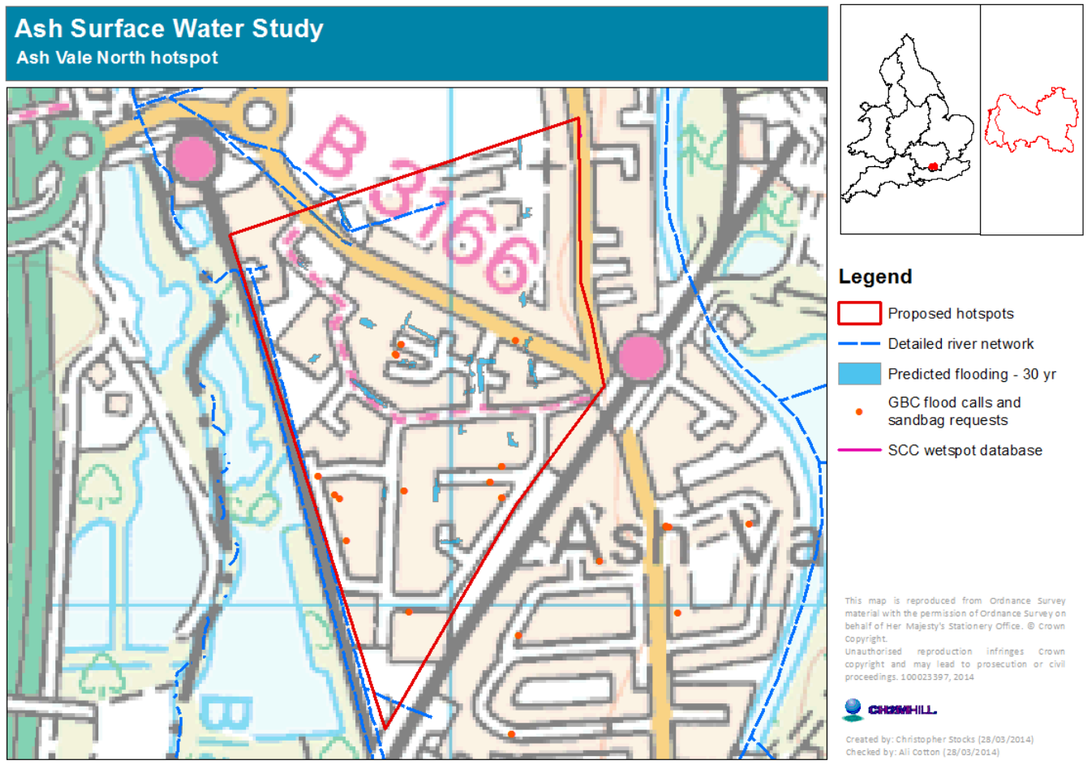
Action plans for hotspot locations

Ash Vale North

Actions	
1.	Local evidence indicates the culvert could not discharge during December 2013 because the outlet was blocked on the western side of the railway. Guildford Borough Council should investigate whether the culvert is flowing freely, and ensuring there are no restrictions
2.	There is a channel which is located at the toe of the National Rail embankment to the west of the study area. This need to be well maintained by Network Rail to maximise conveyance of surface water away from properties
3.	There was some evidence on site of blocked highway gullies and these need to be well maintained to ensure flows are effectively conveyed away from properties
4.	Maintenance of the channel and balancing pond near Lysons Avenue should be undertaken
5.	The route of surface water sewers from Fir Acre Road area (Ash Vale South hotspot) is unclear. If they discharge under the railway and ultimately discharge into the drainage channel near Wellesley Close there is a possibility the culvert would not have sufficient capacity to pass forward flows. Therefore a CCTV Survey should be undertaken to establish the connectivity of the network in this area
6.	Preliminary calculations suggest that upsizing it to a 1.6 x 1.6m culvert would provide sufficient capacity to pass forward all flows (assuming surface water sewers discharge from Ash Vale South hotspot). This has not been costed at this stage, until the contributing area can be better defined
7.	The downstream end of the catchment suffers flooding because of excess surface water which cannot be drained away. Therefore measures are proposed to reduce the amount of surface water generated upstream by introducing localised storage in green areas around Birch Way and Cypress Grove. Area around Birch Way and Cypress Grove is approximately 18000m^2. Assuming 10% of this can be utilised as localised above ground storage this gives a total stored area of 1800m^2. As this is a residential areas, the depth of the any above ground storage are limited to 0.5m. Hence this gives a total water stored of 900m^3.
8.	Wellesley Close was severely flooded as surface water backed up from the drainage channel. This measure seeks to store surface water in underground storm cells near garages on Wellesley Close to store flows in storm events. Wellesley Close is approximately 150m in length, take 80% of the length as available for underground storage which is 120m. Assuming the width of the storm cells to be 3m with a depth of 0.5m gives a total volume of storm cells to be 180m^3.
9.	The intrusion of surface water into the foul water network causes overloading to the foul water network assets. Most importantly, the pumping station is then required to operate outside its designed operating conditions. The proposed measure here is to increase the capacity of the pumping station and this will provide relief to the foul water system and reduce flood risk to properties on Wellesley Close
10.	There is evidence of surface water ingressing into the foul network through manholes. It is recommended that sealing of foul manholes is undertaking to reduce surface water ingress into the foul network. This will reduce the likelihood of the foul pumping station being overwhelmed by surface water

Map:



11.	There is anecdotal evidence suggesting that misconnections of surface water into the foul water network are present. Identifying the misconnections will help to reduce the risk of foul water flooding which is more onerous than surface water flooding.
Responsibility	
Lead Organisation	Guildford Borough Council
Partners	Surrey County Council, Thames Water, Network Rail and local residents
Summary of costs and benefits	
Total costs of proposed works are £239,000, although some measures have not been costed at this stage (e.g. pumping upgrades or improvements to the culvert under the railway) Estimated benefits = £1.1 million (assuming 20 properties can have a standard of protection of 1 in 25 years)	
Funding strategy	
The flood risk issues in Ash Vale North are localised and primarily relate to the operation of the existing drainage system within the area, particularly how surface water is discharged via the drainage ditch and foul water via the existing pumping station. Thames Water are the asset owners and operators for the sewerage network, and would be responsible for funding improvement works to their network subject to the work being cost-beneficial for Thames Water. The drainage ditch to the west of the hotspot is owned and maintained by Network Rail, so improvements to the ditch or culvert might be funded by Network Rail. Guildford Borough Council could make a contribution towards improvement works and progress this scheme as jointly funded with Thames Water and Network Rail. CCTV Survey work should be funded by Guildford Borough Council.	

Ash Vale South

Actions	
1.	The open watercourse which runs north-east to south-west from Vale Road was flowing freely during the site visit. This watercourse is critical to drainage of this area, so the watercourse and 450mm culvert need must continue to be well maintained to ensure adequate conveyance of surface water from the north of the hotspot
2.	Along Fir Acre Road there was significant evidence of blocked highway gullies with resultant standing water. Given Fir Acre Road is a natural conveyance route for excess surface water it is vital that highway gullies are well maintained to reduce flood risk to properties.
3.	It is assumed that improved maintenance of gullies on Fir Acre Road will be sufficient to reduce flood risk in this area. However, should further flooding occur, additional highway gullies may be required to convey surface water away from properties and into the 450mm culvert under the railway.
4.	Based on an initial assessment of capacity it is possible that the 450mm culvert under the railway which drains surface water from the north of this hotspot is under-sized and could result in backing up and flooding. There is no anecdotal evidence of this occurring so Guildford Borough Council should engage with local residents and Network Rail in the first instance to gather local evidence of flooding. Should there be evidence the culvert is under capacity improvement works may be required but have not been costed at this stage
5.	Implement property level protection for affected properties
Responsibility	
Lead Organisation	Guildford Borough Council
Partners	Surrey County Council, Network Rail

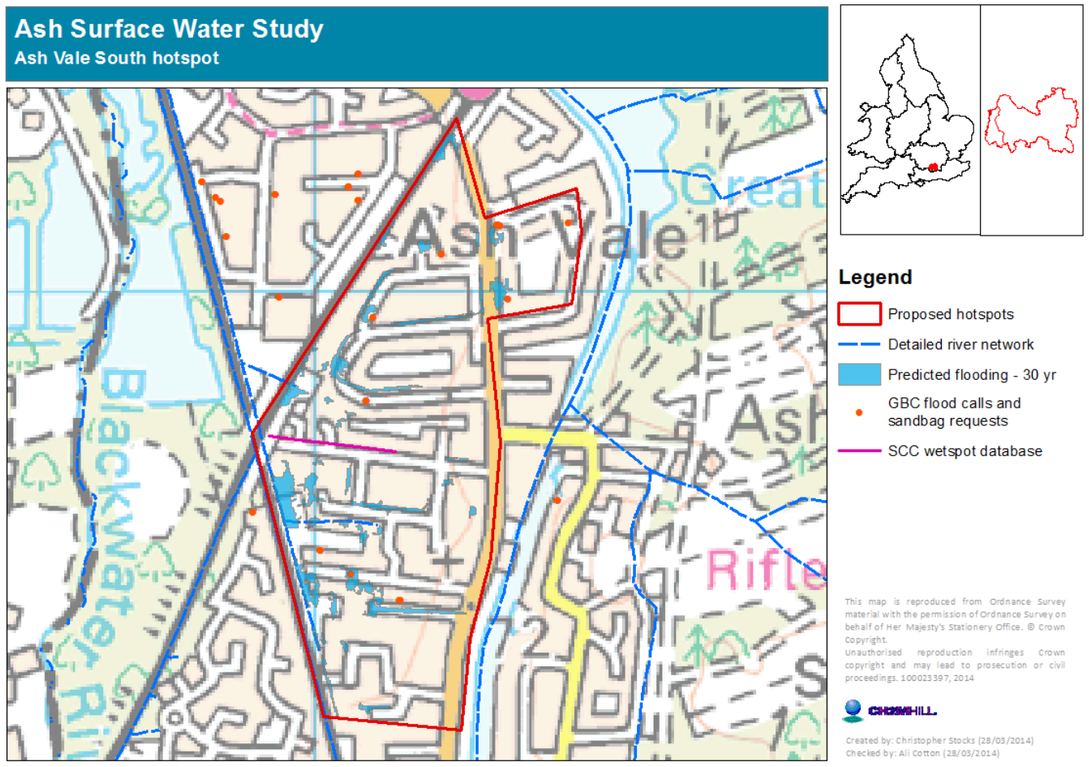
Summary of costs and benefits

The estimated costs of maintenance for actions 1 to 3 are £12,000 per annum. It is not possible to quantify the monetary benefit from this maintenance.
Property level protection has been assumed to implemented to 15 homes (based on an uptake ratio of 50%), which would cost £82,500 based on £5,500 per property. Total benefits of property level protection would be £450,000 over a 20 year period.

Funding strategy

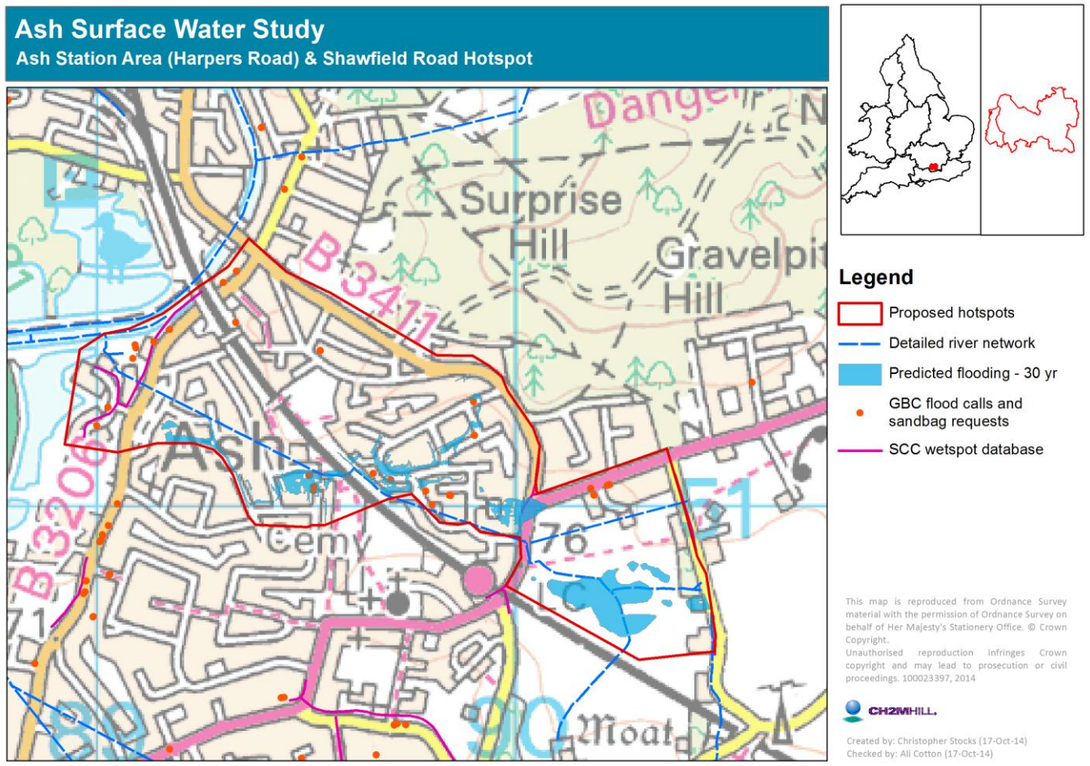
Maintenance of the open watercourse is believed to be undertaken by Network Rail as the asset owner, and therefore Network Rail should fund ongoing maintenance of this watercourse. Improvements to highway gullies on Fir Acre Road should be funded by Surrey County Council as the highways authority.
Property level protection could be funded by Guildford Borough Council, or a Flood Defence Grant in Aid (FDGiA) application could be submitted. Defra's FDGiA Calculator indicates property level protection could qualify for up to £64,500 to protect 15 properties. This would mean £18,000 would need to be secured from Guildford Borough Council or local residents to secure Central Government funding through FDGiA

Map:



Ash Station Area (Harpers Road) & Shawfield Road	
Actions	
Ash Station Area	
1.	There is some discrepancy between the Thames Water sewer maps and anecdotal evidence about the size of the culvert which was the historic watercourse. As a result the capacity of this culverted section of the watercourse is uncertain until further CCTV is undertaken
2.	Downstream of the railway it is worth noting that there was significant overgrowth of the watercourse once it emerged to the west of the railway so it was not possible to observe the culvert outlet. Therefore, improved maintenance of watercourse on the d/s side of railway (near Murrell Road) should be undertaken to ensure the watercourse can freely flow and that the culvert outlet is kept clear
3.	A flood storage area to the east of Ash Hill Road would reduce the risk of surcharge and overtopping of the culvert which would cause flooding to properties along the natural valley of the historic watercourse. A proposed site, bounded by Ash Hill Road to the west, Guildford Road to the north and the railway to the south has been identified in a natural depression. The land is naturally quite flat, so a low level embankment approximately 650m is proposed, tying into a level of 75.7m AOD. The maximum height of the embankment would be 1m, and the average height above existing ground level would be 0.25m. This would provide storage in the region of 10,000 to 11,000 m^3, subject to further analysis and design
4.	Following completion of the CCTV Survey it is recommended that a detailed integrated hydraulic model of the catchment is produced to better understand flooding mechanisms. The model will help to justify the business case for further funding. The model would represent the entire hotspot area and would include Thames Water sewer data to understand exceedance from the surface water sewer network
5.	Pluvial runoff from the wooded area may drain onto Ash Hill Road and subsequently onto Miles Road. It is anticipated that the existing network should have sufficient capacity to drain any pluvial runoff, assuming the network is well maintained. Therefore, the condition of the highway and surface water sewer network should be checked to ensure it is in good condition.
6.	Work with owners of Ash Station Area (Harpers Road) to provide more natural attenuation of runoff on their land. This would not prevent flooding but would mitigate the impacts by reducing the flow rate
7.	Should measures SC-6 or SC-1 described above not be feasible it is recommended that property level protection be implemented for properties at risk upstream of the railway. There are 37 properties at risk based on ISIS 2D modelling for the 1 in 30 year rainfall event. Assuming an uptake ratio of 50% this measure would implement property-level protection for up to 19 homes.
Shawfield Road	
1.	Undertake CCTV Survey of the key surface water drainage network along Shawfield Road, Winchester Road, and Beeton's Avenue to establish condition, size and connectivity of the network
2.	Check condition of existing highway gullies on Shawfield Road to ensure they are fully functioning
3.	Flooding of properties occurs downstream of the railway bridge on Shawfield Road and Culverlands Crescent. During times of excess surface runoff there are several options to manage exceedance flows away from properties: 1. install a raised section of the road (e.g. sleeping policeman) immediately upstream of the ditch connection to the rear of properties on Shawfield Road and re-camber

Map:

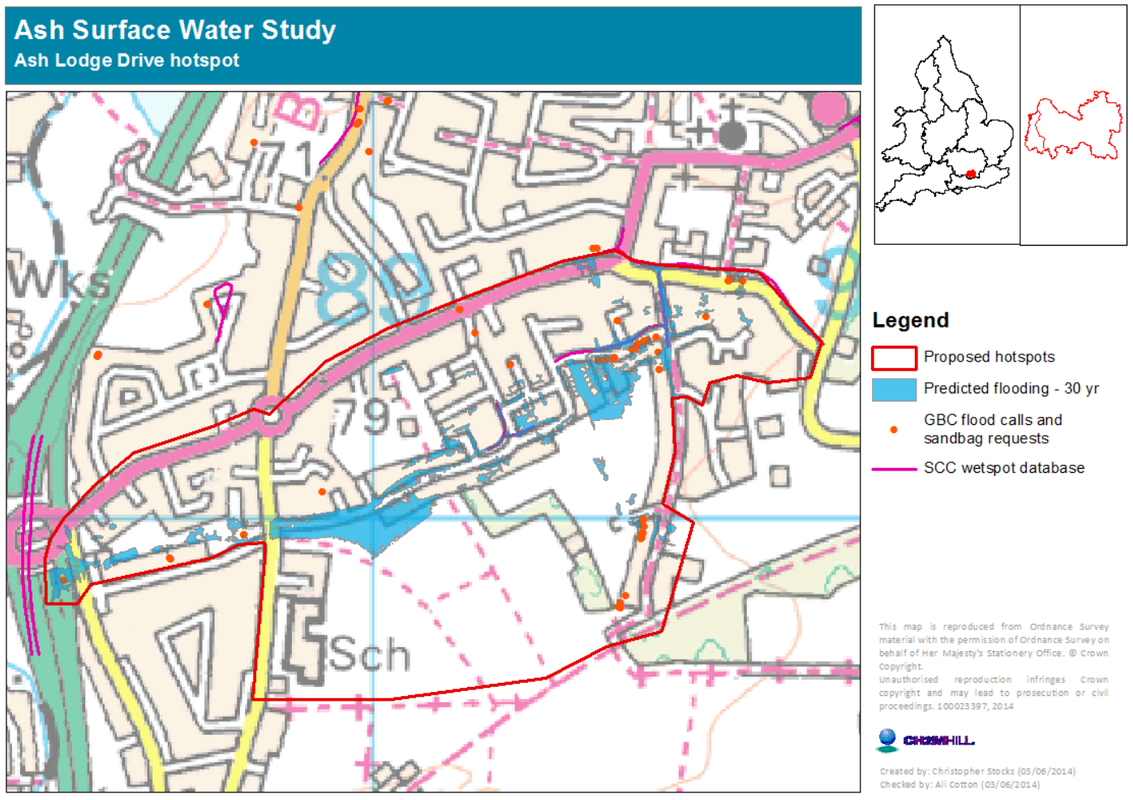


	this section of the road to encourage surface water into the ditch (NB: the capacity of this ditch under high levels in the Blackwater need to be established to ensure it does not cause overtopping of the ditch); 2. Install a cross-drain structure upstream of the ditch connection to the rear of properties on Shawfield Road, which will connect to the ditch ditch (NB: the capacity of this ditch under high levels in the Blackwater need to be established to ensure it does not cause overtopping of the ditch), or; 3. Re-profile Shawfield Road along a 150m length to encourage surface flows to run along the road and not towards properties. The surface water could then discharge into a newly created swale in the grassed area between Shawfield Road and Grange Farm Road. An initial check on levels would indicate the grass verge could be used as a swale, and could accommodate 350m^3 storage assuming a 70m long, 0.5m deep swale with a bottom width of 1m and side slopes of 1 in 4.
Responsibility	
Lead Organisation	Guildford Borough Council
Partners	Surrey County Council, Thames Water
Summary of costs and benefits	
Estimated costs = The estimated cost of the proposed storage area is £280,000 (based on initial concept), with CCTV Survey and identified maintenance adding a further £8,000 per annum, and detailed hydraulic modelling costing £25,000-£30,000 Estimated benefits = £830,000 (assuming 40 properties will have a 1 in 30 year standard of protection) On Shawfield Road the CCTV Survey will cost approximately £4,000 and a walkover assessment of gullies should be funded by officer time. The costs for subsequent exceedance flow measures has yet to be determined.	
Funding strategy	
Guildford Borough Council and Surrey County Council should provide funding for CCTV Survey and identified maintenance, although Thames Water may be willing to contribute towards the CCTV Survey of their asset. For the flood storage area it is recommended that a Flood Defence Grant in Aid (FDGiA) application be submitted. However, the cost-benefit ratio for the scheme is relatively low. Based on the FDGiA calculator there is potential to secure £165,000 towards the scheme from FDGiA funding, which would leave a funding gap for the improvement works in the region of £100,000 (excluding the hydraulic modelling). It is unclear how the funding shortfall can be met. With respect to Shawfield Road the initial CCTV Survey and walkover assessment should be undertaken by Guildford Borough Council or Surrey County Council. Funding for any subsequent works to manage exceedance flows will need to be determined during design of the measures.	

Ash Lodge Drive

Actions	
1.	As a first step Guildford Borough Council should ensure that culvert inlets which capture runoff from the south of Ash Lodge Drive are well maintained. Local residents confirmed that during times of heavy rainfall the main culvert inlet needs to be maintained daily to avoid blockage of the culvert, which would exacerbate flood risk.
2.	To support the development of the business case it is recommended that CCTV Survey of the key 900mm and 1050mm surface water sewers be undertaken, as well as at key pinch pints in the network (e.g. Ash Church Road, South Lane)
3.	Surface water sewers at the head of the catchment (Ash Church Road / Ash Street) are rapidly exceeded during times of heavy rainfall which causes exceedance flows to run down Ash Church Road and Ash Street before flowing onto Ash Lodge Drive, Loddon Way, Lea Close, Grange Road/South Lane, Littlefield and Southlands Closes. It is worth noting that these surface water sewers have not been adopted by Thames Water and it is believed this is because they are considered to be under-sized. Local evidence indicates the sewers are 150mm to 225mm. At this stage it is proposed to upsize the sewer along Ash Church Road / Ash Street to a 300mm before it connects into Ash Lodge Drive to alleviate exceedance flows at the head of the catchment, but this would need to be confirmed via modelling
4.	East of South Lane sewer maps indicate the surface water sewers drain to the low spot on South Lane into a 375mm sewer, before flowing into the 1050mm surface water sewer which runs to the south of Ash Lodge Drive. The initial capacity assessment for the 375mm sewer indicates this is a potential pinch point in the network where flooding would occur. The sewer should be upsized to a 900mm to reduce flood risk from this point in the network.
5.	To alleviate risk of surcharging of the 1220mm surface water sewer to the south of Ash Lodge Drive it is recommended that additional flood storage is provided in the fields to the south of the disused railway near Bin Wood. This could be achieved by throttling the culvert under the disused railway such that it can only pass a 1 in 2 year flow (approximately 200 to 400 l/s) and storing flood water behind the existing embankment. The existing embankment will need to be raised to minimise the risk of overtopping in more extreme rainfall events.
6.	Should further flood storage be required to compensate for upsizing the drainage network upstream or to provide an enhanced level of protection the existing green space bounded to the north by Ash Lodge Drive and to the west by Manor Road should be utilised. The Flood Risk Assessment for the proposed development south of Ash Lodge Drive has identified a detention basin will be provided in this location to manage surface runoff from the development site. There is sufficient scope in this location to upsize the proposed detention basin. An overflow from the surface water sewer could be provided into the detention basin to alleviate risk of surcharging and backing up from this sewer. This would only provide a small amount of attenuation as the difference in ground level is only approximately 500mm, it would rely on an overflow arrangement to discharge into the storage area before surcharge onto the highway occurred.
7.	There is evidence of surface water ingress to the foul network causing foul system to flood properties. Sealing of the foul network around Southlands Road would reduce flood risk from the foul network
8.	Following completion of the CCTV Survey it is recommended that a detailed integrated hydraulic model of the catchment is produced to better understand flooding mechanisms. The model will help to justify the business case for further funding. The model would represent the entire hotspot area and would include Thames Water sewer data to understand exceedance from the surface water sewer network

Map:



9.	Local evidence indicates that the balancing pond near South Lane which was built to attenuate runoff from The Briars development is potentially under-sized. A review of the balancing pond size compared to predicted inflows should be undertaken to confirm whether the balancing pond is providing sufficient attenuation, and whether upsizing may be required
10	Should measures described above not be feasible it is recommended that property level protection be implemented for properties at risk upstream of the railway. There are 118 properties at risk based on ISIS 2D modelling for the 1 in 30 year rainfall event. Assuming an uptake ratio of 50% this measure would implement property-level protection for up to 59 homes.
Responsibility	
Lead Organisation	Guildford Borough Council
Partners	Thames Water, local residents, Bewley Homes (developers)
Summary of costs and benefits	
Estimated costs = £750,000 (excluding action 7 which has not been costed at this stage, action 9 which is unknown until improvement works are scoped through a high level investigation, and action 10 which is an alternative approach) Estimated benefits = £2.4 million (assuming 120 properties will have a standard of protection of 1 in 50 years)	
Funding strategy	
Guildford Borough Council should fund the following mitigation measures: • Improve maintenance of the culvert inlets of watercourse from the south of Ash Lodge Drive; • CCTV Survey of the surface water sewer network (although Thames Water should be engaged to identify whether they would contribute), and; • Investigation of the balancing pond near South Lane. For the significant capital investment measures (upsizing the network and providing storage near Bin Wood) it is recommended that a Flood Defence Grant in Aid (FDGiA) application be submitted. However, the cost-benefit ratio for the scheme is relatively low. Based on the FDGiA. Based on the FDGiA calculator there is potential to secure £500,000 towards the scheme from FDGiA funding, which would leave a funding gap for the improvement works in the region of £186,000. The funding gap would need to be sourced from external sources, including Guildford Borough Council, Thames Water and Bewley Homes.	

Tongham

Actions

1.	There are isolated reports of flooding in this area based on Guildford Borough Council's data. In the south of the hotspot there is reported flooding on New Road, The Street and in a cul-de-sac off Lambourne Way. The available evidence indicates that flooding in these locations were due to blocked drainage, which is assumed to be blocked highway gullies in the absence of other data. In additional Surrey County Council have reported a flooding problem on their wetspot on Poyle Road near the junction with The Street, although it should be noted that this system was cleared in 2008. Throughout the hotspot there are other areas where surface water is predicted to pond, although it is not predicted to result in property flooding. This includes: Grange Road near the junction with Lambourne Way, Newton Way, The Street near the junction with Manor Road. Given these data it is recommended that the function of highway gullies and pipes are key to ensuring surface water are adequately drained in this area.
2.	There is previous evidence of overtopping of the watercourse on Poyle Road although this is believed to be as a result of poor maintenance rather than hydraulic capacity. Therefore, it is critical that the watercourse is well maintained. This includes maintenance of the culverted sections
3.	Following feedback during public consultation it was agreed that Guildford Borough Council will undertake an additional site walkover with local residents to identify any additional pinch points which could cause property flooding. This may identify additional actions which can be fed back into this action plan
4.	There is little evidence that the watercourse to the south of Poyle Road has overtopped due to hydraulic incapacity. Therefore capital investment to reduce peak flows arriving to this watercourse should only be undertaken if evidence emerges if hydraulic incapacity. To reduce peak flows (if required) there are two potential options identified: • intercepting pluvial runoff from the playing fields to the south of Poyle Road with a low embankment, or; • providing upstream flood storage. Guildford Borough Council should monitor water levels on the watercourse during times of heavy rainfall and engage with local residents to gain additional local knowledge about the watercourse.

Responsibility

Lead Organisation	Guildford Borough Council and Surrey County Council
Partners	Local residents

Summary of costs and benefits

The estimated costs of maintenance for actions 1 and 2 are: £20,000 per annum. It is not possible to quantify the monetary benefit from this maintenance.
Action 3 is associated with officer time from Guildford Borough Council and no costs for improvement works has been undertaken at this stage

Funding strategy

At this stage only maintenance improvements are recommended to be taken forward in the absence of further evidence of historic flooding to properties. Investigation and maintenance of the highway system should be undertaken by Surrey County Council, whereas the maintenance of the watercourse south of Poyle Road should be undertaken by Guildford Borough Council. Should enhancement works be required to manage flows into the watercourse this should be funded by Surrey County Council or Guildford Borough Council. It is unlikely that any enhancement works would receive Central Government funding because few properties would benefit from the scheme, based on current evidence.

Map: