Fairlight East Sussex Pathfinder
Technical Report

January 2023

from
Southern Water

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Document History

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Executive Summary

The Fairlight catchment, located in East Sussex, was specifically chosen as a Pathfinder catchment due to historical and current flooding occurrences and current sewer overflow performance within the area. The Stage 0 report aims to investigate the Fairlight catchment, providing further understanding of the issues faced within the catchment and to present a list of interventions that will reduce the existing flooding risk and reduce the operation of the storm overflows within the catchment.

The original Fairlight sewer network was built to perform as a partially separate system with wastewater flows and roof drainage connecting into the sewerage network. Over time, the village has developed extensively, and the system now performs as a combined system conveying excess water from surface water runoff, resulting in numerous storm overflow discharges and property flooding. This catchment was selected so that, by using a holistic catchment approach to managing flows, we can identify options to reduce the storm loading on the treatment works and reduce flooding and pollution incidents.

The catchment is relatively small, with a population of approximately 1,600 but includes three network storm overflows within the sewerage system. These storm overflows, previously called combined sewer overflows (CSOs), act like a relief valve during periods of heavy rain. They release flows into the environment to reduce sewage flooding in the catchment.

Having surface water runoff from rainfall mix with the sewage creates several issues including: an increased risk of flooding, contamination of rainwater that could be fed straight back into the environment and increased costs of pumping and treating diluted sewage, as well as the impact of overflow spills into the environment.

Managing surface water is a complex, shared problem, as it means making sure that water drains effectively from homes and gardens, roads, fields, businesses, and public spaces. It requires a holistic, multi stakeholder approach to manage these flows successfully.

Southern Water has set up a Task Force with several aims, the key one being to significantly reduce the use of storm overflows by 2030. To investigate how this can be achieved, several pathfinder projects have been set up and the Fairlight catchment is one of those. These pathfinders have a staged approach as follows:

Stage 0 – Study and surveys
Stage 1 – No regret interventions and trials
Stage 2 – More complex interventions and large-scale pilots
Stage 3 – Larger scale investments to deliver the outcome

The interventions identified are likely to be a mix of types of innovative and traditional solutions such as:

- Operational interventions
- Upstream source control (removing and slowing the flow of rainwater)
- System optimisation (making better use of the existing infrastructure)

- Infrastructure enhancements (build new or larger infrastructure)

The mechanism that these interventions will be delivered by is also likely to be innovative, with Southern Water working in partnership with East Sussex County Council, local council projects and community groups to implement solutions that provide multiple benefits.

Within Fairlight we believe the key opportunities will be focused on source control and reducing the volume of non-domestic flows entering the sewerage network. The reduction in the volume of flow passing through the system would lower the risk of the system being overwhelmed, leading to a reduction in flooding risk and a reduction in the operation of overflows in the catchment.

To better manage the non-domestic flows entering the network, we will look at options to install sustainable urban drainage systems where appropriate. For all these interventions, further survey work and modelling will be required, to confirm if other potential interventions will provide the benefit required. We will continue to identify and, where appropriate, enact these interventions whilst we collate the results of the rest of the surveys.

This report is only the start of the journey towards a sustainable drainage system in Fairlight. We will work as partners to investigate and better understand the existing drainage systems, to identify and deliver opportunities for improvement, and plan together for the sustainable growth of the town of Fairlight.

What we ask of our partners and the community is to continue to support that journey, with photos and data, ideas, and enthusiasm. So that together we can agree how decisions can be made, now and in the future, for mutual community benefit.

1.0 The Catchment

1.1 Location and Local Government Services

Fairlight is a village in East Sussex, approximately three miles to the east of Hastings, located within the Rother district. The Fairlight Parish includes the villages of Fairlight and Fairlight Cove, and the Parish Council is responsible for local amenities such as recreation grounds, bus shelters and public events. Rother District Council and East Sussex County Council are responsible for the more strategic services with East Sussex having responsibility for education, social care and transport, roads and parking and Rother District Council having responsibility for council tax, planning and building control, housing and climate change services.

1.2 Geography & Topography

The villages of Fairlight and Fairlight Cove make up the Fairlight catchment; they are located between Ore, Pett and Winchelsea (see Figure 1).

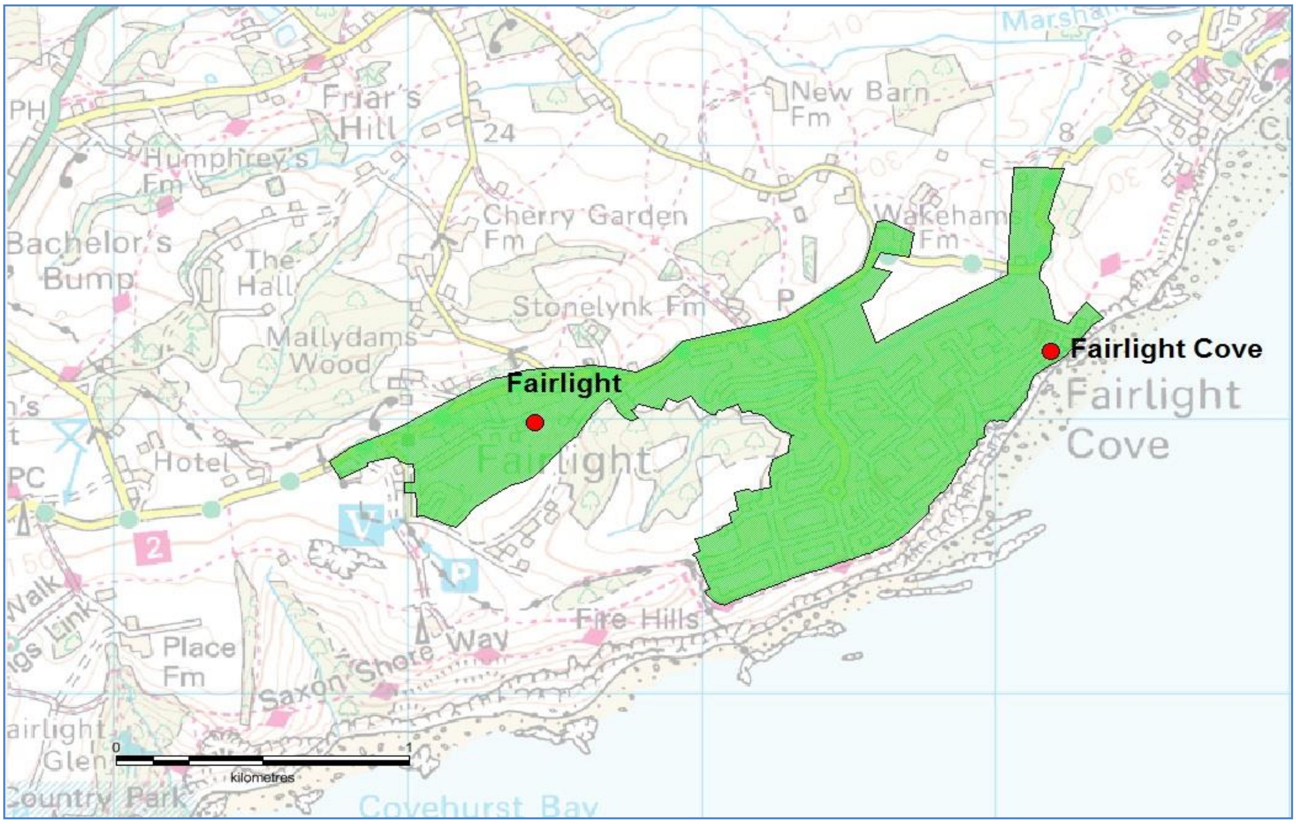

Figure 1 – Location of Fairlight Catchment[1]

Two small watercourses run from west to east through the Fairlight catchment, continuing northeast past the Wastewater Treatment Works into the Marsham Sewers watercourse, (see Figure 2). The Marsham Sewer watercourse, passes through a Site of Specific Scientific Interest, (SSSI), as it continues northeast, approximately 4km downstream of

[1] Southern Water Drainage Area Plan 2019

Fairlight WTW. The catchment is said to have several underground springs and wells located across the area; further details are provided in Section 1.11.

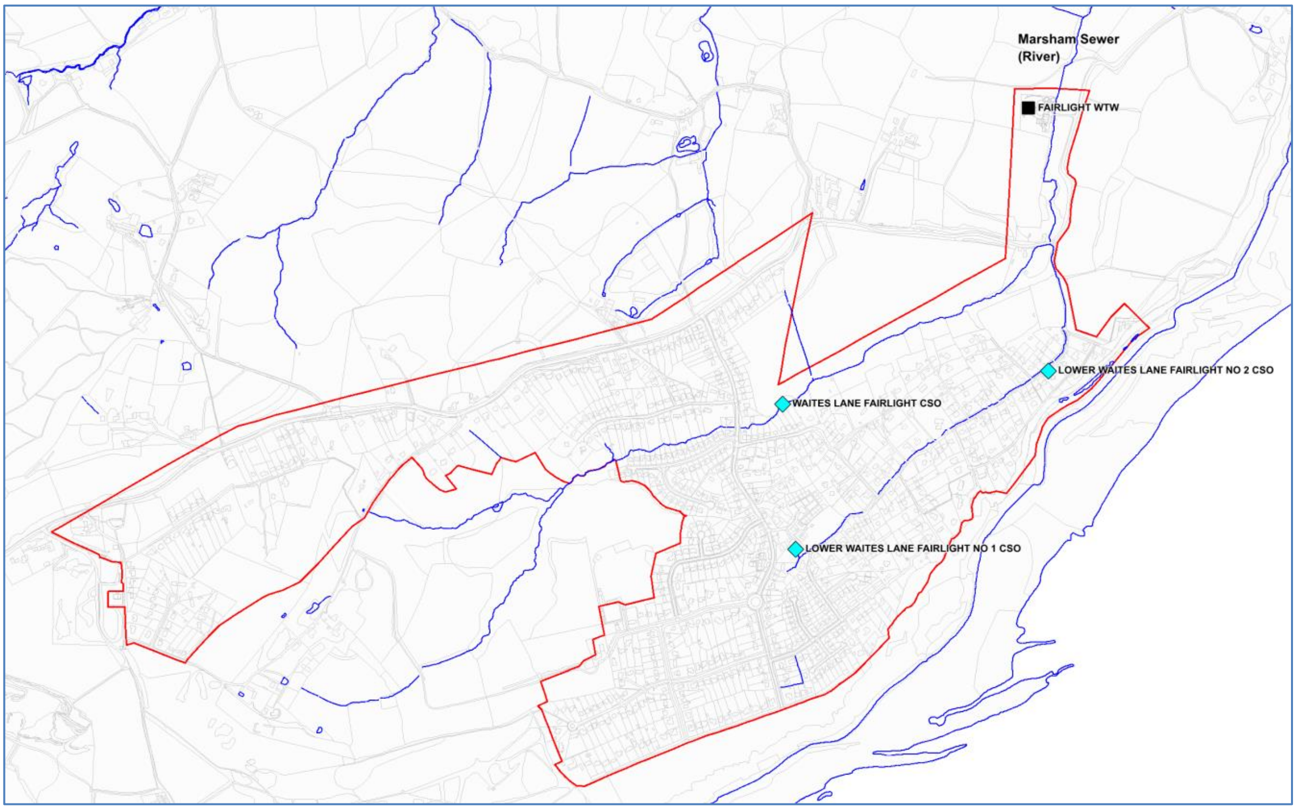

Figure 2 – Fairlight Watercourses

The topography of the catchment is moderate-to-steep, as shown in Figure 3, (higher areas in red/brown, lowers areas down to sea level in blue), with the highest point in the catchment at approximately 158mAOD and the lowest point approximately at sea level, with the village of Fairlight Cove situated at the bottom of a 500m hill with a ground level of approximately 30 to 40mAOD.

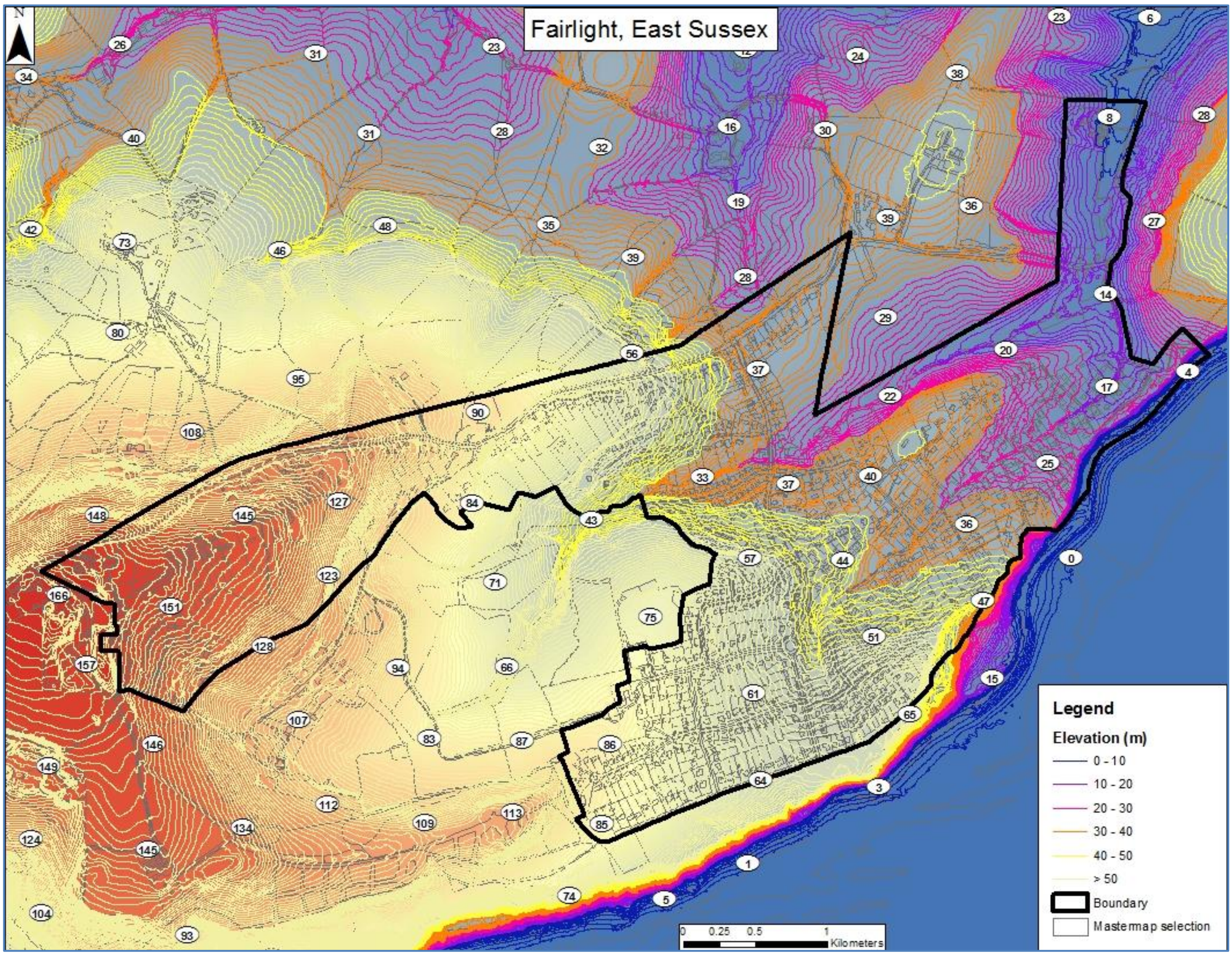

Figure 3 – Fairlight Catchment Topography EA LiDAR[2]

1.3 Geology

For the most part, the Fairlight catchment is underlain by a solid geology of Ashdown Beds – a mix of fine-grained sandstone and siltstone, with some mudstone shown as blue on Figure 4. Ground Investigation including boreholes and on-site infiltration tests are necessary for Fairlight to confirm permeability and whether the ground type is suitable for soakaway drainage.

Mudstone (Brown on Figure 4) – there is mudstone present throughout the catchment. A soft to firm unconsolidated, compressible silty clay, which can contain layers of silt, sand, peat and basal gravel. Where weathered mudstones/clays are present, permeability would be expected to be low.

Head Deposits (Pink on Figure 4) – comprising mainly of clay, silt and sand, this area is expected to be derived from the Ashdown Formation. Head deposits often have a high clay content so would be expected to have indifferent permeability. It occurs as a narrow transverse band of deposit aligned east/west on the north-east side only of the catchment, e.g. East of Lower Waites Lane.

[2] Southern Water Asset Miner OS copyright

Wadhurst Clay Formation (Yellow on Figure 4) – comprising mainly of sandstone, derived from the Wadhurst Clay Formation. It occurs towards the West of the catchment, for example Coastguards Lane.

Cliff Collapse
Due to its location on the coast, cliff collapse and coastal erosion has been an ongoing problem for Fairlight. If soakage water enters an impermeable layer higher than the cliff base it could create a spring line in the cliff, which if it is composed of granular material could cause soil mobility and collapse. For any SuDS opportunities to be explored, ground investigations will need to be carried out.

Borehole Data
East Sussex County Council and the Environment Agency have been contacted regarding whether there are any boreholes, either current or historical, that have monitored ground water within the catchment.

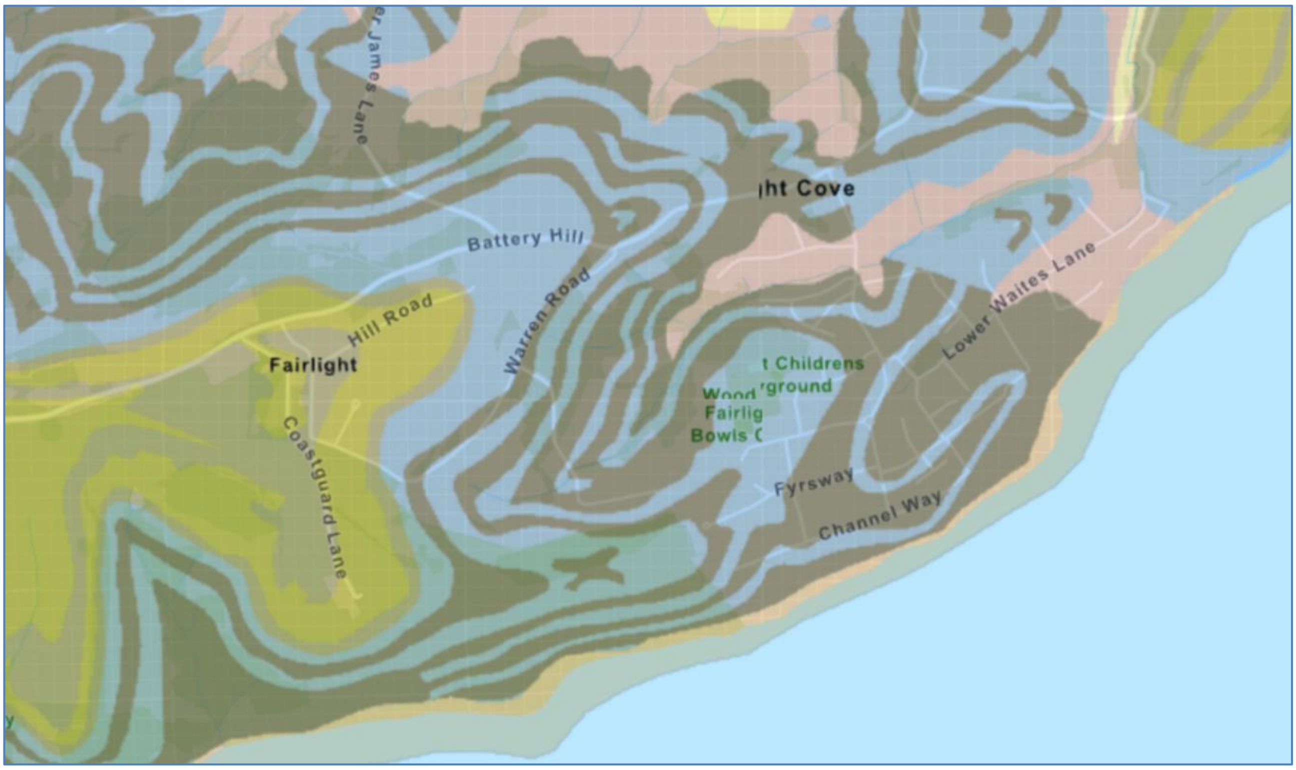

Figure 4 – Geology of Fairlight[3]

1.4 Southern Water Drainage System

Drainage systems can be made up of single pipe systems (combined) and two pipe systems (foul and surface water). Appendix B provides some background information on how drainage systems have developed and the contribution that legacy housing (houses where the roof drainage and sewage drainage combine), makes to the surface water management. The drainage system within Fairlight consists of combined sewers.

[3] www.bgs.ac.uk

1.5 The Combined Sewerage System

The Fairlight combined sewerage network consists of small diameter sewers with most of the catchment being served by 175mm circular sewers. The area upstream of Lower Waites Lane No. 1 overflow, including Shepherd's Way, Commanders Walk and Channel Way, are served by 225mm diameter sewers; this section of the network drains towards the storm overflow and storm tank with the pass forward flow controlled via a penstock into the downstream 175mm diameter sewers. The sewers at the downstream end of Lower Waites Lane increase in size to a 450mm diameter sewer leading towards the treatment works. The flows from Waites Lane also connect into this 450mm diameter sewer and continue to the WTW, where the flows enter the inlet via a 525mm diameter sewer.

The whole system flows by gravity with no Southern Water pumping stations within the catchment, flowing from south-west to north-east, roughly parallel to the coast. The topography shows a maximum level of 158mAOD at the head of the system in Battery Hill to approximately 13mAOD at the inlet to the WTW.

Southern Water have been carrying out the installation of sewer level monitors across the whole of their region. There are currently three active sewer level monitors in the Fairlight catchment, with a further twenty-eight locations due to come online by early 2023. These monitors will provide more 'real-time' data of water levels in the catchment to facilitate pro-active management of the network.

A hydraulic network model of the existing Fairlight combined sewer system is available and has been used to simulate design storms and typical year rainfall scenarios to help understand the performance of the system. As the catchment changes and develops this model must be updated, calibrated, and verified to ensure it accurately replicates the performance of the Fairlight sewer system. Figure 5 shows the current extent of the model.

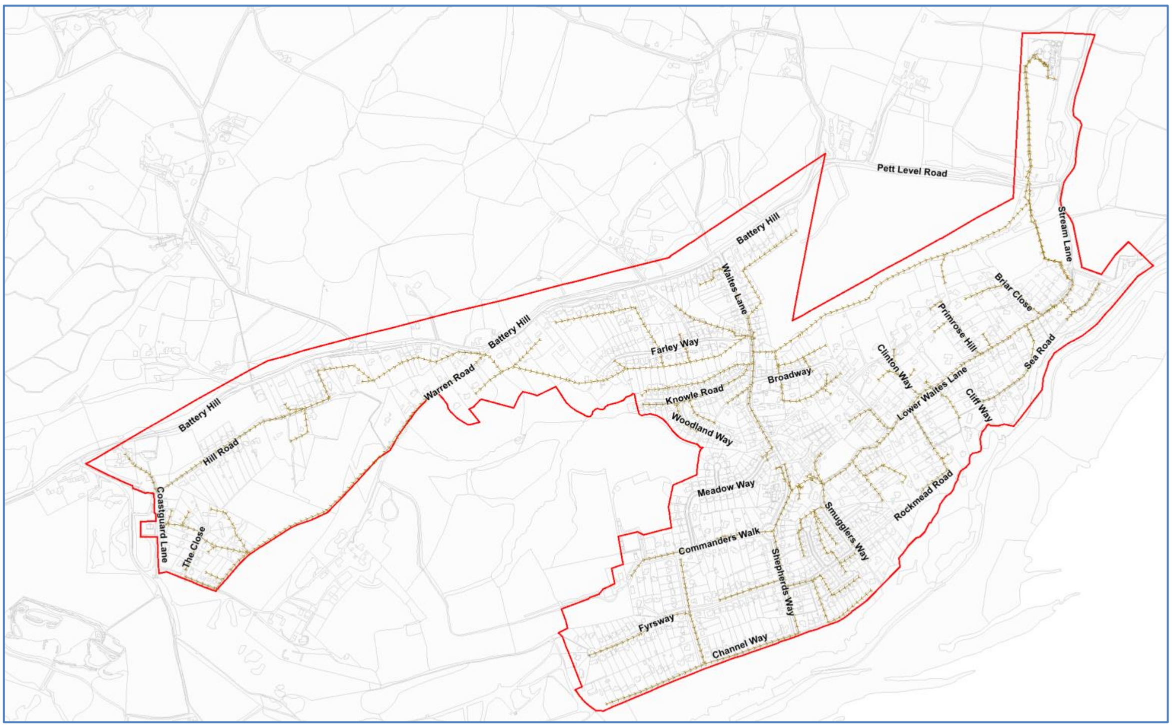

Figure 5 – Combined sewer system in the Fairlight catchment (brown)[4]

Further survey requirements will be considered and commissioned for key elements of the combined system to enable the network model to be improved. This will support decision making around potential interventions.

1.7 Fairlight WTW

The Fairlight drainage catchment is served by the Fairlight Wastewater Treatment Works (WTW). The WTW is located in the north-eastern corner of the catchment. The foul sewage from the Fairlight catchment is transferred to Fairlight WTW by gravity.

Fairlight WTW is a conventional filter works treating domestic wastewater and serves a population of approximately 1,600. It is located approximately 2 km to the north-east of Fairlight village, in a remote countryside area. Fairlight WTW has a three-phase treatment process, the key elements of the process stream are:

- Primary treatment consisting of screening and two settlement tanks
- Secondary treatment consisting of two biological trickling filters
- Tertiary treatment consisting of two moving bed sand filters.

Treated sewage effluent is discharged to The Marsham Sewer watercourse, which flows towards Winchelsea and the Pett Level Wetlands area.

The WTW manages and treats the dry weather flows reaching the site and has spare treatment capacity available for dry weather flows. At present, the WTW struggles to cope with the surface water flows generated during storm conditions, which leads to sewer overflow spills at the works. In the past two years, (2020-2021), Southern Water spill data

[4] Southern Water latest hydraulic model

shows that the in-catchment sewer overflow spills occur at the same time as spills from the WTW. Analysis shows that 88% and 86% of the in-catchment sewer overflow spills correlate to the timing of the WTW spills in 2020 and 2021 respectively.[5]

1.8 Fairlight Storm Overflows

Storm overflows are a relief valve for the sewerage system to prevent the devastating impact of sewer flooding. Storm overflows in the Fairlight catchment are consented and are permitted to spill to the watercourse during storm conditions. For more information see the Southern Water Storm Overflows web page.

There are four sewer overflows within the Fairlight WTW catchment. The contributing areas of each overflow are shown in Figure 6. Flooding and pollution incidents have been experienced in the catchment, especially along Lower Waites Lane, where two of the storm overflows are located.

Sewer Overflow	Overflow Type	Releases in 2021[5]	Releases in 2020[5]
Fairlight (WwTW) CSO	Storm Tank Overflow	46	49
Lower Waites Lane No. 1 CSO	Combined Sewer Overflow	16	8
Lower Waites Lane No. 2 CSO	Combined Sewer Overflow	9	11
Waites Lane CSO	Combined Sewer Overflow	8	18

Table 1: List of Storm Overflows within the Fairlight WwTW catchment

[5] https://www.southernwater.co.uk/our-performance/flow-and-spill-reporting

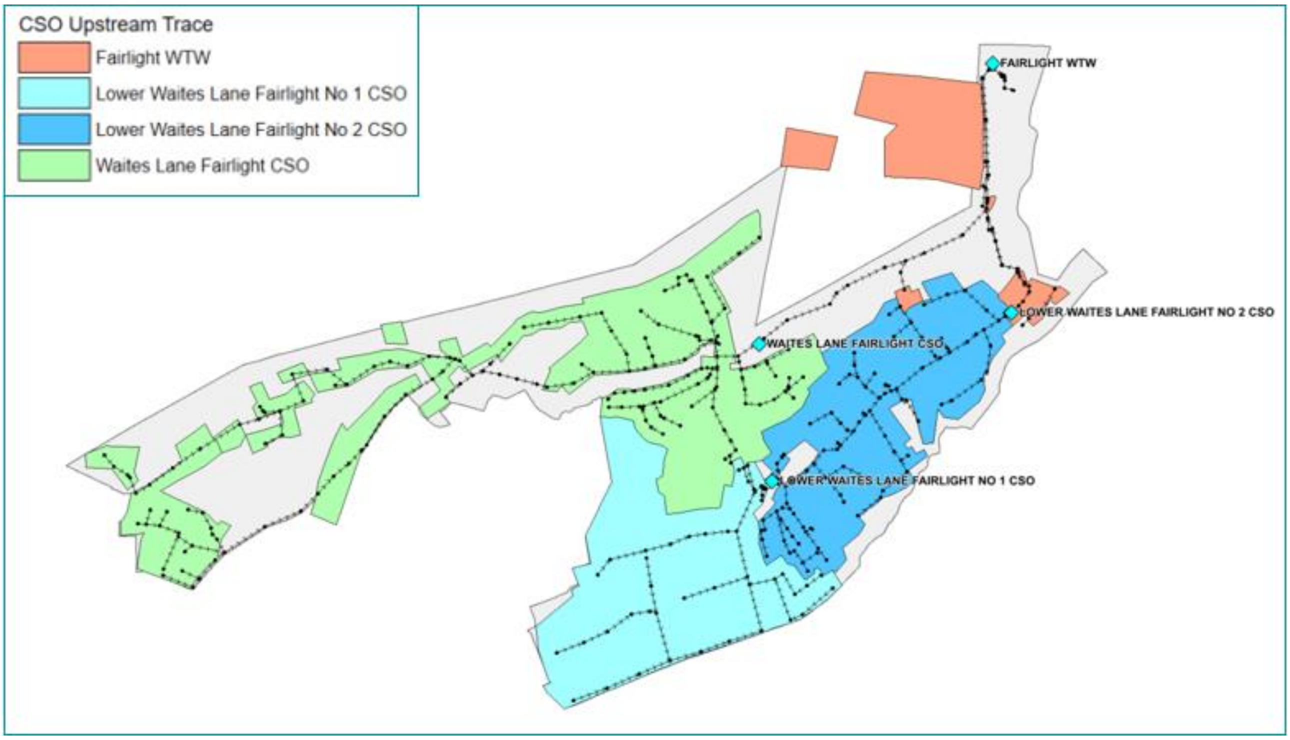

Figure 6 – Drainage catchment areas of the Fairlight Storm Overflows[6]

1.9 The Surface Water System

At present, there is no standalone surface water system in Fairlight and no surface water assets detailed in the Southern Water asset data system.

1.10 The Highway Drainage System

Highway drainage generally consists of road gullies and drains connected to the surface water, combined sewer systems or even local watercourses available within a catchment. For Fairlight, the highway drainage is owned and maintained by East Sussex Highways (ESH) and the downstream connectivity is unconfirmed.

East Sussex Highways Department have provided mapping information detailing the locations of highway gullies, drainage assets and a single soakaway, but were unable to confirm the discharge locations of the highways drainage system (Figure 7 and 8).

[6] Southern Water Asset Miner System

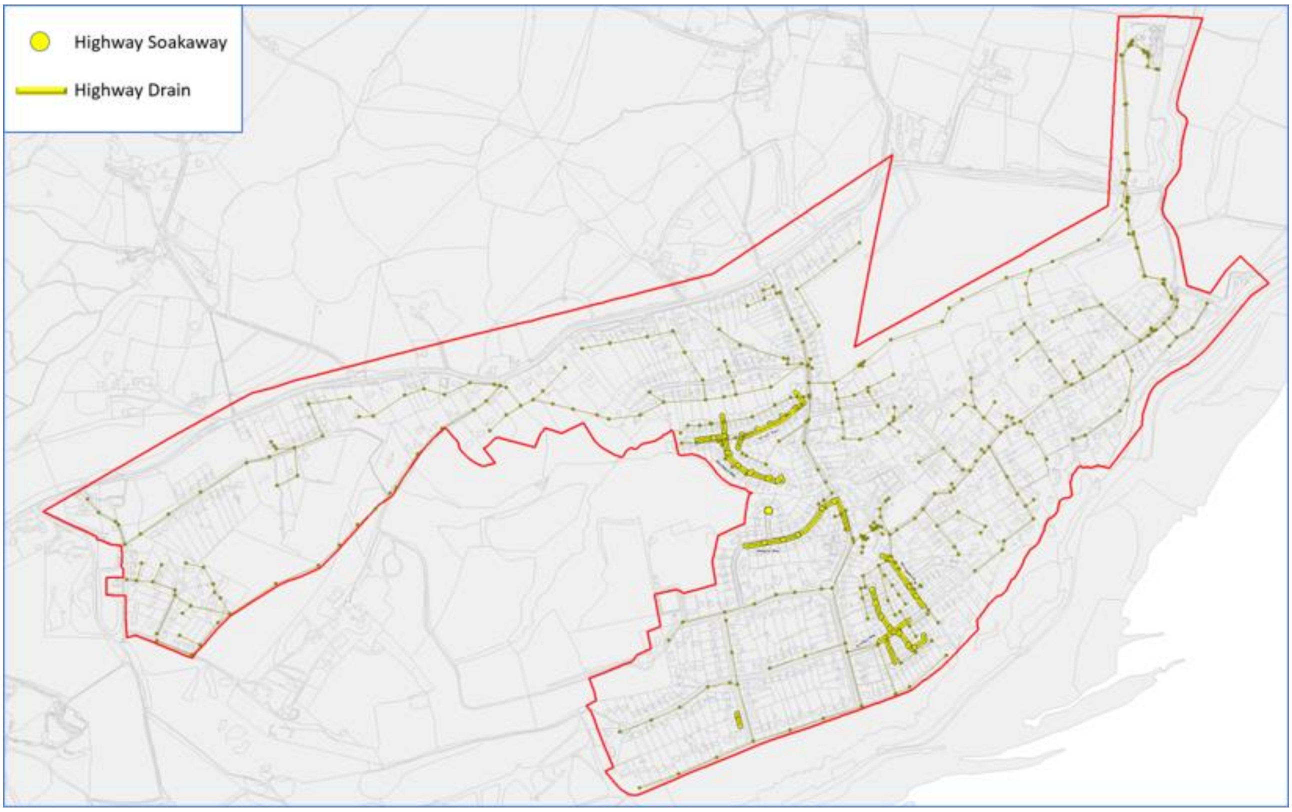

Figure 7 – Highway Drainage and Soakaway Locations [7]

[7] East Sussex Highways department, 2022

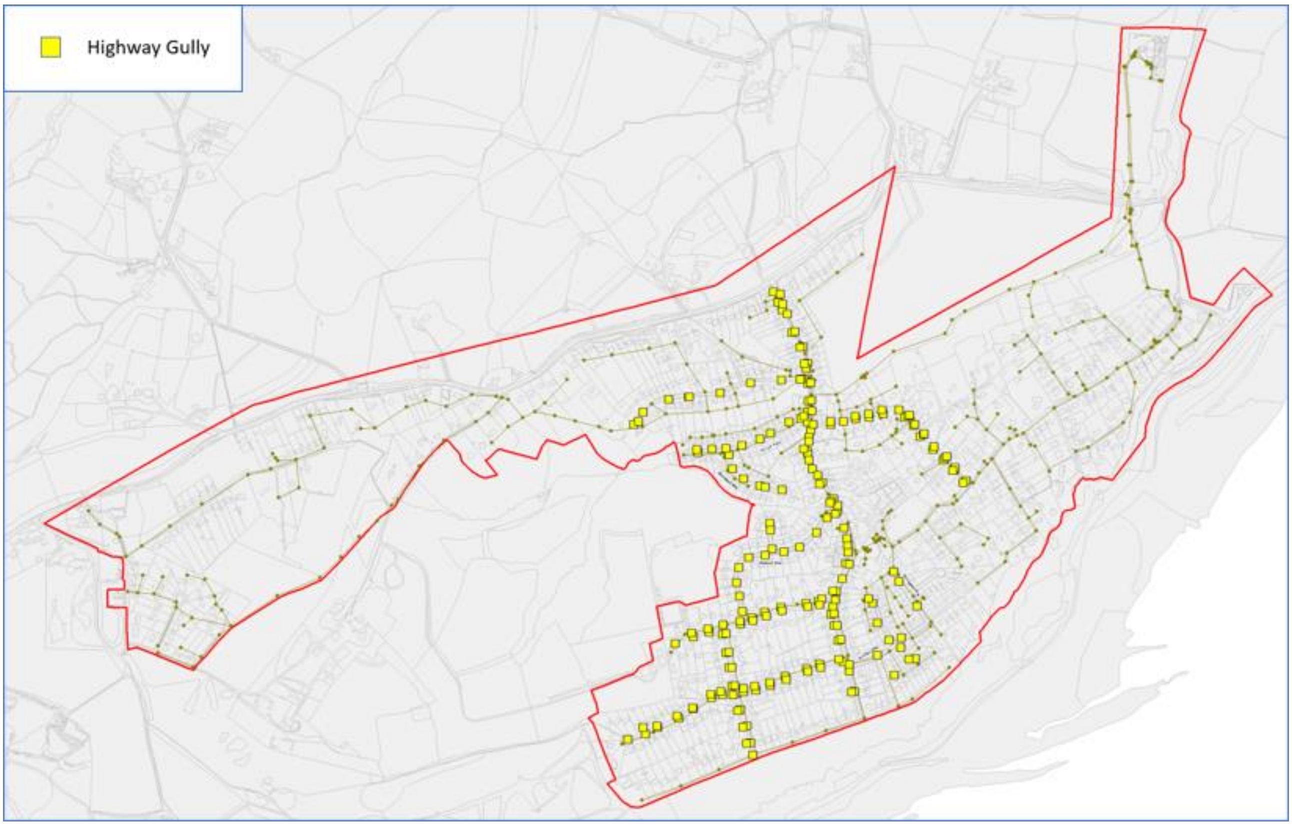

Figure 8 – Highway Gully Locations[8]

1.11 River and Coastal System and Flooding

The main watercourse draining the catchment is a tributary of the Marsham Sewer (river system), which flows through the centre of the catchment from west to east, and then north past the Wastewater Treatment Works (WTW). The watercourse continues in a northerly direction through Chick Hill and on towards Winchelsea and should have a clear route through to the sea via Royal Military canal and River Brede. In the event of the Marsham Sewer over topping upstream of Chick Hill, it is possible that the flows can impact on the Romney Marshes area, but this has not occurred since 2014.

The Marsham Sewer, Royal Military Canal and River Brede pass through many highly designated landscape areas, including Sites of Special Scientific Interest, Special Protection Areas, Ramsar wetland areas, Areas of Outstanding Natural Beauty, Local Nature Reserve and Nitrate Vulnerable Zones.

The residents have confirmed several spring and well locations located across the catchment, including the areas of Battery Hill and Lower Waites Lane. Fairlight Historical Group and Fairlight Preservation Trust have confirmed further locations including a spring at Stonelynk Farm, and three wells: one opposite no. 53 Battery Hill, one at Wakeham's Farm and one to the west of Leather Waggon. According to planning documents, an underground drain was identified in the western half of the Wakeham's Farm site, that drains towards the stream along the southern edge of the site. Further detailed information from

[8] East Sussex Highways department, 2022

resident M Sullivan confirms springs, ponds, tanks and wells located across the catchment; this information is available in Appendix D.

Further information from long-term residents suggests that the areas of Fyrsway and Gorsethorn had water supplied from a large tank and did not have wells at their properties.

Figure 9 shows the Marsham Sewer to the northeast and the tributaries within the catchment; these tributaries are not classified as main rivers by the EA and therefore are not subject to any regulatory or management requirements. There are no estuaries or coastal waters that interact with the sewerage system.

The Environment Agency assessments have assigned the Marsham and Panel sewer an ecological status of Moderate[9]. The National Trust have observed a decline in the watercourses over time.

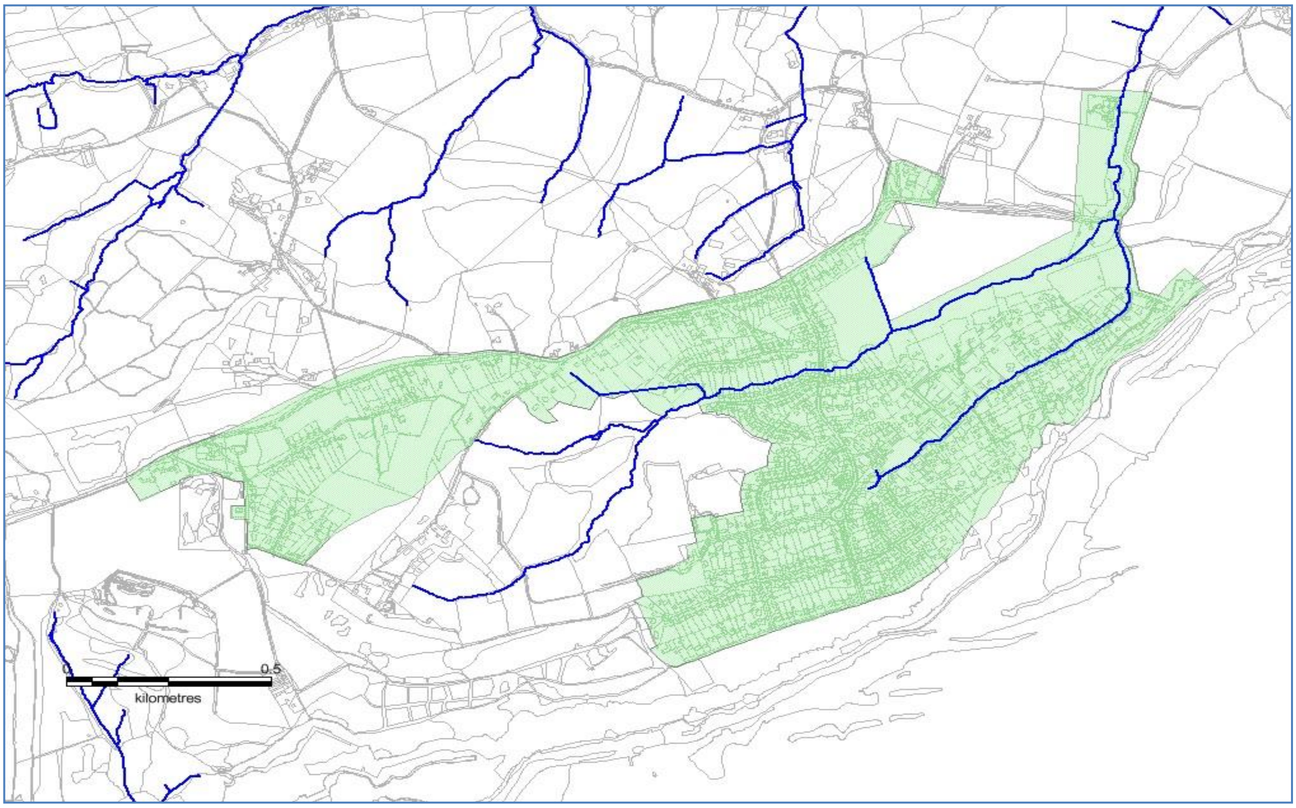

Figure 9 – Watercourses within the Fairlight drainage catchment[10]

[9] https://environment.data.gov.uk/catchment-planning
[10] Southern Water Drainage Area Plan 2019

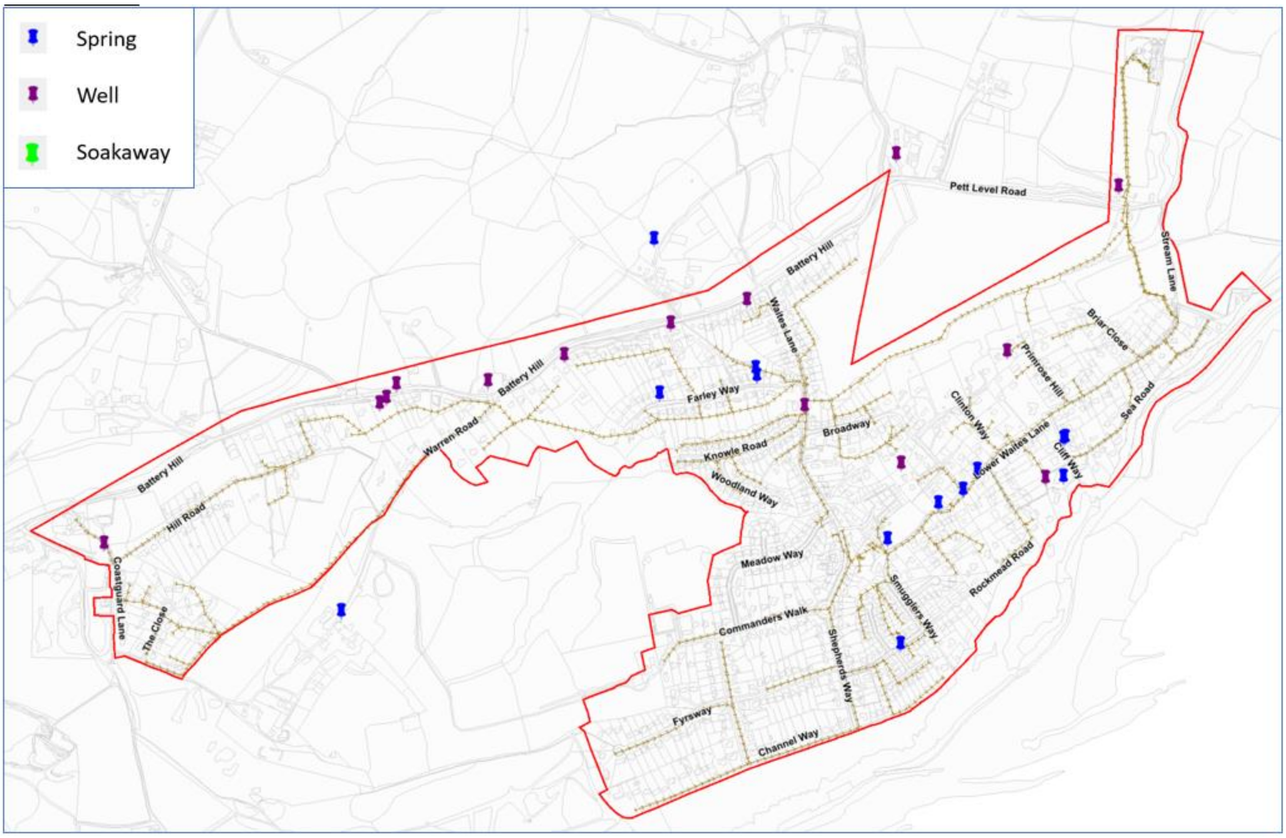

Figure 10 – Springs and Wells within Fairlight

Figure 11 shows the risk of flooding caused by rivers or the sea. This assessment considers the effect of any flood defenses in the area. These defenses reduce but do not completely stop the chance of flooding as they can be overtopped or fail.

For the most part, the Fairlight catchment is in Flood Zone 1, with a low risk of flooding. The south-eastern coastal area of Fairlight is however a medium to high-risk zone for coastal flooding. This area appears to be at the bottom of the cliffs which are at risk of collapse (see Figure 11).

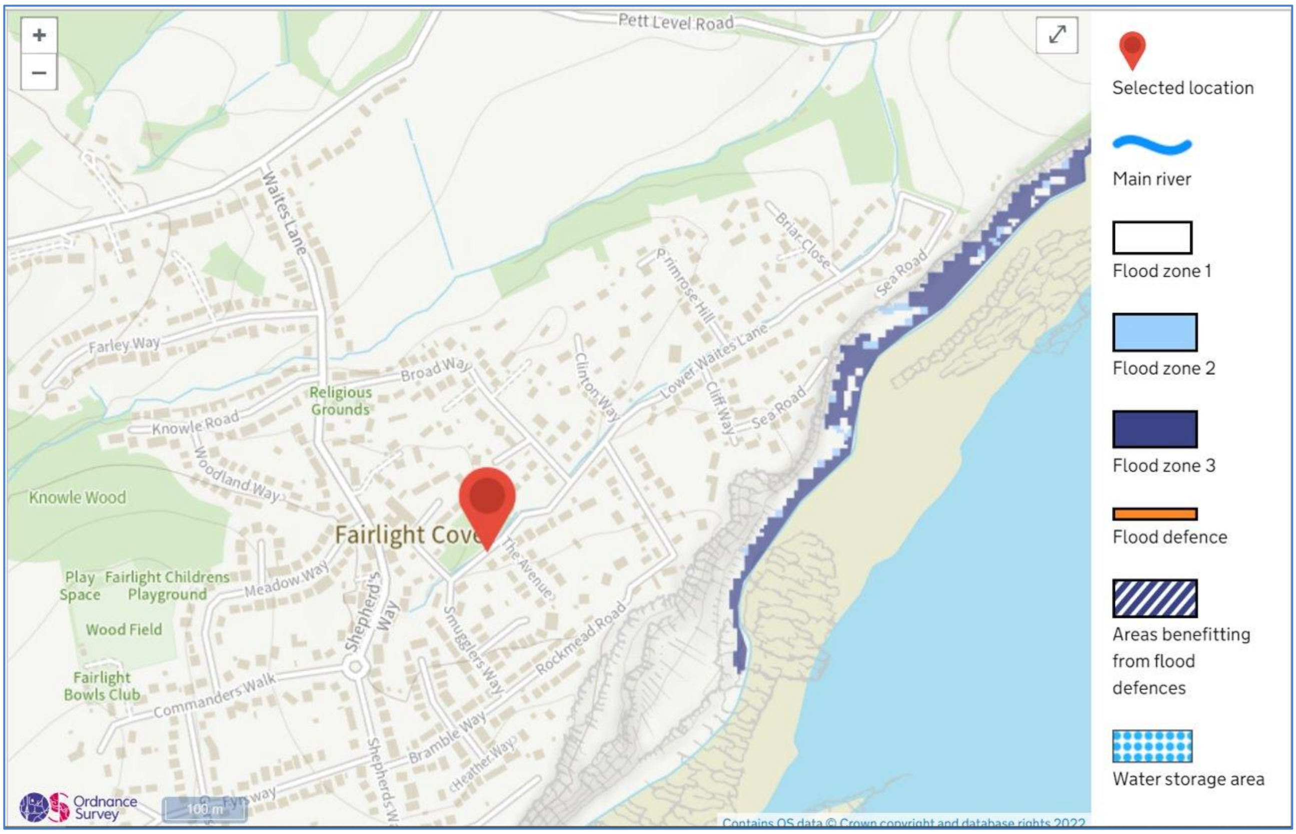

Figure 11 – Environment Agency River and Coastal Flood Map[11]

1.12 Surface Water Flooding

Flooding from surface water is typically associated with natural overland flow paths and local depressions in topography where surface water runoff can accumulate during or following heavy rainfall events. The Environment Agency's map shown in Figure 12 shows the risk of flooding caused by surface water. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features, such as topography, can greatly affect the chance and severity of flooding.

Figure 12 shows that Waites Lane has a low risk of surface water flooding – this means that this area has a chance of flooding of between 0.1% and 1% each year. At the southern end of Waites Lane this increases to a high risk of surface water flooding – meaning that this area has a chance of flooding of greater than 3.3% each year.

Lower Waites Lane has a significantly higher risk of surface water flooding as shown by the widespread shades of blue all along the highway, extending outwards to where properties are situated along the lane. This could be due to several reasons; including the fact that Lower Waites Lane is situated at a low point, with steep roads connecting onto it increasing the risk of surface water flooding.

10 Your long-term flood risk assessment - GOV.UK (check-long-term-flood-risk.service.gov.uk)

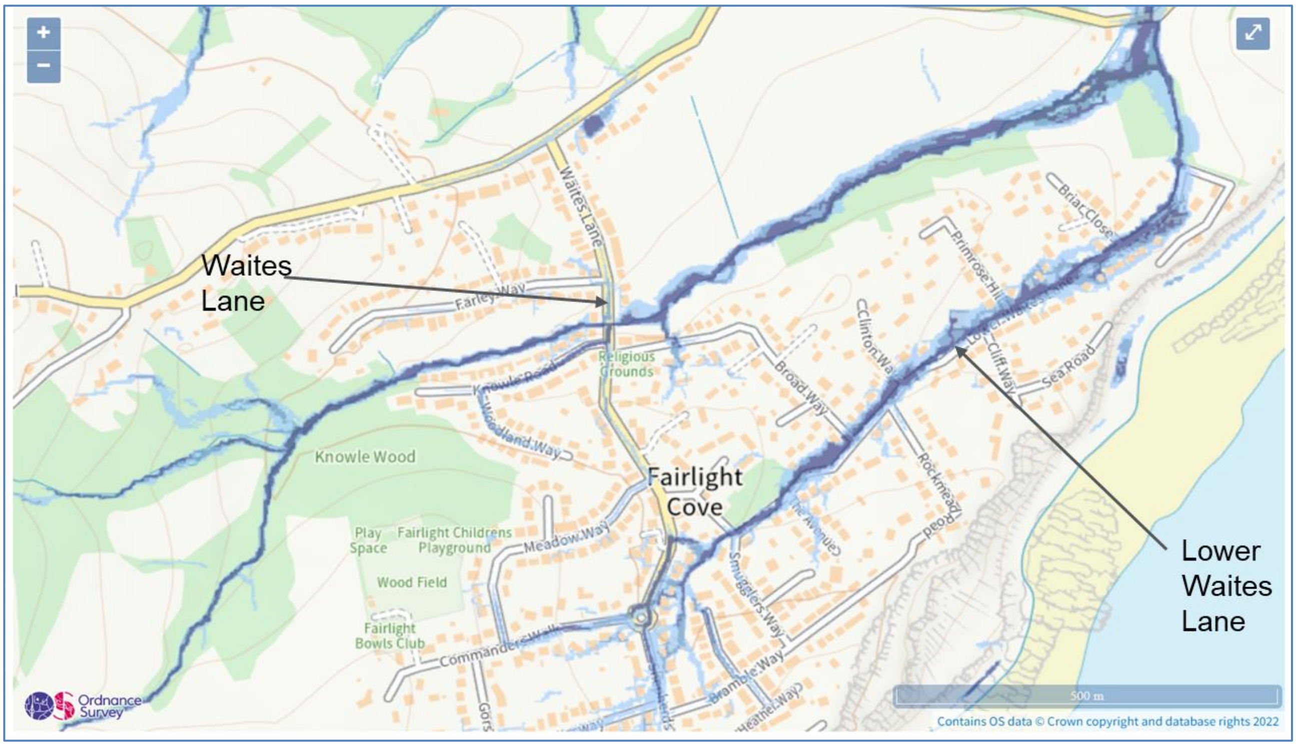

Figure 12 – Extract from the Environment Agency's Flood Risk from Surface Water map[12]

1.13 Simplified Fairlight Schematic Layout

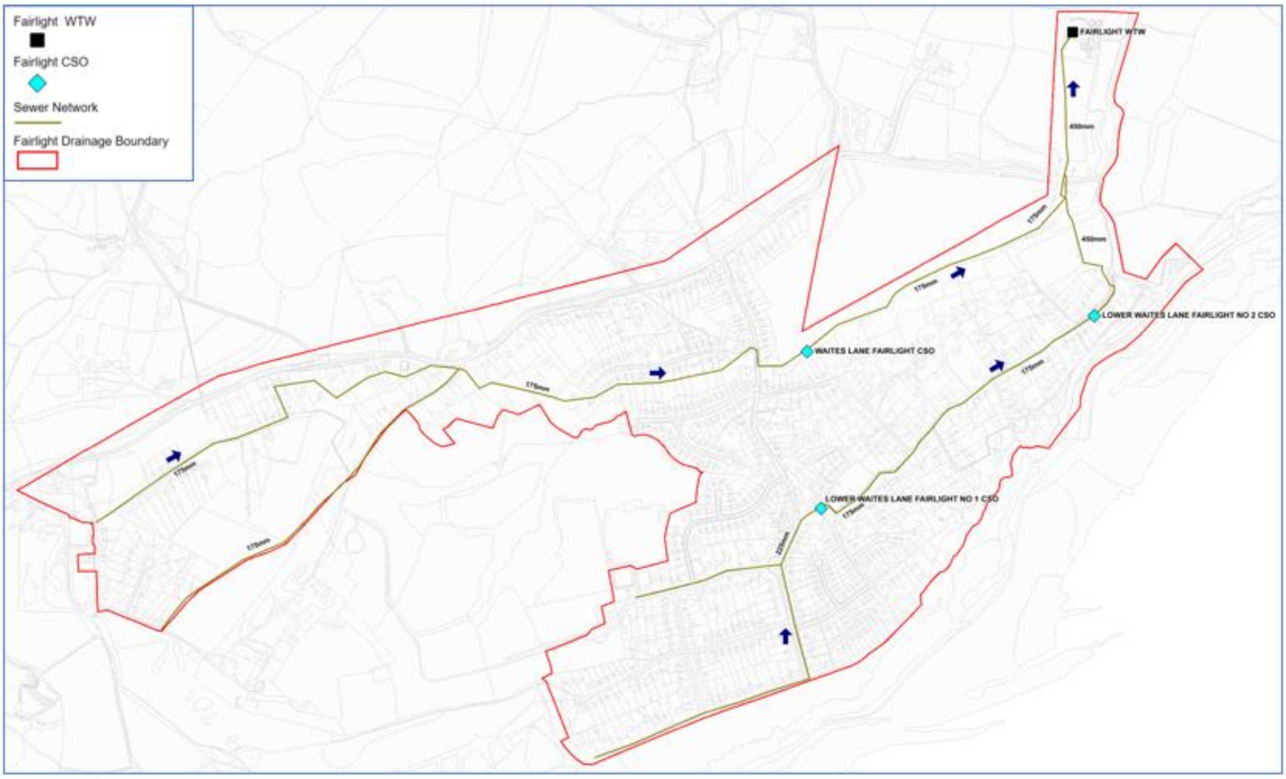

Figure 13 – Fairlight Catchment Schematic

[11] [Your long-term flood risk assessment - GOV.UK (check-long-term-flood-risk.service.gov.uk)](https://check-long-term-flood-risk.service.gov.uk)

2.0 Why Change is Required

The Fairlight catchment has been included in the Pathfinders programme due to the historical sewage flooding and storm overflow performance experienced within the catchment.

2.1 Flooding

The Southern Water flooding database details one property currently at risk of internal flooding and 15 properties currently at risk of external flooding.

The property at greatest risk of internal and external flooding, Leather Waggon on the Pett Level Road, has experienced flooding since the 1950s, with an increase in occurrences over time. The residents have compiled significant information on the history of the issues and provided Southern Water with useful photographic and video evidence of the flooding experienced. The residents of Leather Waggon experience restricted use of amenities, flooding from inspection covers outside the property and overland flooding from the field upstream and have had their mains water supply cut off during events. The overland flows have caused damage to the property boundary line, and the installation of gabion baskets has taken place to protect the bank running around the edge of the property. The property has an Anti-Flood Device (AFD) fitted to stop any high-water level sewer flows in the main sewer system from surcharging back up into the property, but the property still experiences internal flooding issues. It is understood that an AFD has also been installed at Broadway, near Coastguards Lane.

A sewerage scheme completed between 2002 and 2008, as a part of improvement works for Lower Waites Lane No. 2 CSO, included new larger diameter sewers and a new sewer layout taking the flows past Leather Waggon and on to the WTW. The overflow scheme has not resulted in an improvement for the residents of Leather Waggon.

External flooding locations are clustered along Lower Waites Lane and the junction of Waites Lane and Farley Way. Residents confirm that the sewers along Lower Waites Lane are overwhelmed during wet weather events, leading to manhole covers lifting and sewer flows exiting the sewerage system into the highway and watercourse that runs parallel to the highway. These incidents cause pollution of the watercourse and Stream Lane; Stream Lane, which is a walkway to the local school, is unusable during these events and the main water supply crossing the lane has been cut off.

2.2 Sewer Overflow Performance

The Fairlight catchment has a high number of sewer overflows compared to the catchment area size and residential population. The overflows discharge into tributaries of the Marsham Sewer (river system), and event duration monitoring equipment documents that the sewer overflows are triggering regularly in wet weather conditions. The sewers are overwhelmed during wet weather and in 2021 the four overflows spilt a combined total of 81 times.

3.0 Catchment Investigations

The desktop analysis of the Fairlight catchment and the available data has concluded that there are several factors that could be impacting on the performance of the Fairlight combined sewerage network, leading to the flooding and overflow discharges that have been experienced.

The following section describes those factors, how they can affect flooding and storm overflow spills, the level of detail understood so far for the Fairlight catchment and potential next steps. Section 4.0 provides more specific activities and actions that are recommended for the project and the catchment.

Interventions considered for the catchment include operational interventions, above ground measures to remove or slow the flows, underground measures to remove or slow the flows, optimisation of the existing network and new infrastructure.

3.1 Sewer Maintenance

Sewer systems play an essential role in maintaining public health, protecting the environment, and managing surface water flood risk. If the condition of the sewerage networks is not monitored and maintained then it leads to blockages, collapses, sewer flooding and pollution discharges into waterbodies.

3.1.1 Risks

Issues located within sewers include cross sectional area losses from items such as deposits or root intrusions, infiltration into the sewer system and structural defects along the sewer lengths.

Deposition, such as fats, oils and greases or root intrusions, lead to a loss in cross sectional area of the sewer pipe. This cross-sectional loss reduces the flows that the sewer can pass forward, reducing the flow velocity and increasing the flow depth within the sewer. This flow condition change may only occur in a localised area of the system close to the deposition but where the cross-sectional area loss is significant, it can lead to that flow change being experienced much further upstream in the system.

Structural defects within the sewer network, such as cracks, fractures, displaced joints, and broken pipes can increase the chances of the sewer collapsing as the structural integrity of the pipework will be compromised. The collapse of a sewer can lead to flooding of properties, both internally and externally and pollution incidents; depending on where the collapse occurs in relation to local watercourses.

Infiltration increases the volume of water passing through the network. The sewer system may be unable to cope with the additional water, leading to surcharging in the system. When the sewer network becomes overwhelmed, it can lead to an increased risk of flooding and cause overflows to discharge to the watercourse to relieve the system.

3.1.2 Fairlight Findings

The desktop exercise and site visit have confirmed there are areas of the Fairlight sewer network that have regular maintenance tasks scheduled, such as CCTV and jetting, to manage sedimentation and root intrusions. There are also assets that require one off maintenance to ensure they are performing as expected, such as manhole cover repairs and re-sealing of manhole covers.

CCTV has historically been utilised to assess the condition of sewers within the Fairlight catchment and where significant risks have been discovered, rehabilitation works have been completed. Structural integrity of the sewer assets is defined using the grading system from the Sewer Rehabilitation Manual[13]. The manual includes two subsets of criteria based upon the service hydraulic performance of the asset (how well it works), and the structural integrity of the pipe (physical condition). The grading for the sewers ranges from 1 to 5, where 1 is excellent condition and 5 is the most severe deterioration. Assets evaluated with a grading of 4 or 5 would be repaired or replaced. The latest asset data for Fairlight does not document any assets with a grading of 4 or 5.

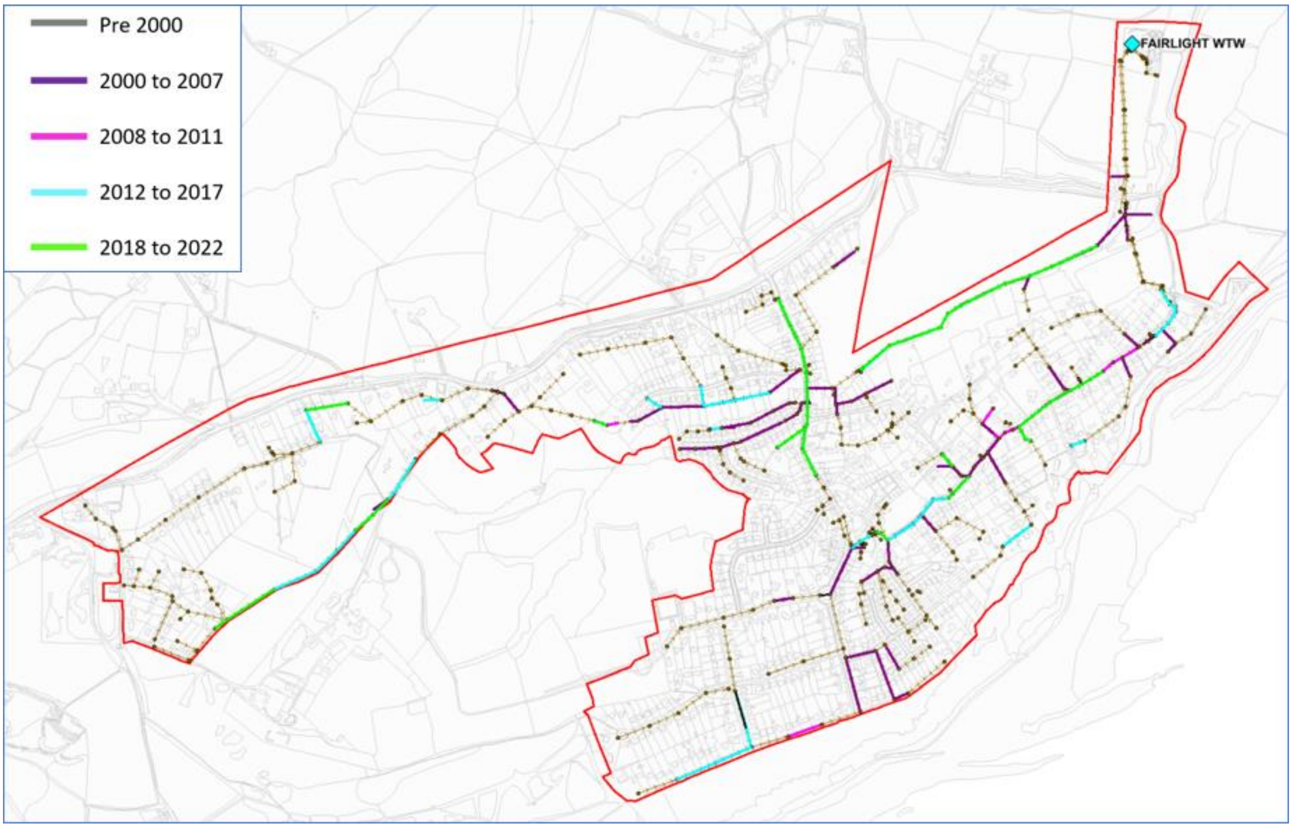

Figure 14 – Fairlight CCTV

3.1.3 Actions and Investigations

Southern Water will undertake a review of the current Maintenance Service Tasks, (MST), for the catchment and review their scope and frequency. This MST could include CCTV to monitor the progress of any structural defects, deposition levels and root intrusions. Over time regular monitoring would provide trends in the siltation and depositions within the

[13] Sewer Rehabilitation Manual WRc

sewers; these trends would enable network operators to better understand the catchment and to implement pro-active maintenance of the network.

Following on from the CCTV and scanning of the pipework, sealing of the defective pipework can be completed to reinstate the structural integrity of the assets. The traditional method for sealing sewers is to install leak tight liners into the public sewers, made either from an epoxy or a silicate-based resin. These liners have been tested against 5m head of water and have a design life of at least 50 years. Manholes can be sealed separately using a spray lining from the inside or stitch drilling and injecting a resin into the ground surrounding the manhole to make it watertight. These methodologies are well used and understood.

Southern Water have an ongoing Sewer Level Monitoring (SLM) programme, whereby 22,000 monitors will be in place across the Southern Water region by the end of 2022. The SLM programme will enable sewers to be continuously monitored and trends established to understand the typical levels at each SLM. Live monitoring of the SLMs will detect when measurements deviate from these typical levels, and network operatives will be alerted. The cause can be investigated, and action can be taken as necessary.

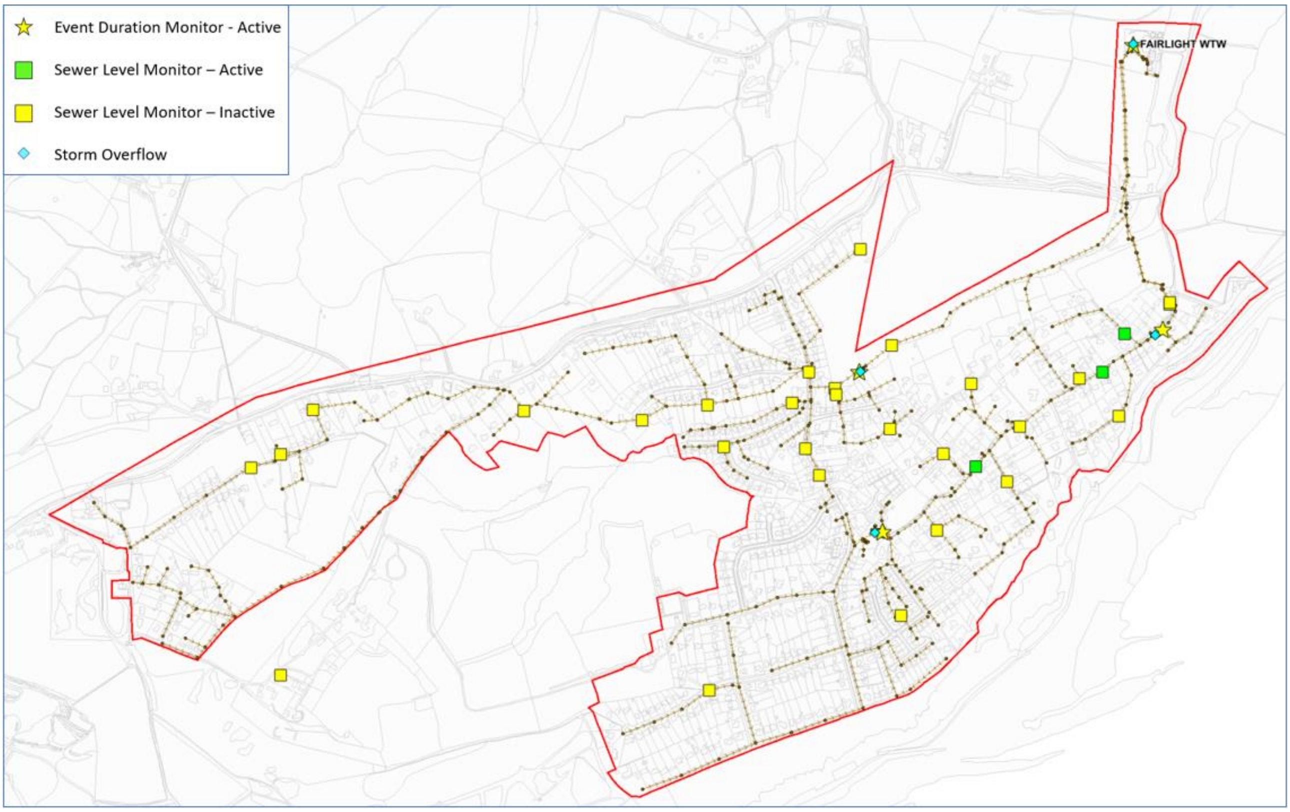

Figure 15 – Fairlight Monitoring Locations

Customers are a key element in maintaining the functionality of the sewer network. Customer behaviour can have a significant impact on the sewerage system through the disposal of unflushable items, (e.g. wet wipes, sanitary products), and fats, oils and grease, leading to blockages, flooding and pollution events. Educational campaigns, such as 'The Unflushables', can be promoted within the catchment to better inform customers and provide advice on the best way to dispose of these items, especially in areas where there are known maintenance issues.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.2 Highway Drainage

The highway drainage system is utilised to remove rainwater from the highway and footpaths into the sewerage system. Highway gullies capture flows from the road edge and convey them into the highway drain. The highway drains then connect into the local drainage system, surface water sewer or combined sewer system.

3.2.1 Risks

If highway drainage is connected into the sewerage network, then it will be increasing the flow volumes within the network, especially in times of heavy rainfall. These additional flows could overwhelm the system, raising top water levels, increasing the flood risk and causing overflows to prematurely discharge into the watercourse. The additional flows would also put pressure on the treatment works, increasing the volume of flows that need to be treated.

3.2.2 Fairlight Findings

The desktop exercise and site visit have confirmed there is highway drainage within the Fairlight catchment. East Sussex County Council have provided details of the confirmed locations of highway drainage, gullies and soakaways. There is one soakaway, located in Meadow Way, and several lengths of highway drainage around Woodland Way, Knowle Road, Meadow Way, Smugglers Way and Bramble Way. The Council were unable to confirm where these highway drains discharge to. Gullies are confirmed in the areas of the highway drains plus Farley Way, Broadway and the Fyrsway area; there are no records of highway drains in these areas. If these highway assets, covering approximately 6 hectares, connect into the Southern Water sewerage network, they will have an impact on the flows reaching Lower Waites Lane and Waites Lane, with an estimated peak flow of between 40 to 60l/s, dependent on the surface condition, in a 5mm intensity rainfall event.

Stakeholders have confirmed there are resident-built gullies located along Channel Way that are understood to drain out over the cliffs. There are gullies along Lower Waites Lane, but the downstream connectivity is unknown. One long-time resident mentioned gullies to the east of the catchment connect to local watercourses. There is a gully on Cliff Way that connects to the stream, although it is regularly blocked with debris.

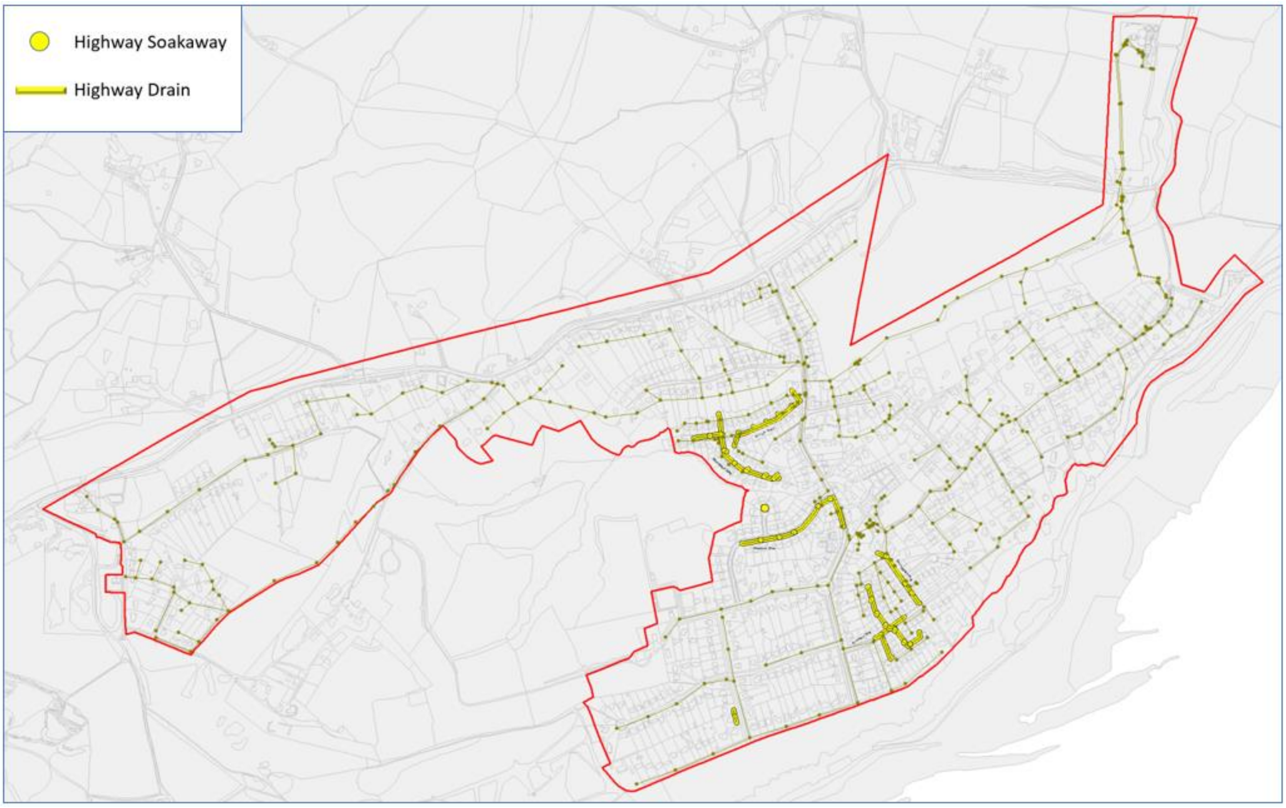

Figure 16 – Highway Drainage

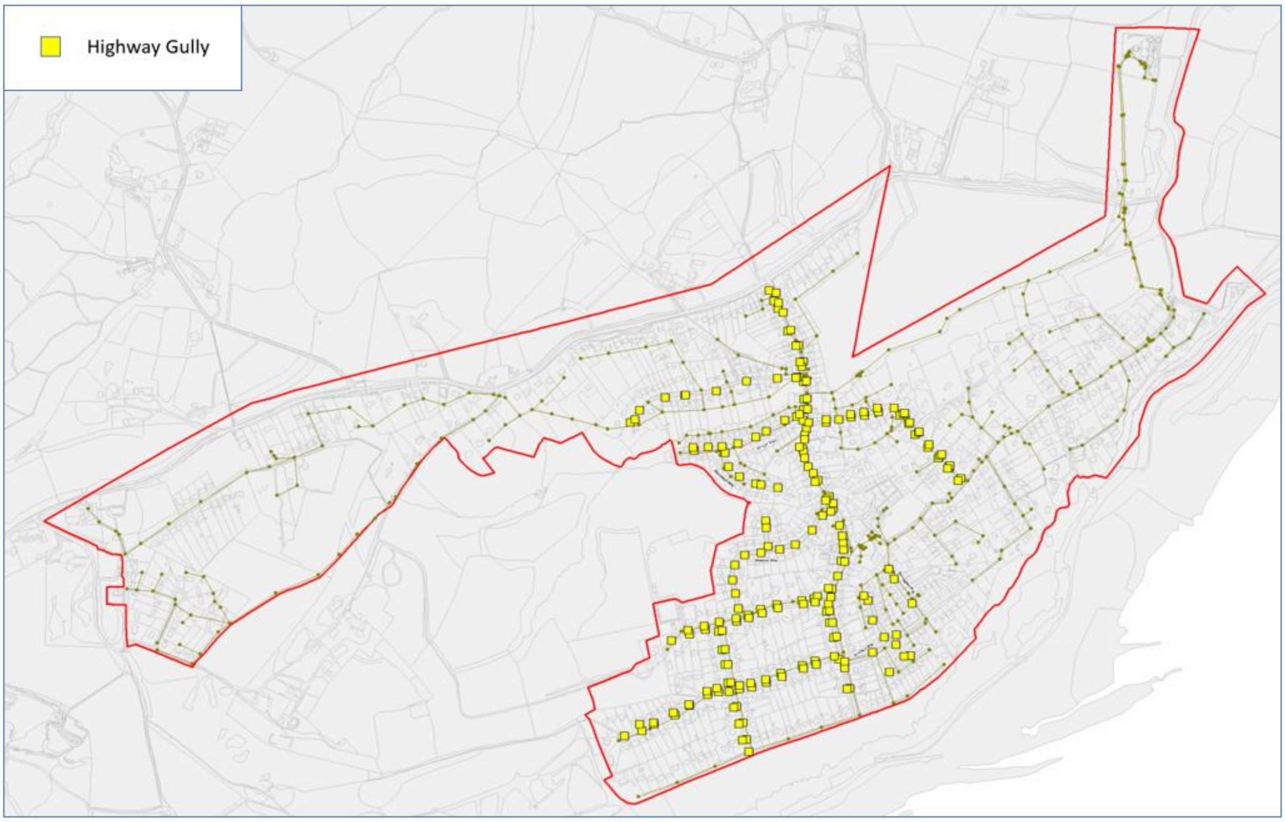

Figure 17 – Highway Gullies

The site visit discovered control measures in place to manage the flows along the highways. Drainage channels have been created in the embankments alongside Pett Level Road with additional connection channels to guide the runoff from the highway into the stream. Drainage channels were apparent within some of the side roads that drain down to Lower Waites Lane; these channels ran along the edge of the road into a gully style connection; it was unclear where these gullies discharge.

3.2.3 Actions and Investigations

Confirmation of the highway assets downstream connectivity would be key to understanding the impact the highway flows are having on the catchment.

Removal of the highways flows from the sewerage system would decrease the volumes entering the network, freeing up capacity for the wastewater flows to be conveyed to the treatment works and lowering the top water level within the system. The reduction in top water level would reduce flood risk and storm overflow spill occurrences.

It was understood that Fairlight has a ‘no soakaways’ policy in place, due to the existing coastal erosion risk for the catchment. Rother District Council have confirmed that the use of soakaway drainage is prohibited in the catchment within 50 metres of the cliff face. This restriction limits the use of soakaways, therefore any highway drainage removed from the sewerage network in these specific areas of the catchment cannot be drained naturally into the ground. It should also be noted that there are two geological faults within the catchment, Haddocks Reverse Fault and Fairlight Reverse Fault.

The highway drainage in Fairlight appears to be concentrated to the west of Waites Lane and Lower Waites Lane. The highway drainage connectivity could be altered and extended to connect into the local watercourses, rather than into the sewerage system. Risk assessments would be required to ensure these additional flows would not increase flood risk from the watercourse.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

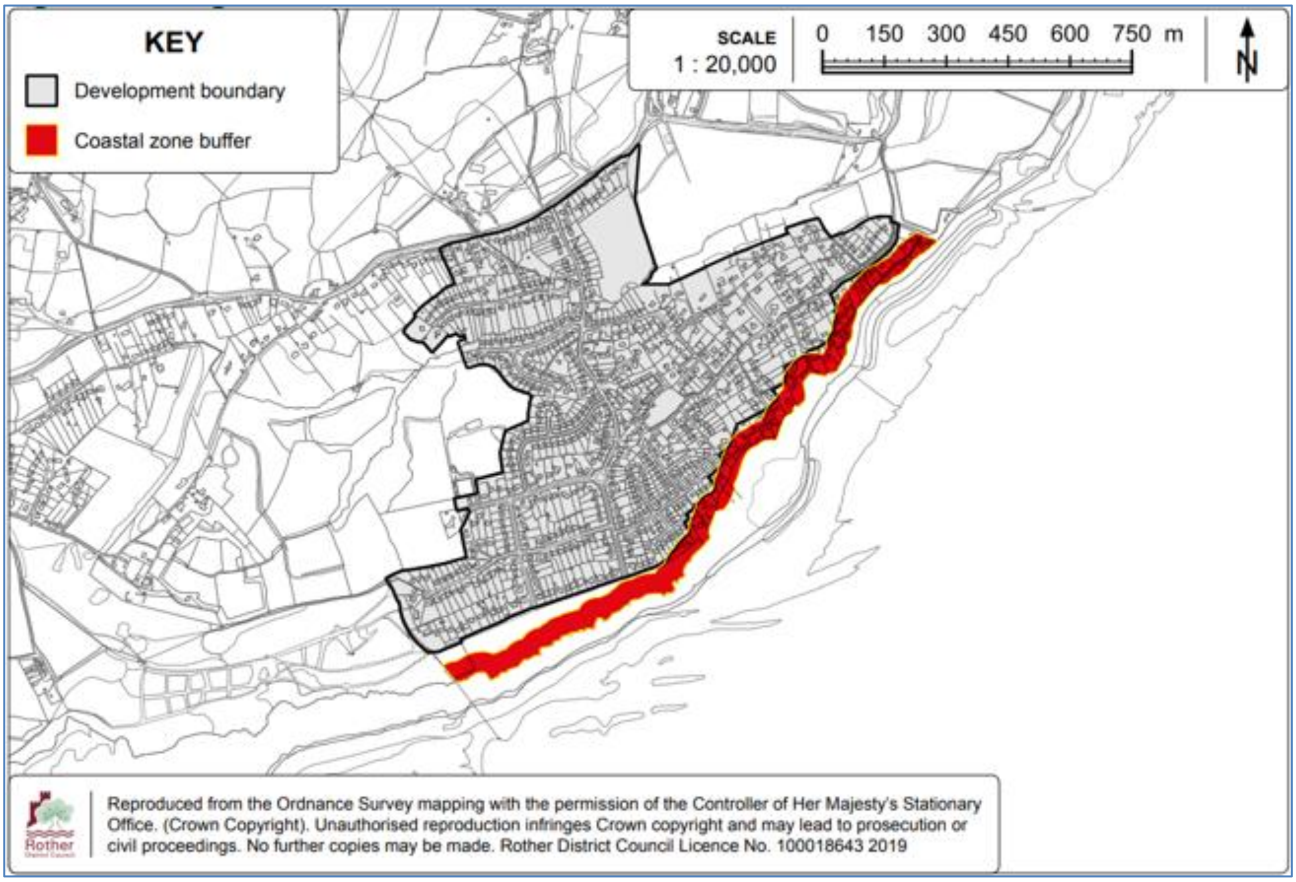

Figure 18 – Soakaway Restriction Area[14]

[14] Courtesy of Rother District Council

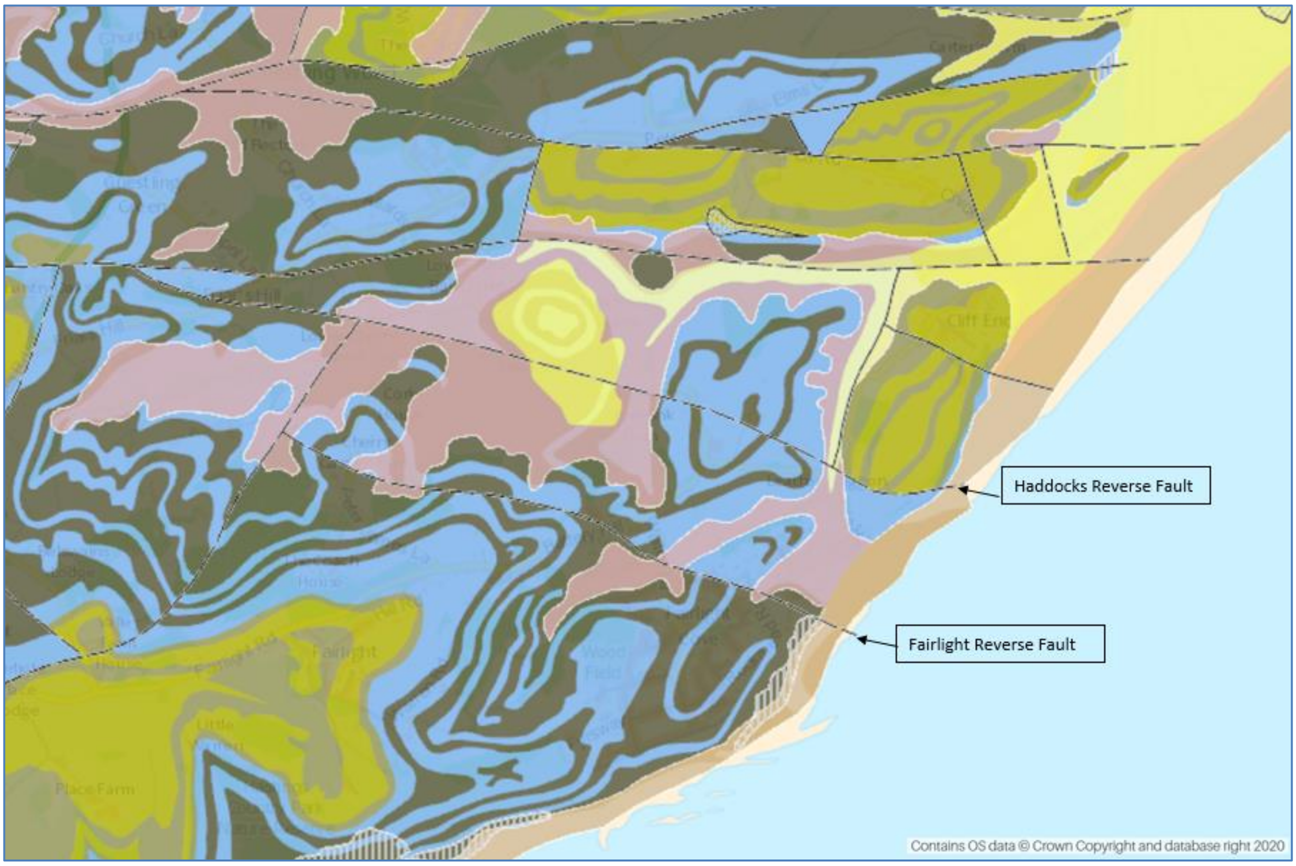

Figure 19 – Fairlight Geological Faults[15]

3.3 Roof Drainage

Historically, older parts of towns and cities have combined sewerage systems which take both the rainfall and wastewater to the sewage treatment works. Properties built later, from 1960s onwards, will have included a level of separation of the flows. The level of separation will vary from area to area depending on the existing sewerage system available and the ground conditions, with some areas using soakaways or a fully separate surface water system.

3.3.1 Risks

Surface water runoff from property roofs entering the sewerage system can significantly increase the volume of water passing through the network, especially during times of heavy rainfall. The sheer volume of flow can make it impossible for the sewer system to cope with the additional water leading to surcharging in the system. When the sewer network becomes overwhelmed, it can lead to an increased risk of flooding and cause overflows to discharge to the watercourse to relieve the system.

3.3.2 Fairlight Findings

The desktop exercise and site visit commentary has implied that roof drainage within Fairlight, including properties along Lower Waites Lane, connect into the main sewerage network.

[15] BGS GeoIndex Onshore

3.3.3 Actions and Investigations

Carry out connectivity surveys to confirm the properties that are contributing roof drainage to the sewerage network. These connectivity surveys could be completed in conjunction with the pitch fibre investigation, (see Section 3.7), to reduce the disruption to the residents.

Removal or reduction of the property roof drainage entering the sewerage system by installing SuDS devices, such as water butts or planters at each property. Water butts enable the rainwater from the roofs to still be collected, but the rate at which the flows enter the sewerage network is controlled via an orifice within the device. Figure 19 indicates the theoretical impact of a water butt on the runoff experienced in the sewers; the water butt reduces the peak of the rainfall response and slows the flow of rainwater entering the sewer system. Southern Water ‘leaky’ water butts would provide the homeowner with a water source as the device would include a tap allowing the resident to make use of the collected water. SuDs planters are designed to capture rainwater run-off from roofs, rerouting the downpipe into the planter instead of directly into the sewerage system. The planter is made up of a series of layers, acting as both a sponge and a natural filter, attenuating flow and removing sediment as the water soaks through to the reservoir.

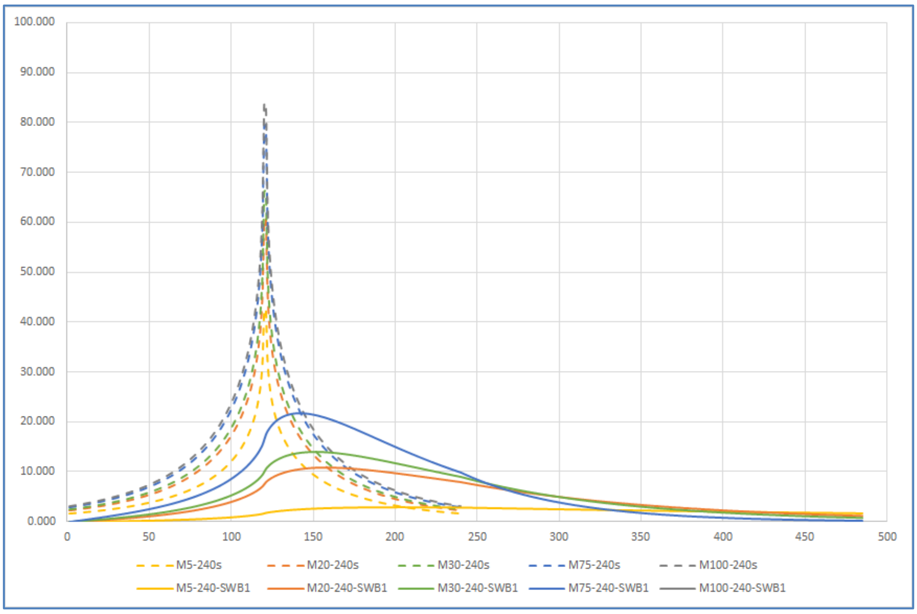

Figure 20 – Smart Water Butt Impact on Rainfall

Figure 21 – Water Butt and Planter Examples

Ideally the property roof drainage would be completely disconnected from the combined sewerage system and discharge to the ground or to the nearest surface water sewer or local watercourse. However, the impact on any existing flooding of the watercourse or cliff stability issues would need to be considered to ensure the transfer of these flows did not cause any increase in risk.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.4 Overland Flow

Overland flow is the flow of water over ground surfaces when excess rainwater can no longer infiltrate into the soil. Overland flow pathways are the natural routes for the rainwater to take to reach the nearest surface water body. The natural flow pathways may be interrupted via the development of towns, with highways or buildings constructed across the natural flow routes. Overland flows will pass across different surface types and may begin their journey on rural or manmade surfaces.

3.4.1 Risks

Significant flows can be experienced via overland flow pathways, especially during heavy rainfall events. These flows may continue to the nearest waterbody overland, or they may enter the sewer system via unsealed manhole covers, gullies or highway drainage.

The overland flows can cause flooding of highways or properties if the route to the waterbody passes through built up areas such as towns and villages, and the natural flow route is blocked or built upon.

The overland flows can cause pollution of the watercourses, depending on the types of land that the flows have passed over prior to discharging into the local waterbody; for example, agricultural land and industrial estates may include pollutants that could have a detrimental impact on the watercourses.

If the overland flows enter the sewer network, via gullies or other means, this will result in an increase in flow volumes experienced in the system. There may be a delay between the rainfall event and the overland flows reaching the sewer system if they have travelled a distance to reach an entry point into the network. The sewer system may be unable to cope with the additional water, leading to surcharging in the system. When the sewer network becomes overwhelmed, it can lead to an increased risk of flooding and cause overflows to discharge to the watercourse in order to relieve the system.

Overland flows can lead to erosion of land surfaces. The repeated occurrence of fast flowing water through the same flow pathway can erode soil and lead to changes to the landform. Overland flows can also have detrimental impacts on built environments, such as highways, kerb lines and buildings, when the flows consistently pass alongside or over the structures, leading to a failure of the materials.

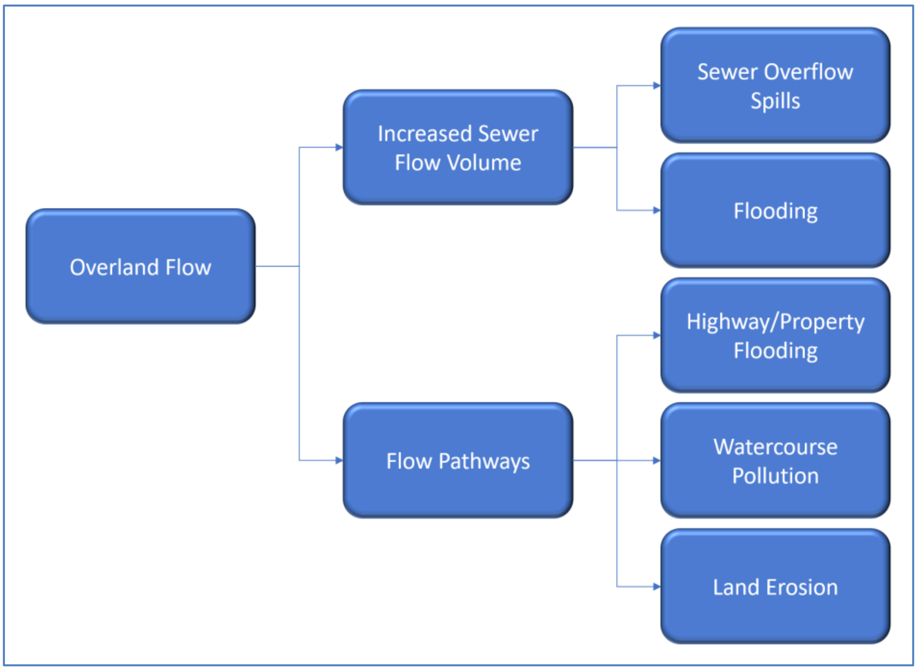

Figure 22 – Overland Flow Risks

3.4.2 Fairlight Findings

The desktop exercise has investigated the topography of the Fairlight catchment and the overland pathways that could be impacting on the sewerage system. The natural flow paths of the catchment drain flows from west to east, with the two lowest flow channels following the routes of the Marsham Sewer tributaries. These tributaries run parallel to Lower Waites Lane and Waites Lane.

Residents have reported and provided evidence of the overland pathways that occur from Wakehams Field through Leather Waggon to the watercourse that lies along the border of the property. These flows are understood to originate from a manhole within the field. These flows have led to erosion of the watercourse bank alongside Leather Waggon; some repair work has taken place with Gabion baskets being installed to reinforce the bank line.

Residents have reported that wastewater flows spill out of the manholes within Lower Waites Lane during wet weather events and pass overland, via the highway, to the watercourse that runs parallel to the lane, leading to pollution of the watercourse occurring.

Stream Lane becomes flooded during heavy rainfall and the overland highway flows struggle to re-enter into the watercourse at the downstream end of the highway.

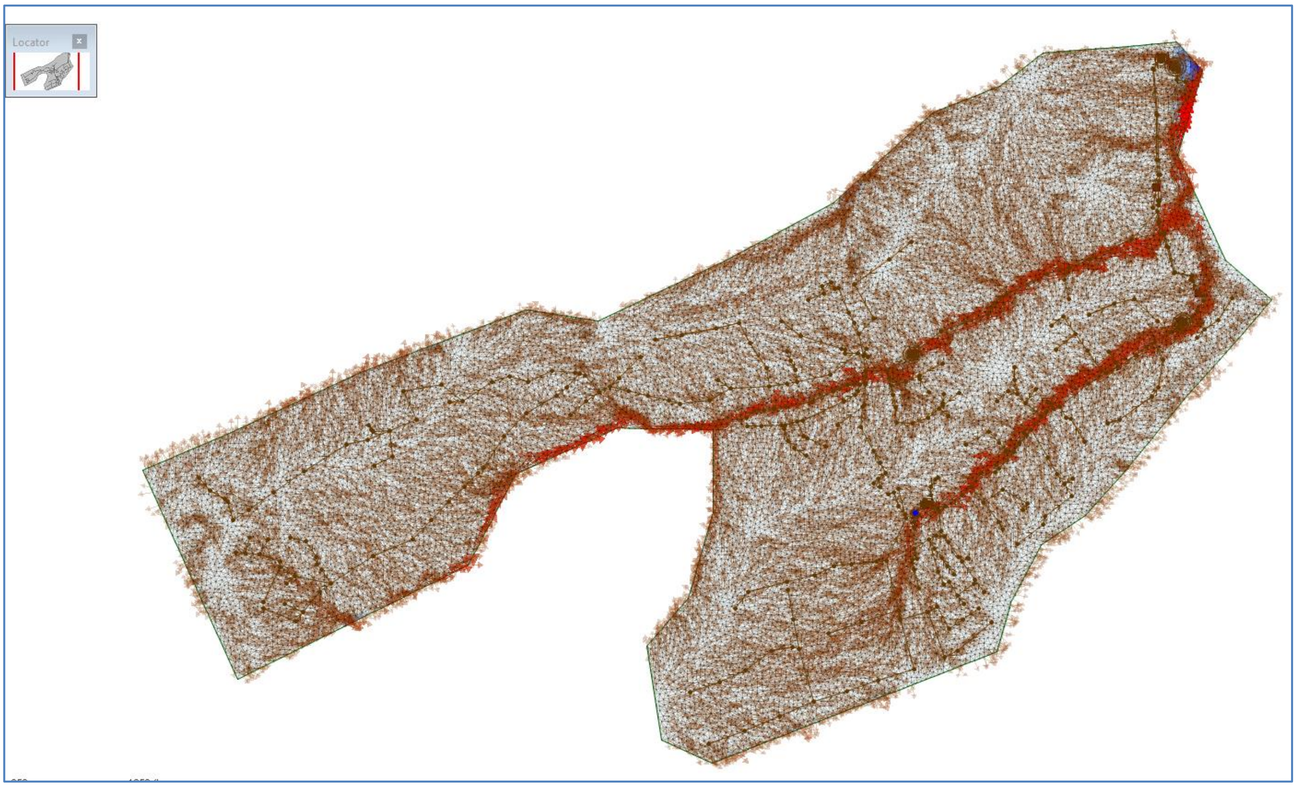

Figure 23 – Overland Flow Pathways

A hydraulic assessment of the catchment has concluded that there is not significant natural runoff from the fields surrounding the residential areas of Fairlight. LowFlows is a decision support tool designed to estimate flow regimes in ungauged catchments. The software uses hydrological models and specific catchment characteristics to calculate annual and monthly flow values.

A LowFlows assessment has been completed on six areas affecting the drainage boundary to provide annual average flow rates for the catchment. This assessment has established that the average flows are less than 6l/s, with a maximum flow of 12l/s. The QMean value details the average flow rate in cubic metres for the area analysed across the assessment duration and the Q95 value details the flow in cubic metres that was equalled or exceeded for 95% of the assessment duration. The maximum QMean value is the largest monthly flow rate calculated across the outputs; for all six areas this was the January flow rate.

Area	Basin Size (km²)	Maximum Ntrl QMean (m³/s)	Annual Average Ntrl QMean (m³/s)	Annual Average Ntrl Q95 (m³/s)
1	0.52	0.012	0.005	0.000
2	0.37	0.009	0.004	0.000
3	0.12	0.004	0.002	0.000
4	0.40	0.012	0.006	0.000
5	0.14	0.004	0.002	0.000
6	0.14	0.004	0.002	0.000

Table 2: LowFlows Outputs

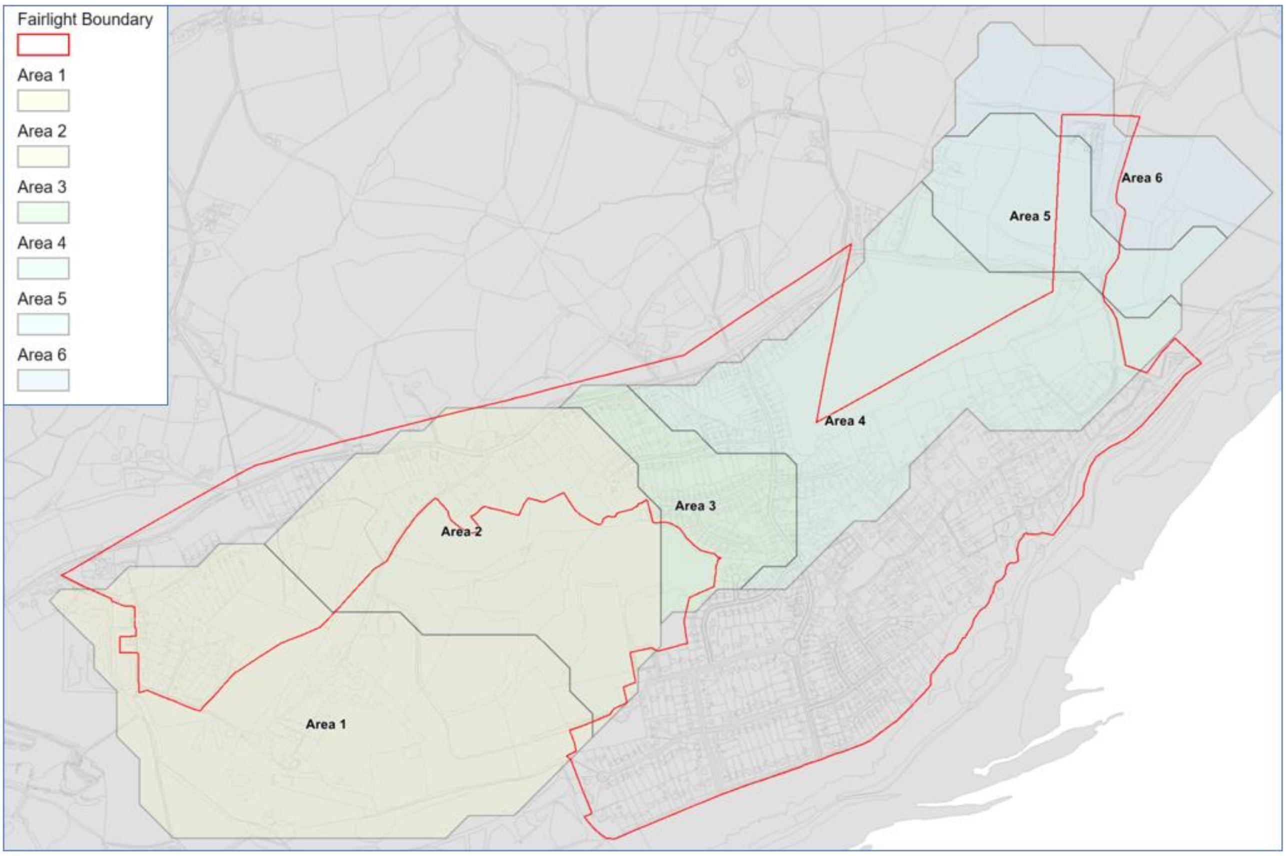

Figure 24 – LowFlows Assessment Areas

3.4.3 Actions and Investigations

Rural runoff can be reduced and managed via Rural Sustainable Urban Drainage Systems, (RSuDS). RSuDs, including elements such as swales with or without barriers, retention ponds and basins, can be utilised to convey runoff whilst reducing volume and velocity.

Manholes located along the overland pathways in Waites Lane and Lower Waites Lane can be sealed to remove the prospect of overland flows entering the sewer system via the manhole covers.

Overland highway runoff can be controlled and managed via a highway drainage system; this system should include gullies and pipework to collect and convey the flows, discharging to the nearest watercourse. Several of the roads in the catchment are steep and will convey the highway flows quickly; if these flows are entering the sewerage system, via gullies or manhole covers, they will raise the top water level immediately after rainfall has occurred increasing risk of the system being overwhelmed. Using other highways elements, such as the camber of the road and speed humps to reduce flow velocity and control how the flows reach the gullies, sewers, or watercourses could manage the timing that these overland highway flows reach the downstream collection systems to reduce their impact.

Regular maintenance of drainage ditches is vital to ensure the natural flow pathways have maximum capacity to convey flows. If the capacity of these natural elements is reduced, the water could overtop the banks and find another route, which could affect properties and highways. Formalisation of the drainage ditches, via culverts or manmade banks, could provide a more robust structure for the flows; these channels could also incorporate control measures such as orifices or drainage beds to reduce velocity and encourage infiltration into the soil.

See Section 4.0 for specific proposals.

3.5 Pipe Crossings

Pipe crossings are a means for running a pipeline over a river or another obstacle. Pipeline crossings are generally only installed where the typical conventional methods of construction are not possible. The pipeline crossing could be utilised on the clean water or the wastewater network.

3.5.1 Risks

Pipe crossings over watercourses can cause restrictions to the flow pathway of the watercourse it is located within. As the top water level in the watercourse rises, the pipeline crossing the waterbody will act as a dam structure and slow the flows and further increase the water level upstream of the obstructing pipeline.

The pipeline crossings will collect debris, that would otherwise continue in the flow downstream. If the debris is left uncleared, the flow of water will slow down leading to further deposition of debris and an increase in top water level upstream of the obstruction location. If unmaintained this cycle will continue with more debris deposition, further velocity reductions and increased top water levels which could lead to overtopping of the banks of the watercourse and flooding of nearby properties and highways.

If the pipeline crossings suffer from defective joints or any structural defects, the asset could allow flows to infiltrate into the system and increase top water levels and risks of flooding and sewer overflow discharges. If the pipeline crossing is on the clean water system, then there is the possibility of the water supply becoming contaminated from the flows infiltrating in and causing disruption to the water supply. There is a possibility of flows within the asset exiting the pipework through the defects and spilling into the watercourse or obstacle that it is passing over; this could lead to pollution of the watercourses.

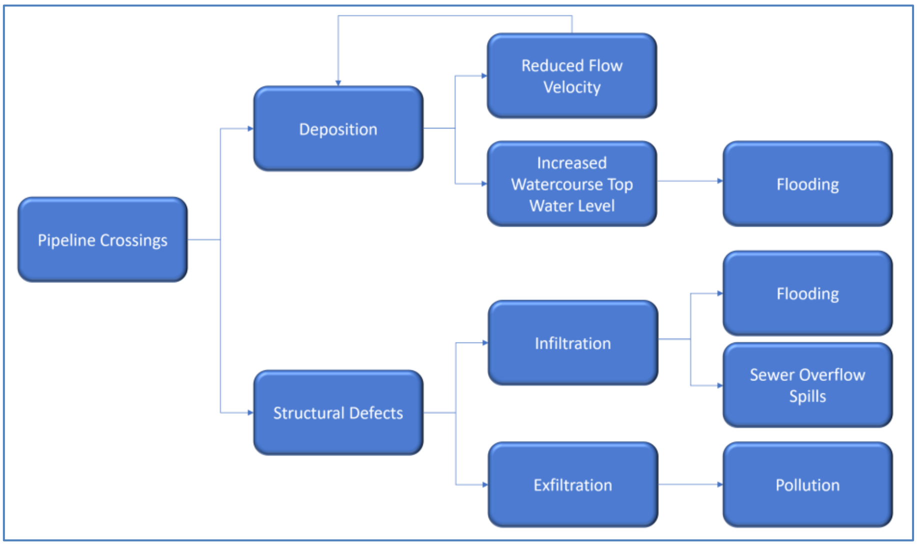

Figure 25 – Pipeline Crossing Risks

3.5.2 Fairlight Findings

There are several pipeline crossings within the Fairlight catchment, some of these crossings are on the wastewater network and some are the clean water supply for residential properties. The pipeline crossings are located along Waites Lane, Lower Waites Lane and within the Leather Waggon property boundary. There are other potential locations where the sewer network and the watercourse are crossing one another, but these locations need confirmation on whether these crossings are over or underground.

Figure 26 – Pipeline Crossing examples within Fairlight[16]

One of the main water supply pipes is located under Stream Lane, which regularly is overwhelmed by runoff and watercourse flows. This disrupts water supply to residential properties.

3.5.3 Actions and Investigations

Regular watercourse maintenance could ensure any debris caught on the pipeline crossings was removed in a timely manner to ensure there were no negative impacts on the upstream sections of the watercourse and top water levels.

Surveying the pipeline crossing assets to confirm any structural degradation to ensure there are no locations where flows may be able to infiltrate into or exfiltrate out of the assets.

Removal of the pipeline crossings is an option and would reduce the risks of debris, increased watercourse top water levels and velocity reductions associated with the assets. The assets could be replaced with inverted siphons to remove the overground pipework; however, these types of assets can also cause issues.

The watercourse could potentially be made deeper to provide a larger cross-sectional area for the flows to pass through the catchment. The deepening of the stream could provide more freeboard between the top water level and the pipeline crossings to enable the flows to pass underneath freely

[16] Photographs courtesy of M Sullivan

Liaison would be required with the clean water departments for any actions required on the mains supply network that cross the watercourses within Fairlight.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.6 Groundwater and Infiltration

Groundwater is the water found underground in the cracks and spaces between soil particles. The groundwater is derived from rainwater and snow melt percolating through the ground surfaces. Groundwater infiltration is the process by which groundwater finds its way into the underground sewerage network. Small leaks, openings, defective joints and cracks are the main causes for infiltration.

3.6.1 Risks

The sewer systems have been designed to mainly convey wastewater flows, therefore any additional flows entering the system have the potential to overwhelm the network. The additional flows can result in surcharge of the network, raising the top water level leading to flooding of highways and properties. The increase in top water level can lead to overflows discharging to the watercourse. If the infiltration experienced in the system is significant, it could lead to overflow discharges during dry weather.

Infiltration flows could also result in the Wastewater Treatment Works being overwhelmed due to the increased flow volume reaching the site and going through the treatment process. The increase in flows could lead to the WTW spilling to the storm tanks prematurely and an increase in spills to the environment. The WTW becoming overwhelmed could lead to backing up in the main sewer network upstream of the WTW, surcharging the system and raising the top water level. An increase in top water level will increase the flooding and overflow risk for the catchment.

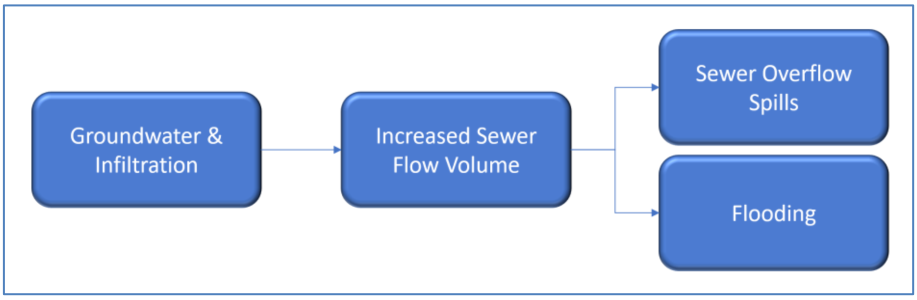

Figure 27 – Overland Flow Risks

3.6.2 Fairlight Findings

Fairlight Wastewater Treatment Works (WTW) and Flow to Full Treatment (FTFT) data has been analysed for the last five years 2017 to 2022. The data shows there is a trend for an increase in the base flows reaching the WTW in the early part of the year, signifying that there may be some infiltration experienced within the catchment. The WTW operations team have confirmed they can see a darker effluent after rainfall and high flows but have not identified the cause of this change; they have assumed there to be infiltration within the network.

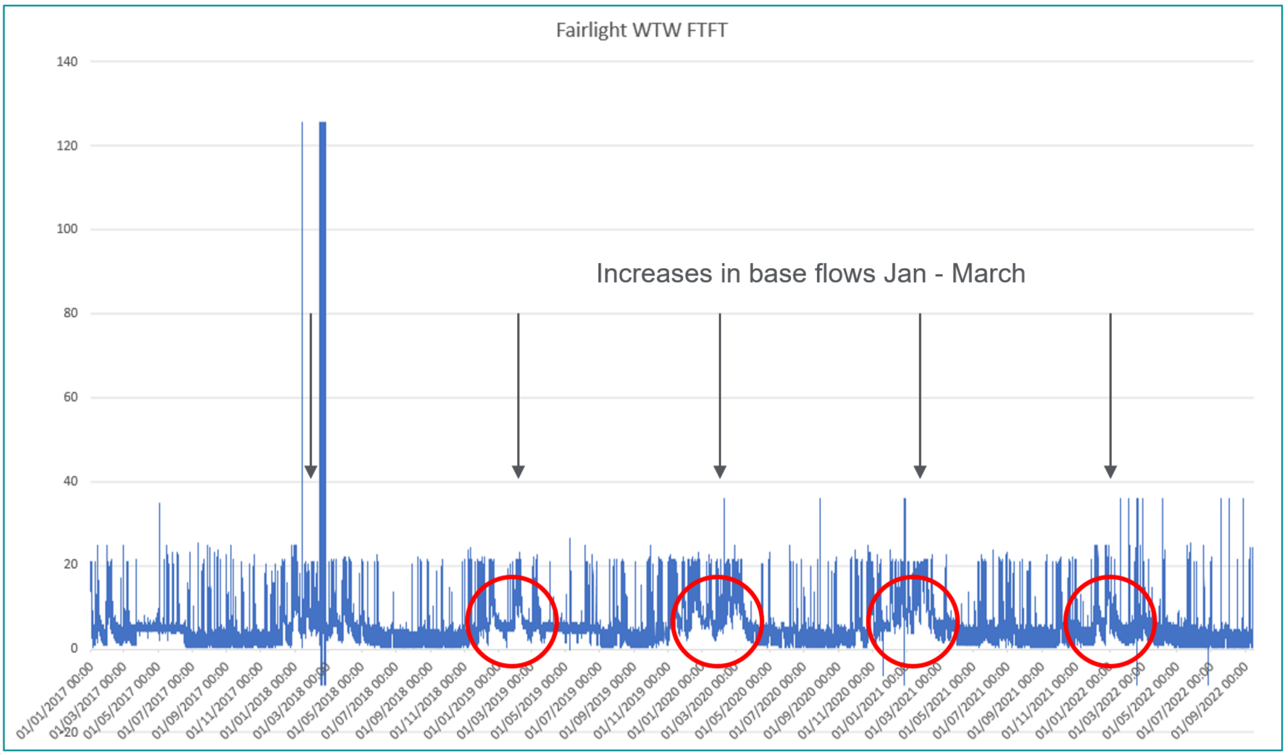

Figure 28 – Fairlight WTW FTFT Data

Assessments have been completed for the catchment storm overflows to understand the drivers for the spills at each location and to confirm whether infiltration has an impact on the overflow performance. The assessment at the treatment works indicates that there is infiltration experienced in the system during the winter months, but infiltration does not appear to be a significant factor at the catchment storm overflows.

Figure 29 – Storm Overflows - StormHarvester Assessment

A Geo-Environmental assessment was completed by Land Science for the Wakeham's Farm 45-property development on Pett Level Road. The report details hydrogeology assessments whereby groundwater levels within boreholes/trial pits were between 1.5 and 2.16 metres below ground level; the borehole locations were not available within the report. The conclusion of the report stated the extent of groundwater was not considered to be onerous. A previous report for the 150-property development included a historical borehole, TQ81SE5, that recorded a standing water level of 14.32 metres below ground level; this reading was dated from 1950. The 150-property development report commented that the site area was heavily saturated and boggy during the site walkover in January 2018. The conflicting information in the reports should be further assessed and confirmed.

Historical CCTV survey has been obtained and there are locations where running infiltration has been discovered in Heather Way and Rockmead Road. The CCTV analysis located defective assets across the catchment with cracks and fractures evident; any asset with a defect increases the chances of infiltration flows entering the system. Maintenance may have already been completed on historical CCTV findings where the structural grade of the assets were found to be a risk but there may be other areas of the network that are at risk of infiltration due to defective pipework and manholes.

Fairlight has coastal protection schemes in place to slow the erosion of the coastline and lower the groundwater levels. Rother District Council have installed a rock bund at the base of the cliff as well as a groundwater control system to reduce groundwater pressures that were affecting the stability of the cliff. There are 56 wells installed along Rockmead Road, at the top of the cliff. These wells penetrate down through the unstable clays, silts and sands and collect the ground water, expelling it either by gravity down the cliffs or into a smart ditch, or by using the compressor house to force the groundwater up to an outfall. All water from this system exits via the cliffs and no water should find its way back into the ground. The system is currently operating and the groundwater levels have been controllably lowered, reducing the water pressures within the slip planes and helping to stabilise the slopes.

3.6.3 Actions and Investigations

Electroscan surveys can be carried out to identify structural defects in the pipework. An electrode is passed through the pipe measuring the variation in electrical current through the wall of the pipe. Where the pipe is structurally sound, the electrical current received at ground level is low but when there is a defect, a much higher current is recorded at ground level. The amount of current received at ground level provides an indication on the size of the defect. This technology has been used in other catchment areas and provides confidence into whether a pipe is structurally sound or defective and at risk of infiltration.

CCTV surveys can be carried out to locate any defects and points of infiltration within the network. CCTV surveys provide clear footage inside the sewer network, alongside detailed reporting that pinpoints all structural defects, depositions, root intrusions and infiltration within the assets.

Depth assessments to assess the likelihood of a pipe to suffer from infiltration. There must be groundwater surrounding a pipe for it to experience infiltration and therefore the depth of the pipe is a key factor in the likelihood of infiltration occurring. Public sewers tend to be deeper underground than private sewers and therefore public assets are more likely to be affected by groundwater infiltration. The public sewers within the Fairlight catchment range between 0.2m and 7.2m depths; with over 80% of the sewers being at a depth of 2m or less. Borehole data for the area has been requested from the Environment Agency and East Sussex County Council. The available data shows that there are areas of Fairlight where the depth to the water table is less than three metres; these areas are around Lower Waites Lane, Waites Lane and the coastline.

Figure 30 – BGS Borehole Data[17]

Temperature sensors could be utilised to track temperature within the sewer network with values taken every six minutes. Foul flow tends to be warm, and infiltration is typically of a lower temperature of around 9 to 12 degrees Celsius, therefore an assessment can take place using the temperature sensor data to confirm infiltration in the network.

The temperature sensors should ideally be positioned across the catchment and be in situ between December and April to capture temperature changes due to infiltration. The temperature data should be analysed alongside rainfall data, river level data, address point data and traditional lift and look surveys to identify areas of the network that are experiencing infiltration.

Southern Water's Sewer Level Monitoring (SLM) programme could be used to locate areas of infiltration as over time the monitors would provide information on longer term trends within the sewer network. Summer levels could be compared to winter levels to confirm any locations where there is an increase in levels during the winter months, which is an indication that infiltration is occurring.

Confirmed infiltration locations can be sealed to reinstate the structural integrity of the asset. The traditional method for sealing sewers is to install leak tight liners into the public sewers, made either from an epoxy or a silicate-based resin. These liners have been tested against 5m head of water and have a design life of at least 50 years. Manholes can be sealed

[17] Data provided by East Sussex County Council

separately using a spray lining from the inside or stitch drilling and injecting a resin into the ground surrounding the manhole to make it watertight.

Infiltration locations could also be sealed using Tubogel, a newer technology from Germany, that uses two silicate-based liquids. The liquids are installed by filling the network with each in turn, allowing the liquids to find and fill all the pipe defects. Once the second liquid is pumped out, the pipe is sealed. This type of sealant would allow for private and public assets to be repaired at the same time; this could be a suitable solution should the infiltration be located on both the public and private assets.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.7 Pitch Fibre Pipes

In the UK, pitch fibre pipes were commonly installed from the 1950s through to the 1970s, connecting properties into the main sewerage system. The pipework was installed due to it being lighter and more cost effective than the alternative clay pipework. The pipe materials were a mixture of a wood cellulose and an inert coal tar pitch and were deemed a suitable drainage option for residential and commercial buildings.

3.7.1 Risks

Pitch fibre pipework does not cope well with today’s drainage needs. Current drainage systems process a significantly higher volume of water than they did decades ago. When vast quantities of hot water pass through pitch fibre pipes on a regular basis, it causes bubbles to form in the fibre itself. Furthermore, the presence of oils, fats and grease can have a significant destructive effect on the material compared to more modern drainage pipework. The lifespan of pitch fibre pipes is estimated at approximately 40 years; therefore, any remaining pitch fibre pipework is likely to be at risk of collapse or deformation.

When the pitch fibre fails, it can lead to blockages on the sewer line, potentially leading to internal flooding of properties and restricted usage of bathrooms and internal domestic appliances. There is an increased risk that where the pitch fibre pipework has collapsed or deformed these areas could provide opportunities for infiltration into the system to occur. This infiltration would increase the flow volumes within the sewer system; this flow increase could add to the risk of flooding in the network and increased risk of the overflows in the catchment discharging to the watercourse.

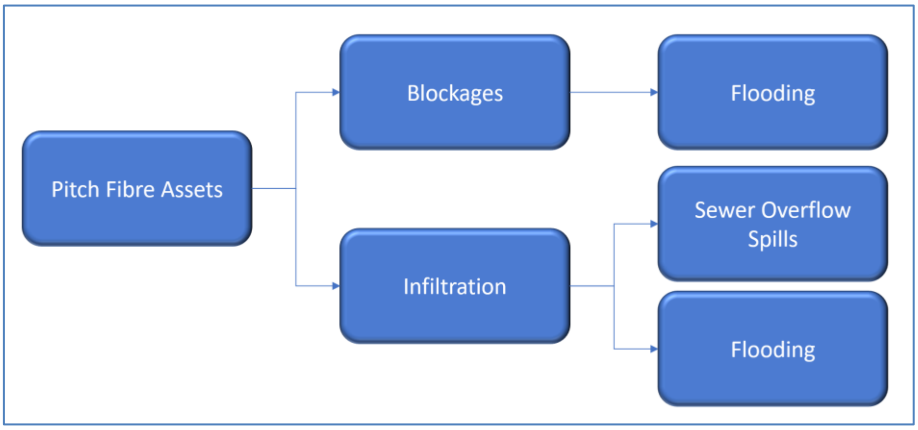

Figure 31 - Pitch Fibre Risks

3.7.2 Fairlight Findings

The desktop exercise has located entries within the Southern Water maintenance system that have confirmed pitch fibre pipework at properties within the Fairlight catchment. These pitch fibre locations have been confirmed via visits by network operations teams due to blockage or flooding issues at the properties; all these locations have had repairs completed.

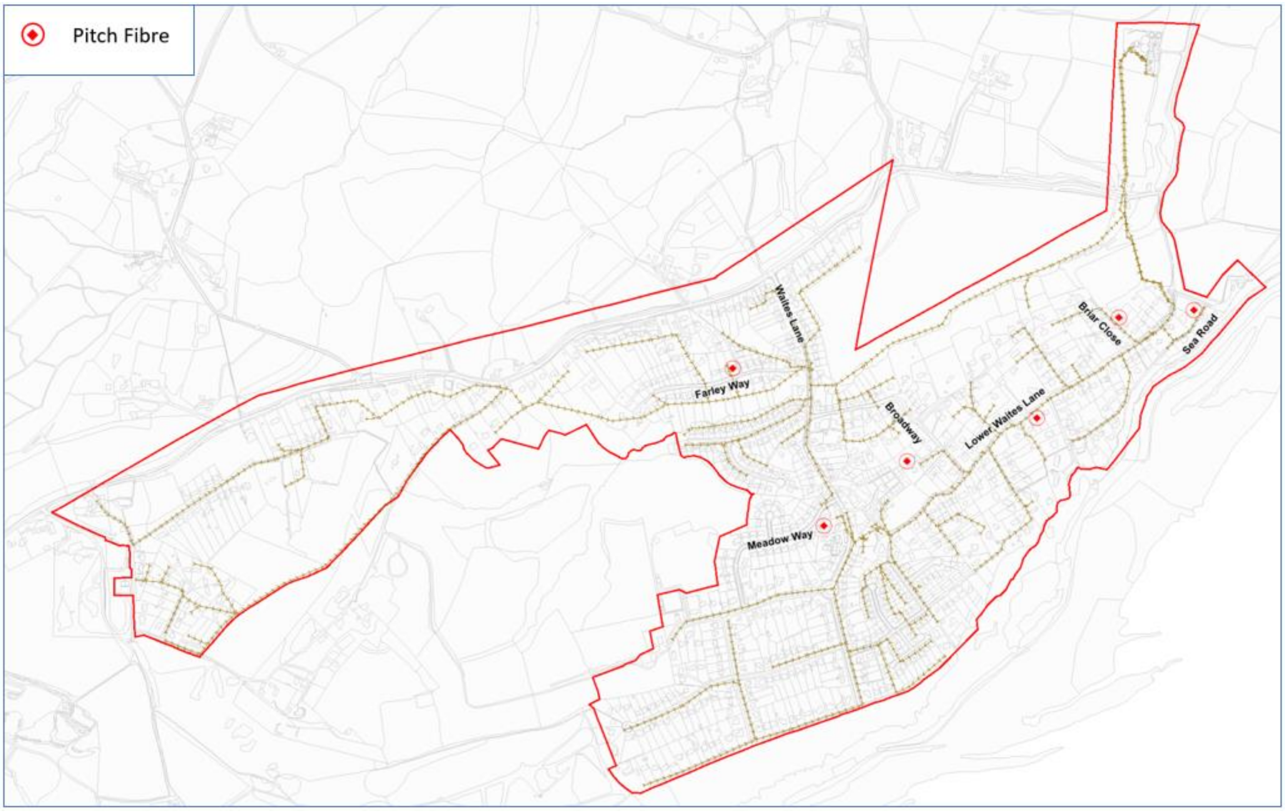

Figure 32 - Pitch Fibre Locations in the Catchment

3.7.3 Actions and Investigations

Investigate the catchment for additional pitch fibre locations and assess their existing condition to confirm the level of risk posed by these assets. These initial investigations would confirm the number of pitch fibre assets there are in Fairlight, whether these assets are on the private or public drainage system and enable a repair schedule to be developed.

The initial areas to investigate would focus on the roads where pitch fibre pipework has been located previously and areas of the catchment that were developed between 1950 and 1970. CCTV and manual inspections of property connections would be utilised to locate any further pitch fibre pipework and confirm their current condition and determine the associated risk to the drainage system. Private drains are owned by the property owner and their maintenance is the responsibility of the property owner. The maintenance of public sewers, and lateral drains serving more than one property, is the responsibility of the water company.

Figure 33 – Drainage Definitions and Responsibilities

Any damaged pitch fibre pipework would require repair to enable the flows to convey from the property to the sewer without issue. Liners can be added to the pipe to reform and reshape the pipe and to increase the strength of the asset. Once the liner has been installed and has set, the drainage will be reinforced and will no longer present the problems that a standard pitch fibre drainage system brings.

For significantly damaged pipework and collapses, replacement of the asset may be the appropriate solution which would involve excavation work and would be a more intrusive task than lining the asset.

Whilst the investigation to locate the pitch fibre pipework is implemented, the customers can help to reduce the risk of deterioration to these assets by reducing the fats, oils and greases disposed of into the sewer system. Customer information leaflets can be distributed across the catchment to provide advice on disposing of these items.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.8 Connectivity

The desktop exercise and site visit have located some areas of the Fairlight catchment where the connectivity of the sewers is not fully understood and requires clarification.

3.8.1 Sewer Connectivity Queries

It is unclear whether the highways within the catchment are connected into the sewerage network. Data from East Sussex County Council has confirmed where drainage pipes, soakaways and gullies are located, but the downstream connectivity of these assets is unknown. Connectivity surveys, such as sound and dye testing can be utilised to confirm the downstream connections to understand where the highways and footpaths are impacting on the flows within the sewerage system.

The connectivity at Leather Waggon includes acute angles of connection and stepped invert levels that could be causing sedimentation, loss of flow velocity and surcharging. Full manhole and connectivity surveys are required at this location to establish the exact layout of the sewer network so that network optimisation can be investigated to improve the hydraulics of this area.

There are two sewer lengths, located to the northwest and southeast of the Leather Waggon property, which previously had CCTV carried out in 2007. There doesn't appear to be any properties upstream of these two sewer lengths as they are located across fields, therefore it is unclear what the sewers are draining or if they are still in situ. The sewer from the southeast could be the connection in waiting for a proposed extension at Leather Waggon; the extension has yet to be built but confirmation that this sewer is not conveying any flows would be required.

There are two sewer branches modelled from the Leather Waggon area and connecting to Fairlight WTW. During the site visit it was mentioned that the sewer branch to the west was abandoned and no longer in use; the abandonment of this sewer branch needs to be confirmed.

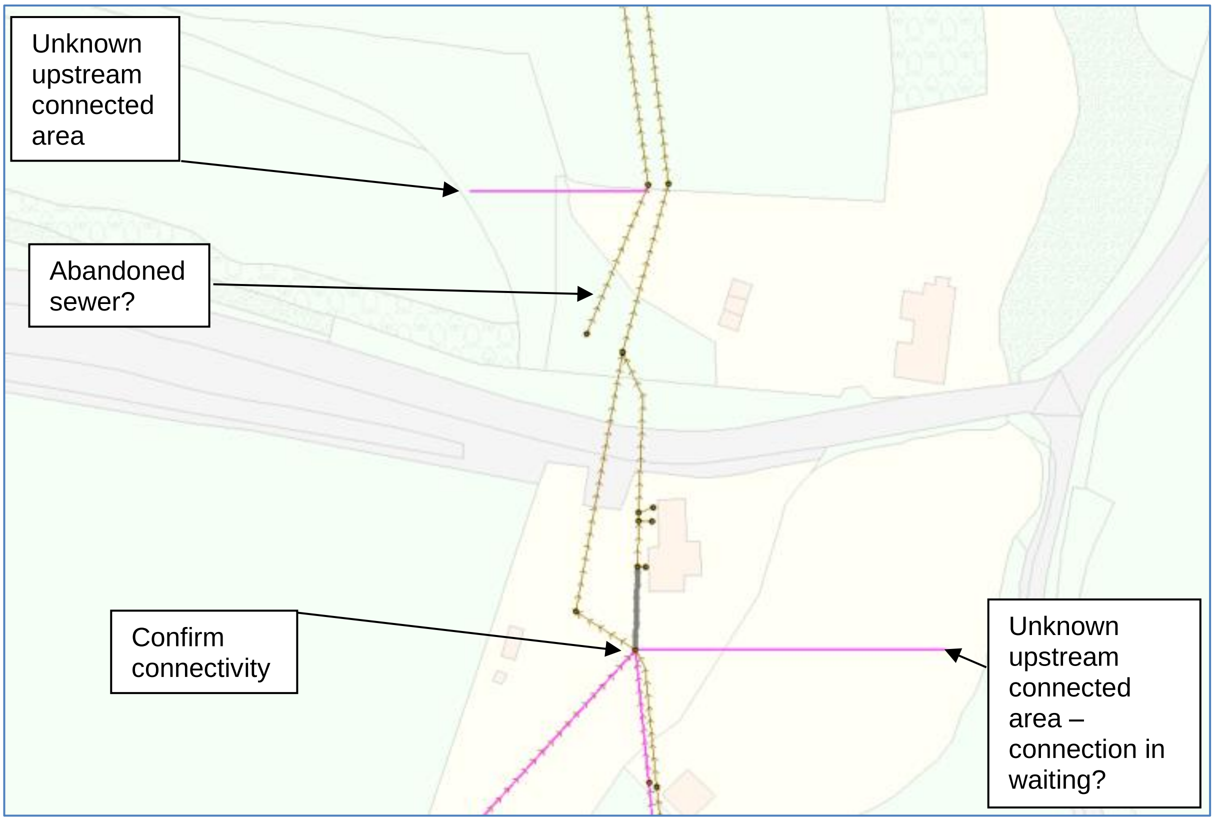

Figure 34 – Leather Waggon Connectivity Queries

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.9 Network Optimisation

There is an existing storm tank within the Fairlight catchment, located at Lower Waites Lane No. 1 CSO. The storm tank operation is controlled via a penstock actuator on the continuation sewer within the overflow site. This penstock controls the spills to the storm tank by limiting the pass forward flows continuing along Lower Waites Lane to approximately 12l/s; the flows greater than 12l/s will spill to the storm tank and either return to the main sewer network when capacity is available or otherwise spill to the watercourse via the outfall. Available telemetry data for the actuator showed no change in operational status and therefore it is assumed that it is open in a set position to limit the flows at a continuous rate.

Investigations into the storm tank operation and the pass forward flows could identify if there is an opportunity to optimise the tank and its' operation. A sewer level monitor could be used to identify when Lower Waites Lane is overwhelmed and therefore reduce the flows passing through the penstock to protect Lower Waites Lane from being overwhelmed and flooding out of the manholes. This same monitor could help manage the flows returning into the Lower Waites Lane sewer, to ensure they are held back until there is capacity downstream.

The limitation of flows passing into Lower Waites Lane would increase the spills to the tank and therefore could lead to an increase in overflow operation. The tank itself can be investigated to ensure it is filling before any spills to the environment occur and an MST could be implemented to ensure all storage capacity is available at the tank.

There could also be further investigation to understand if there was scope to increase the size of the storage available at the site and whether it would provide significant benefit to managing the flows draining towards Lower Waites Lane.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

3.10 Infrastructure Changes

The majority of the sewers within Fairlight are smaller diameter 175mm assets; these assets would have been designed to convey wastewater flows and not to accommodate significant rainfall and surface water runoff from the local surfaces. Calculations predict the capacity of the sewerage network is large enough to convey the wastewater flows generated within the catchment.

Alongside the wastewater flows, there may have been an increase in rainfall runoff entering the system either from misconnections, damaged assets, groundwater, or highway drainage. Additional flows could be the result of urban creep, whereby the amount of impermeable area in the catchment increases due to property extensions and new driveways, leading to more surface runoff. Infrastructure changes, including pipe upsizing or relief sewers, where the hydraulic incapacities are located could be a potential option to convey these additional flows whilst reducing the flooding and storm overflow spill risks.

Network optimisation could investigate any other areas where a storage tank could be utilised to manage flows through the network and areas of the network that would benefit from pipework upsizing. Another network optimisation investigation could locate any areas of the network that have spare capacity where flow could be held back via control gates and smart network controls during the peak of the rainfall events. The flows could be held back in upper branches of the system to enable the overwhelmed assets to convey the flows through to the downstream network; once the downstream network has available capacity, the control gates would release the upstream flows gradually through the system. Controlling the flows from the upstream areas of the network would help to control top water levels within the system, providing a reduction in flooding and overflow risks.

See Section 4.0 for specific proposals for the next steps in the Fairlight catchment.

4.0 Catchment Actions Overview

4.1 A Staged Approach

A staged approach is being undertaken to the pathfinder project which allows for some low-risk interventions and pilot schemes to be identified quickly, whilst further modelling and investigations take place, providing confidence and to ensure the catchment is fully understood and risks can be managed for larger interventions.

Learning from the Pathfinders will also help to inform Southern Water's regional plan to reduce storm overflows across the operating region.

The staged approach is described below:

Stage	Description
Stage 0	Initial surveys and study with identification of early 'no regrets' low risk interventions and any additional surveys and modelling requirements
Stage 1	No regret interventions, further surveys and small trials (SWS and partner organisations)
Stage 2	More complex interventions and scaled pilots (SWS and partner organisations)
Stage 3	Larger scale investments to achieve pathfinder outcomes (SWS and partner organisations) • Model updates • Large Scale interventions

Table 3: Pathfinder Staged Approach

4.2 Interventions

The key to reducing these highlighted risk factors is either by reducing the volume of rainwater getting into the sewer or increasing the sewer's ability to cope with it. To that end we have split this into four main types of intervention to reduce the risk of flooding and storm overflow use:

- Operational interventions
- Upstream source control (removing and slowing the flow of rainwater)
- System optimisation (making better use of the existing infrastructure)
- Infrastructure enhancements (build larger infrastructure)

Following the desktop investigation into Fairlight, several Stage 0 & Stage 1 activities have been identified to improve the performance of the network in the short term. Some sewer maintenance actions have already been implemented or have been scheduled for completion before the end of the year.

- Pipeline crossings checked and no obstructions found
- AFDs at Leather Waggon re-mapped and MSTs set up
    - Request for AFDs and pipeline crossings to be inspected at the same time
- Field manhole replacement for completion by end of October 2022
- CCTV survey across Wakehams Field complete
    - Lining repairs scheduled for completion by end of October 2022
- Riverbank repair works scoped w/c 17/10/2022
- CCTV and line cleaning of Leather Waggon sewer complete
    - Data review by end of October 2022
- Storm tank at No. 1 CSO cleaned

In the longer-term Stage 2 & 3 investigations, modelling and potential interventions have also been identified. Decisions about progressing stage 3 options are contingent on assessment of the effectiveness of the stage 1 and 2 options and considerations of funding.

Several survey activities have been identified for the catchment to confirm interactions and contributions from the attributes detailed in Section 3. These survey activities include CCTV of key assets to confirm structural condition, survey scoping, initial rollout of property surveys to confirm existence of pitch fibre assets and roof drainage connectivity, highway drainage connectivity surveys and wider catchment surveys if required.

Stage	Contributing Factor	Intervention	Cost	Timescale	Risk	Value	Score
Stage 0	Sewer Maintenance	Complete repairs identified in Waites Lane CCTV	L	< 6 months	L	L	4
	Sewer Maintenance	Review Maintenance Service Task (MST) programme for the catchment & agree updates as required	L	<6 months	L	L	4
	Overland Flow	Review residents' photos & video of overland runoff	L	Before 2025	L	L	5
	Overland Flow	Seal manholes located in the overland flow routes along Waites Lane and Lower Waites Lane	L	< 6 months	M	L	5
	Sewer Maintenance	Reseal/replace MHs in the field	L	< 12 months	M	M	6
	Overland Flow	Develop a ditch/watercourse maintenance plan and monitoring plan.	L	< 6 months	M	M	6
	Pitch Fibre Pipes	Customer FOG Campaign	L	< 6 months	L	H	6
	Highway Drainage	Gully Maintenance	L	< 6 months	M	H	7
Stage 1	Sewer Maintenance	MST in assets where connectivity causes sedimentation	L	< 6 months	M	L	5
	Network Optimisation	SLM monitoring and machine learning	L	< 6 months	M	M	6
	Groundwater & Infiltration	Catchment analysis including pipework depth assessments and borehole data	L	< 12 months	L	M	6
	Overland Flow	Implement the ditch/watercourse maintenance plan and any additional actions resulting from the monitoring.	M	< 6 months	M	M	7
Stage 2	Pipeline Crossings	Design improvements to reduce debris catching on assets.	L	< 12 months	L	L	5
	Network Optimisation	Storage tank monitoring	L	< 12 months	M	L	6
	Sewer Maintenance	Repair defective assets (e.g sealing)	M	Before 2025	M	L	7
	Sewer Maintenance	Targeted maintenance depending on SLM data	L	< 12 months	M	M	7

Stage	Contributing Factor	Intervention	Cost	Timescale	Risk	Value	Score
	Pipeline Crossings	Repair defective pipeline crossing assets	M	< 12 months	M	L	7
	Groundwater & Infiltration	Review data collected and SLM Monitoring - consider temperature sensors if a major infiltration issue is discovered.	L	< 12 months	M	M	7
	Network Optimisation	Update model and review impact and scope improvements (dependent on Stage 1 findings)	M	Before 2025	M	L	7
	Network Optimisation	Storage tank optimisation modelling	M	Before 2025	M	L	7
	Pitch Fibre Pipes	Repair defective pitch fibre public assets	M	< 12 months	L	H	8
	Highway Drainage	Design and delivery work for high priority schemes (highway surface water management).	M	Before 2025	H	M	9
Stage 3	Pipeline Crossings	Potential to invert pipeline crossings if issues still arise	M	2025+	L	L	7
	Overland Flow	Remodelling and modifications of the watercourse if required	H	Before 2025	M	L	8
	Sewer Maintenance	Replace defective assets (if required)	H	Before 2025	H	L	9
	Highway Drainage	Design and delivery work for schemes (highway surface water management).	M	Before 2025	H	M	9
	Pitch Fibre Pipes	Replace defective pitch fibre public assets (if appropriate)	M	< 12 months	M	H	9
	Network Optimisation	Control gates	M	2025+	H	M	10
	Network Optimisation	Deliver modifications around Leather Waggon	H	2025+	H	M	11
	Network Optimisation	Utilise the abandoned 300mm sewer downstream of Leather Waggon	H	2025+	H	M	11
	Infrastructure changes	Changes could include new storage tanks, pipework upsizing, new asset modelling, new surface water system discharging to the sea	H	2025+	H	H	12

Table 4: Fairlight Actions and Investigation Plan

5.0 Partnership and Community Working – What can you do to Help?

"Water companies are not solely responsible for stormwater management; they are one of many organisations involved in ensuring communities stay protected. The change in the weather is testing all sectors of UK society, and we are all moving towards changes in population and in weather conditions that we have never before had to plan for"[18].

To achieve what is needed, utilities, councils and communities need to work together to achieve mutual benefits. Southern Water have committed to doing this by engaging with our partner organisations and the community to solve the problems.

So what can the community do?

5.1 Support Further Investigations for Fairlight

We are interested in time and date stamped photos and videos to help us understand how the Fairlight catchment reacts to rainfall. With time and date stamped evidence, and a clear location, we can match this information with other information to better understand how the whole system interacts. This includes:

- Photos and videos of overland flow.
- Photos and videos of flooded areas.
- Photos and videos of the level of the surface water ditches.
- Reporting blocked highway gullies to ESCC.

5.2 Protect the Pumping Stations, Foul and Combined Sewers

Fat, oil and grease[19]
Fat, oil and grease often ends up being washed down the kitchen sink. Over time, they harden to a concrete-like material and restrict the flow of wastewater in the pipes or even block them. These blockages can cause wastewater to back-up through toilets and sinks into homes and businesses, or escape through manholes into streets and rivers

Unflushables[20]
Items such as wipes, nappies and cotton buds are the scourge of the sewers - they create blockages, cause flooding in homes and damage the environment. Every year in England and Wales water companies deal with over 300,000 blockages – thousands of which see people's homes and belongings ruined by sewer flooding. Wastewater companies are still spending around £90 million each year clearing blockages nationwide, while damage to the environment by the plastics used in unflushable items has become a real focus.

[18] 21st Century Drainage Programme – the context, Water UK
[19] Fat, oil and grease (southernwater.co.uk)
[20] The Unflushables (southernwater.co.uk)

Southern Water sewers are only designed to take away the three Ps – pee, poo and paper.

In the kitchen, follow our top tips to avoid fat, oil and grease building up in the sewer.

- Use containers – butter tubs, yoghurt pots or jam jars can all be used to collect cooled fat and oil – then just put them in the bin
- Clear your plates – scrape any leftover food or grease and fat residue from plates, pans or cooking utensils into the bin before washing up
- Bag it and bin it – put a bin in your bathroom for anything that isn't pee, poo or paper. Perhaps use scented nappy sacks or dog poo bags (degradable if you can) to throw away any nappies, sanitary items or condoms.
- Compost your food waste – collect uncooked fruit and vegetable peelings for use as compost in your garden.
- Strain the pain – a simple sink or drain strainer can stop food and hair getting down the pipes.

5.3 Protect Surface Water and Combined Sewer Capacity – Existing Developments

You can help release capacity in the existing sewer systems by using less water, removing surface water connections and slowing the flow

Households

- Install water butts and planters on your property that take the rainwater from your roof and either slow its connection to the sewers or ideally divert it to a soakaway.
- Could you convert your paved, impermeable driveways into permeable surfaces? Southern Water could help advise and support with this type of alteration.
- Try to ensure that existing impermeable surfaces drain to a permeable surface rather than the road or the sewers.
- If possible, disconnect existing drainage from the combined and surface water sewerage systems.
- Report blocked highway gullies and drains asap to ESCC.
- Report blocked sewers to Southern Water.

Target 100[21]

Population growth, climate change, increased urbanisation and environmental protection mean we all need to change how we understand and value water. Target 100 is a commitment by Southern Water to its customers to support them to reduce personal consumption to an average of 100 litres each per day by 2040; while we reduce leakage by 15% by 2025 and 40% by 2040. As well as making sure there is enough water to go round, households could cut their bills, and less water used mean less water going into the foul and combined sewers, creating more capacity.

Community, businesses, developers & partnerships

Engage with SWS, ESCC, RDC and other partners to identify areas for surface water removal, ownership and maintenance. As described in earlier sections there are multiple benefits that can be achieved for the whole community.

[21] Target 100, together let's hit target 100. (southernwater.co.uk)

5.4 Protect Surface Water and Combined Sewer Capacity – Future Developments

Households

- If you extend your house or create additional roof areas (urban creep) if possible, make sure these drain to a soakaway or surface water system or consider green roofs.
- If developing your drive or garden, could you install permeable paving rather than connect to the surface water system or drain to the highway system.
- Avoid misconnections - misconnections can happen during work to extend or improve a house, when a new house is built or simply when a new appliance is plumbed in. If any of your plumbing drains to a surface water sewer, the wastewater will pollute local watercourses. Similarly, if clean water drains are misconnected, they can overload the foul sewer and lead to flooding. It's the homeowner's responsibility to ensure there are no misconnections at their property. If you're unsure what to do, you can go to ConnectRight or contact Southern Water directly. Alternatively, for a list of plumbers in your area, visit the WaterSafe website.22

Community, businesses, developers & partnerships

- Ensure new developments are sustainable i.e. they are not connected to the combined sewer. Where possible, also avoid connection to the surface water system to allow rainwater to infiltrate to the water table, increasing the water availability for rivers and streams for biodiversity and for extraction for drinking water.

6.0 Future Sustainable Growth

Southern Water are looking to work with our drainage and surface water management partners, including Rother District Council and East Sussex County Council, at how surface water management can be better considered and incorporated into the sustainable growth plans for Fairlight. These conversations could include areas such as:

- More detailed consultation on specific proposals, including small scale developments
- Support to encourage more use of sustainable urban drainage schemes and nature-based solutions, including upstream ‘slowing the flow’ type measures.
- Ensuring that post construction, the installations comply with the requirements.
- Collaboration to make policies more aligned with sustainable drainage and climate change requirements.

[22] Bad plumbing and pollution (southernwater.co.uk)

7.0 Conclusions

The Fairlight sewerage system was originally designed to convey the wastewater flows and roof drainage from a relatively small village area. Over time, the Fairlight village has expanded, and the sewerage system is now conveying significantly greater flows than originally intended. The network is being overwhelmed by these additional surface water flows leading to property and highway flooding and sewer overflow discharges.

The initial investigations have discovered potential sources where surface water flows are contributing to the sewerage network. These sources will be further investigated to confirm connectivity and whether slow the flow and surface water management techniques can be used to reduce the impact of these flows on the sewerage system or whether there are opportunities to remove these flows from the network completely and discharge them elsewhere.

Targeted connectivity surveys will verify the network layout in key areas and confirm any locations where there is roof drainage connected to the system or any pitch fibre assets that require repair or replacement.

Sewer maintenance activities, such as CCTV and jetting programmes can be systematically scheduled in areas where sedimentation regularly occurs. The use of Sewer Level Monitoring can be used to pro-actively observe and analyse the network performance and drive the maintenance activities.

There may be other areas of opportunity within the catchment, and we will continue to work with our partners, and we look forward to engaging with the community, to identify opportunities that may also provide multiple benefits to the region, such as water resources, water quality, green space and biodiversity benefits.

Appendix A – Fairlight Technical Group

Southern Water have set up a Technical Group with prospective partners so that we can discuss some of the opportunities to manage surface water and rainfall better in the Fairlight catchment.

- TBC – Lead Local Flood Authority
- Nigel Powers – East Sussex Highways
- Nick Claxton - East Sussex County Council
- Nick Mills - Southern Water
- Rob McTaggart - Southern Water
- Penny Green - Southern Water
- Lower Waites Lane – Fairlight Cove Maintenance Association

Appendix B – How does Urban Drainage Work?

B.1 The Development of the Urban Drainage System

Victorian drainage – single pipe solution

The modern built sewerage network began to appear in the mid-19th century. Overcrowded cities had no means to control the disposal of wastewater. Rivers were overloaded and public health was under threat. Over the next 70 – 100 years, thousands of kilometres of sewers were laid. These combined sewers, as we know them today not only took wastewater from homes but also rainfall runoff from paved and roofed area.

Roofs and paved areas (urbanisation) and the provision of artificial drainage, or sewer systems, has a twofold effect on the natural drainage process. Firstly, it reduces infiltration thereby increasing the volume of run-off. Secondly, artificial surfaces, pipes and channels convey run-off more rapidly, making drainage areas more responsive to short duration/high intensity storms. This two-fold effect significantly changes the rates of run-off, by a factor of 10 or more when compared to a natural drainage system.

In addition to the intensification of peak flow, the single pipe system mixes untreated wastewater and surface water runoff. Conveyance capacity and disposal capacity at wastewater pumping stations and treatment works has traditionally been limited such that during heavy rainfall (to protect life and property) storm overflows operate to discharge a mixture of 'clean' surface runoff and screened untreated or partly treated wastewater (see Figure 35).

Early 20th Century drainage - two pipe solution

With the advent of modern sewers and cleaner streets, it became feasible to separately drain the two flows (wastewater and surface water). Between the first and second World Wars the building of new combined systems declined in favour of the new separate systems. The roofs and paved area were drained by a surface water system and the wastewater was drained by a foul water system. These foul water systems from new developments would typically connect to their older combined systems for conveyance and disposal at wastewater treatment works. Surface water systems would discharge direct to receiving waters (water courses, estuaries and coastal waters). Although separate systems removed the need to install new overflows, the rapid collection and conveyance of rainwater away from where it fell continues to cause problems, particularly in intense storms.

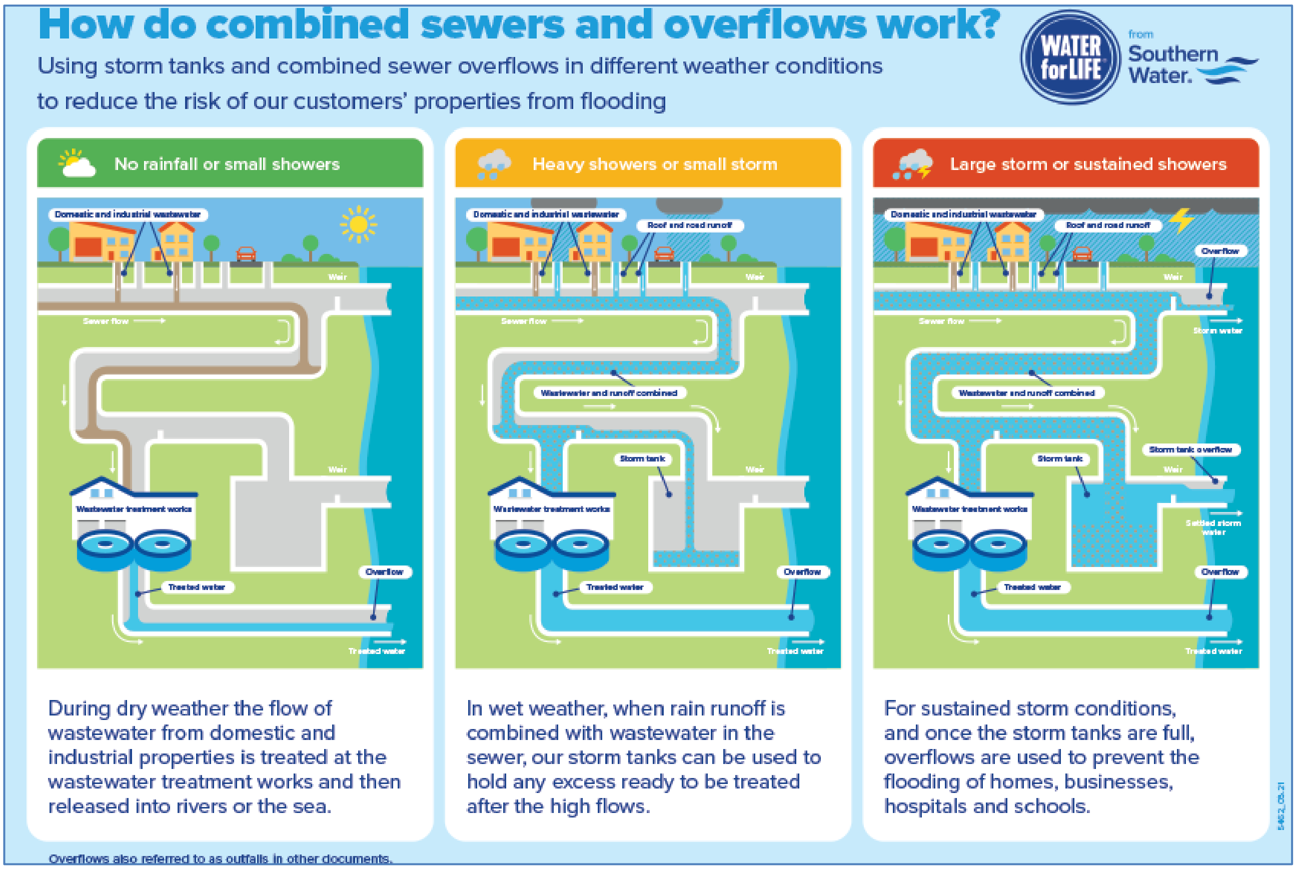

Figure 35 – How combined sewers and overflows work

Late 20th Century drainage – sustainable drainage

In the last 30 years, planning regulation has changed and there is now a requirement to reduce peak runoff rate from urbanized areas. Flows from new developments are restricted to 'greenfield' runoff i.e. a rate equivalent to that of a green field and are typically built with a Sustainable Urban Drainage System (SuDs). These systems closely mimic a natural drainage system.

Retrofitting sustainable drainage

Homes and paved areas drained by combined sewers can be retrofitted with a range of SuDS features which either 'slow the flow' or fully disconnect the surface water flow from the combined sewer system. Both methods reduce the intensity of the peak flows to a more consistent level and mimic natural drainage systems.

Sustainable drainage systems can also reduce flooding in the catchment, increase infiltration to replenish ground water systems and restore capacity in the network. They also reduce pressure on the downstream assets and therefore increase the asset life of existing infrastructure. This also results in storm overflows operating less often, with more flow being treated at wastewater treatment works before discharge to the environment.

B.2 The Contribution of Legacy Housing

Legacy housing is houses that are connected to the combined system. As you can see from Figure 36, only 13% of the water that falls on a home with sustainable drainage will drain to the sewer, therefore significantly reducing the contribution to, pressure on and risk to the downstream assets.

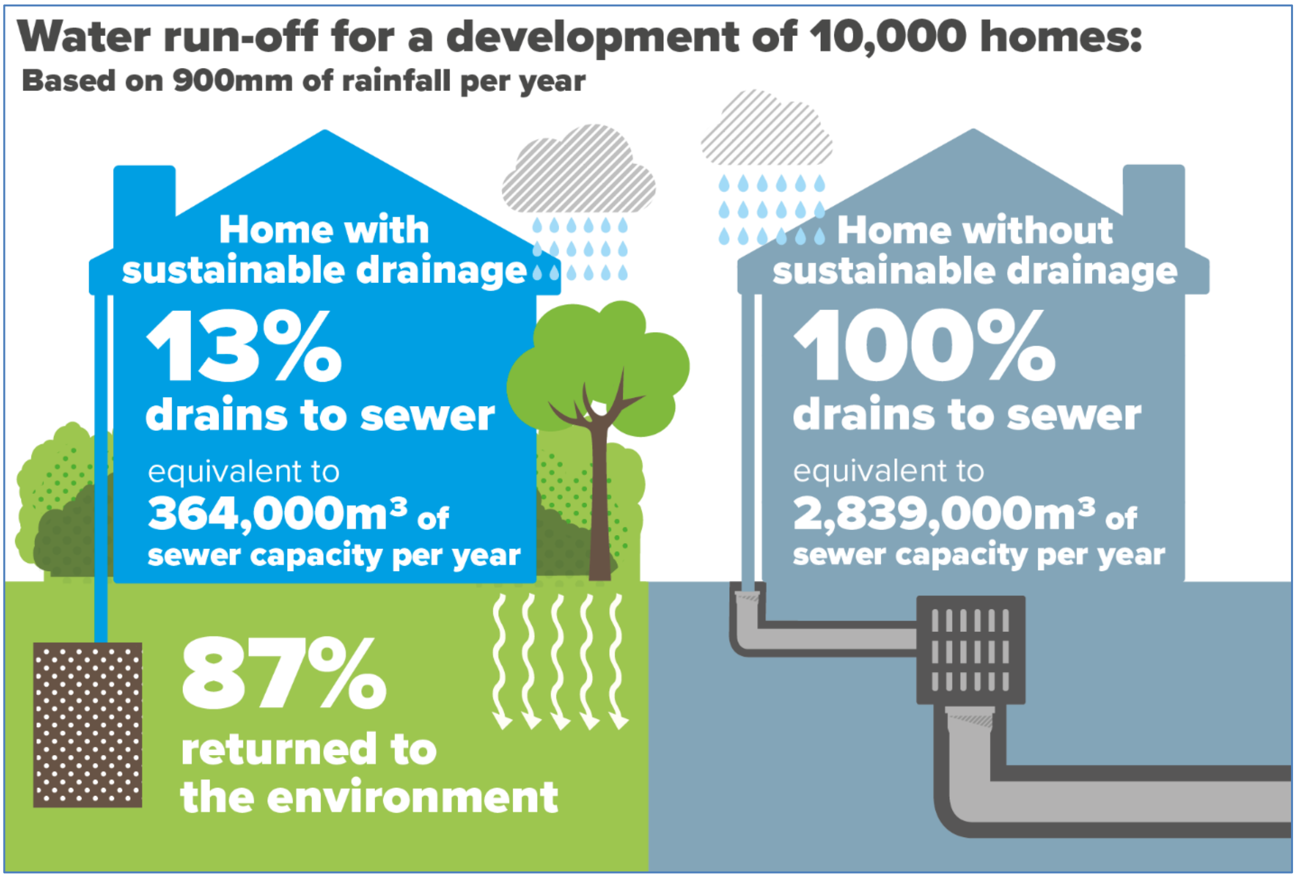

Figure 36 – The impact of legacy drainage systems

B.3 Highway Drainage System

Road or highway drainage i.e. road gullies, also connect to surface water systems. Often this is the same surface water system that takes roof drainage into the single pipe/combined system described in Appendix B.

When rain falls on the impermeable highway areas this can contribute to rapid increases in flow to the drainage system and overwhelm it. In particularly intense storms and/or if gullies are blocked, then overland flow can occur. This overland flow can cause flooding or allow rainwater to enter combined sewers which are not always designed for these extreme flows.

B.4 Internal Drainage Board

Across England there are a number of Internal Drainage Boards who work in partnership with local councils, the Environment Agency and other local partners to reduce the risk of flooding to agricultural, residential and industrial land, and are overseen by the Department for the

Environment, Food and Rural Affairs. They carry out an annual programme of maintenance works to ensure water levels are kept at an appropriate and safe level.

Appendix C – Building a Holistic View of a Catchment for Storm Water Management

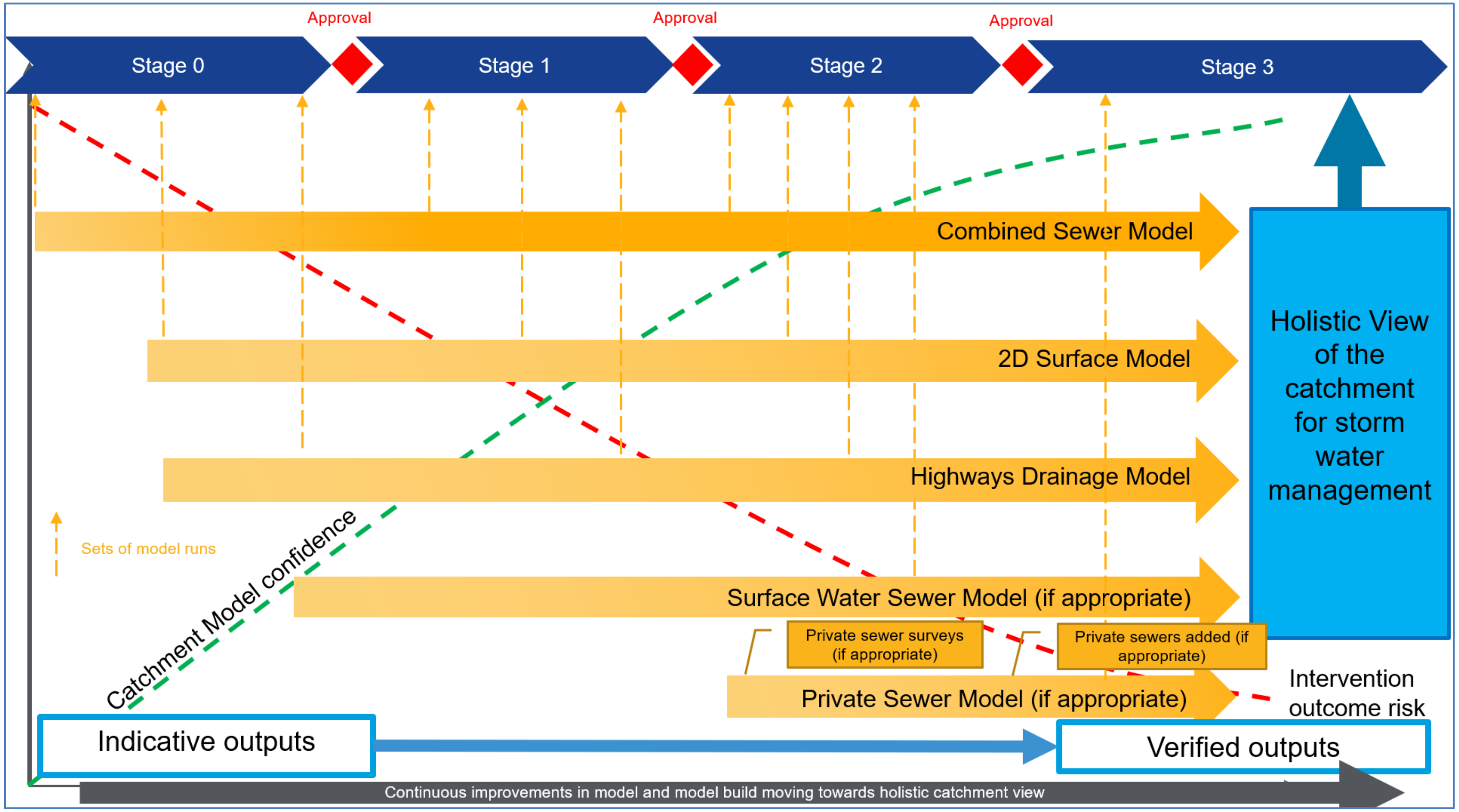

Figure 37 - Building a holistic view of a catchment

Appendix D – Catchment Information – Springs and Wells

Information received from resident M Sullivan detailing assets within the Fairlight catchment. The data has been collated from carefully researched records from 1862 to the current Ordnance Survey Maps of 2022, along with visits to respective sites and the self-reporting of parishioners, which has gleaned many more wells not listed in traditional OS maps. The data considers the whole of Fairlight, from Fairlight Place to Cliff End and includes data from Martineau Lane, Mallydams, Peter James Lane, Rosemary Lane and the surrounding area. This assessment has located 252 wells, 56 land management wells, 17 boreholes, 31 pumps, 187 springs, 40 tanks, 80 spring fed ponds, 5 hydraulic rams and 1 dam.

The codes are as follows.

1. Dark Red ★ indicates **Wells and Boreholes**
2. Dark Purple ★ indicates **Pumps**
3. Dark Blue ★ indicates **Springs**
4. Dark Green ★ indicates **Tanks**
5. Light Pink ★ indicates **Ponds** from which springs feed in the area
6. Light Blue ★ indicates **Convergence of Water Courses**
7. Peach ★ indicates **AFD'S**
8. Dark Brown ★ indicates **Hydraulic Rams, Ditches,** CSO's and the WWTW
9. Yellow ★ indicates a **Dam**

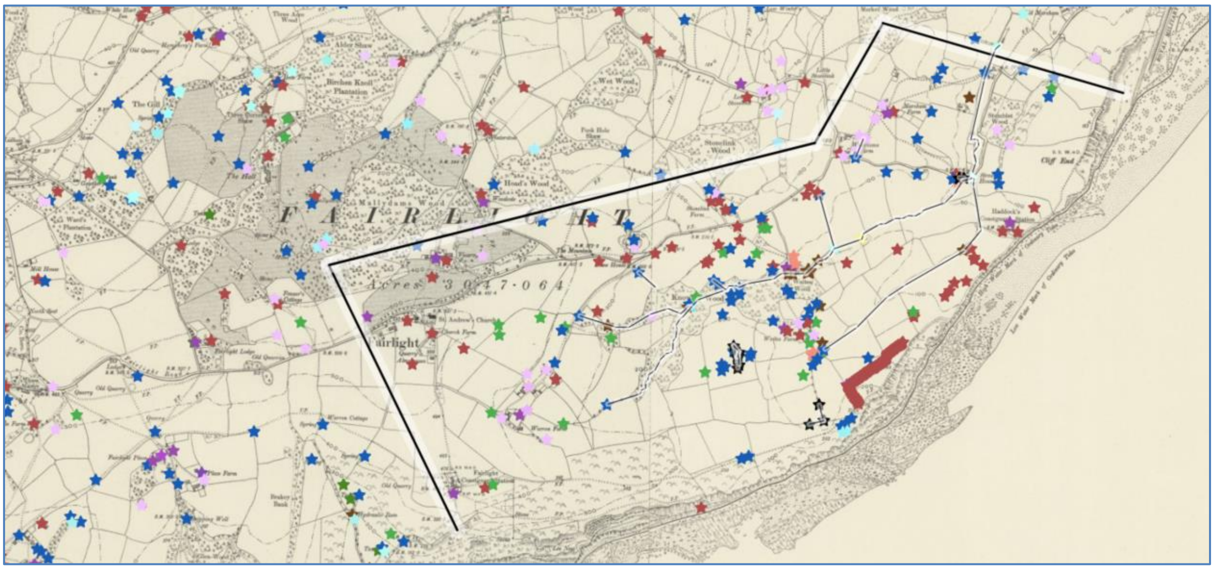

Figure 38 – Historic View Map

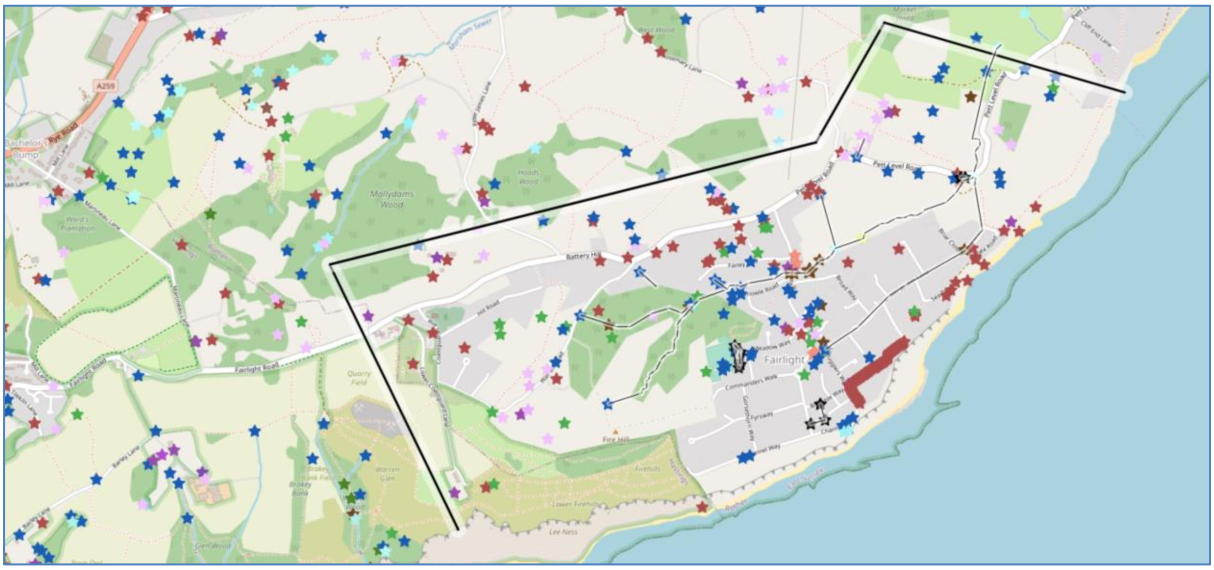

Figure 39 – Street View Map

Glossary

AFD	Anti-Flood Devices AFDs are control devices installed, generally on laterals to properties, that will protect the property from surcharge and flooding from the main sewer network.
Catchment	An area that is drained by a complex sewerage system comprising a network of pipes, wastewater pumping stations, and wastewater treatment works.
CCTV	Closed Circuit Television Video sewer inspection refers to the process of using a camera to see inside pipelines, sewer lines or drains.
Combined Sewers	A system that conveys both foul and surface water.
Storm Overflow	A traditional storm overflow which will have a condition for pass forward flow, an Event Duration Monitor (EDM), a screen and possibly storage volume.
DEFRA	Department for the Environment, Food and Rural Affairs
Dry weather flow	Dry weather flow is the flow of wastewater in a sewer system during dry weather that presents with minimal infiltration.
Dry weather flow pumps	These are pumps whose size is calculated to pump an agreed volume of flow forward to the WwTW. This flow rate is agreed with the EA.
Emergency Overflow	Typically, on a pumping station or WwTW and only used if the site has suffered a power or mechanical failure. For example, Diamond Road WPS has an emergency overflow.
EDM	Event Duration Monitor
FFT	Flow to Full Treatment
FOG	Fat, oil and grease
Foul Sewer	A sewer that is expected to carry predominately foul sewage from toilets, sinks, baths and appliances from a domestic property. The foul sewer also carries wastewater industrial and commercial properties.
GIS	Geographic Information Systems (GIS) are most often associated with mapping and provides geographic information through maps or databases. GIS combines hardware, software and data to provide visual geographic information. Also known in Southern Water as the sewer record.
Hydro-Brake®	This is a device that controls the flow coming out of a tank. Under regular conditions, water passes through the Hydro-Brake® unrestricted and continues downstream at normal levels. At times of high flow e.g. during a rainstorm, the structure's internal geometry harnesses the natural energy of the flow. This holds back the water, releasing it at a controlled rate.

IDB	Internal Drainage Board
Intervention	An action or project being undertaken in order to provide a solution/benefit for the catchment issue e.g. flood risk or number of storm overflow discharges.
KCC	Kent County Council
LSO	Long Sea Outfall
Main River	Main rivers are usually larger rivers and streams. The Environment Agency designates these and carries out maintenance, improvement or construction work on main rivers to manage flood risk.
mAOD	Metres above ordnance datum Ordnance datum is a vertical datum used by ordnance survey as the basis for deriving altitudes on maps; the datum used is usually sea level.
Natural capital	Southern Water defines natural capital as the element of nature that provides value to society.
Network model	A software model representing the piped drainage system through which different rainfall scenarios can be run to understand the impact on storage capacity, water levels and pumping station capacity.
No regret intervention	Where it has been agreed through Governance that intervention will provide a benefit with negligible risk of a negative outcome.
Ofwat	The Water Services Regulation Authority
Rainfall scenario	Different types of storms that can be used in a network model. These storms may vary in length or intensity.
Social capital	Social capital is defined as Southern Water’s relationships and others’ trust in the business.
SWS	Southern Water Services
SSO	Short Sea Outfall
Storm Overflow	Where a combined sewer discharges a diluted but untreated mix of wastewater and rainwater into a water body during rainfall. The term is synonymous, for the purposes of this document, with the terms, combined sewer overflow, intermittent discharge and storm tank overflow.
SuDs	Sustainable Urban Drainage Systems
Unflushables	Items which should be disposed of in the bin, not the toilet.
WPS	Wastewater pumping station
WwTW	Wastewater treatment works