rainfall data to see if the recorded rainfall (over a 15-minute period or hourly period) matched the averages calculated for the FEH Rainfall Profile Data. This helped to establish the approximate rainfall return period (as an approximate range) for the rainfall events that were investigated.