Appendix 8.9.A – Claim WSX05 – Flooding programme

Wessex Water

September 2018

Wessex Water
YTL GROUP

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Contents

1. Summary

This cost adjustment claim relates to our programme of work to reduce sewer flooding. The table below provides a summary of the claim and the following sections provide more detail for each of the headings.

Heading	Summary
Brief description	Sewer flooding programme, which will improve our current frontier performance for internal sewer flooding by a further 22%, reduce external sewer flooding by 10% and maintain stable risk for overloaded sewers.
Claim value (totex)	£86.81m (gross of any implicit allowance)
Business plan table lines where the totex value of this claim is reported	WWn8 Line C11
Total opex of claim for AMP7	£6.83m
Total capex of claim for AMP7	£79.98m
Price control	Wastewater network plus
Need for cost adjustment	We are the industry leader in terms of the number of internal sewer flooding incidents per 10,000 properties, as shown on Discover Water. The additional costs required to deliver a step change in the frontier performance are not currently reflected in Ofwat's cost baselines.
Management control	Some of the underlying reasons for the programme, such as development, urbanisation and climate change are outside of management control. Known planning policies and research suggests that future conditions will increase pressures on our sewerage systems by at least 40%. We minimise the cost impact on customers by investing in additional capacity and maintenance. We work hard to influence customers' behaviour to reduce the impact of sewer flooding.
Need for investment	Customers give sewer flooding a high priority and we have very strong willingness to pay valuations to support the programme to reduce sewage flooding. The Water Industry Strategic Environmental Requirements (WISER) issued by Environment Agency and Natural England in October 2017 highlights the need for us to continue to reduce the risk of sewer flooding.

Heading	Summary
Best option for customers	A variety of options are required to address various causes of flooding – a mix of activities will be used to achieve the most cost beneficial solution to meet the outcome. The proposed improvements are cost beneficial.
Robust and efficient costs	We have challenged the scope and cost estimates. Our costs are based on competitive tendering of the required services.
Customer protection	Customers will be protected through three performance commitments. Two of the performance commitments, internal flooding incidents and external flooding incidents, will be subject to an underperformance penalty.
Affordability	The programme of work outlined in the Cost Adjustment Claim was included in our draft business plan that was tested with customers between January and June 2018. The acceptability testing was designed to test customers' acceptance of our overall package of service improvements and bill impacts. Testing has shown that 96% of our customers find our business plan acceptable. Acceptability is above 90% across all demographic subgroups.
Board assurance	The proposals have been subject to our board assurance process, which is described in detail in section 12 of the main business plan narrative and supporting documents 12.1 to 12.8.

2. Background

2.1 Historical position

Sewage flooding, especially internal flooding, is the worst type of service failure that a customer is likely to experience. We continually look to minimise the number of these events occurring.

Wessex Water is responsible for 17,790km of public sewerage and for 16,990km of S105A sewerage (private sewerage assets that transferred to sewerage undertaker in October 2011) making a total of 34,780km of sewerage. Service failures in terms of the number of internal and external flooding incidents are relatively small in comparison to the asset base and our overall number of customers, 1,243,000, see Table 2-1.

Table 2-1: Wessex Water total number of flooding incidents reported

Service failure	2013-14	2014-15	2015-16	2016-17	2017-18	Average
Internal flooding incidents	242	232	189	163	153	196
External flooding incidents (inside boundary)	2510	2278	2057	2092	1718	2131

Our performance in comparison with other WaSCs is industry leading. Performance has only been less than upper quartile once in the past twelve years, see Table 2-2.

Table 2-2: Wessex Water performance ranking when compared with other WaSCs (internal flooding)

Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
WSX ranking against other WaSCs	2nd	1st	2nd	1st	1st	1st	2nd	6th	3rd (1st)	2nd (1st)	1st	1st
Measure (internal flooding)[1]	Properties flooded						Repeat flooding (Flooding incidents – Discover Water)				Flooding incidents	

Note: WaSCs comparison measure for internal flooding has changed over time, in the June Annual Return(JAR) pre-2011 period – number of properties flooded, in the period between JAR and shadow reporting – Ofwat introduced a repeat flooding metric and most recently under shadow reporting the number of flooding incidents are reported.

2.2 PR14 approach

The PR14 flooding programme was subject to a successful cost adjustment claim.

The flooding programme was primarily focused on internal flooding incidents and overloaded sewers with two bespoke performance commitments:

- C1: Internal flooding incidents
- C2: Risk of flooding from public sewers due to hydraulic inadequacy.

With targets to reduce internal flooding incidents caused by other causes (i.e. blockages, collapses and equipment failures) by 10% and to maintain stable risk against upward pressures; climate change and urban creep.

The figures below show our performance to date against the PR14 performance commitments:

Figure 2-1: Number of internal flooding incidents due to other causes against PR14 performance commitment

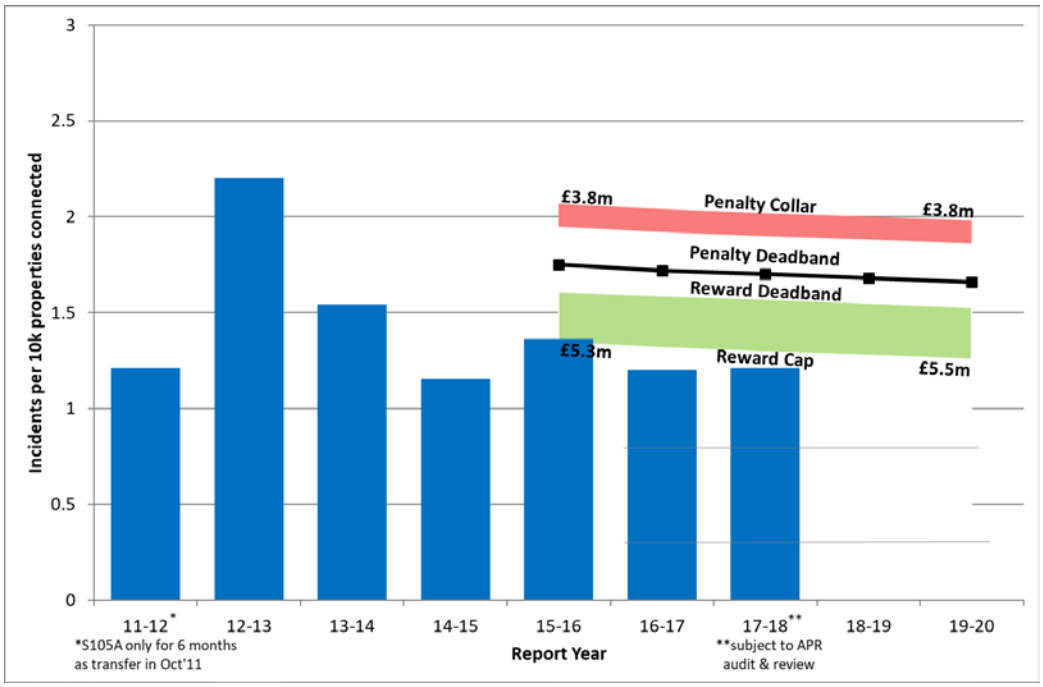


Figure 2-1 shows a decrease in incidents from the average AMP5 performance of 1.77 incidents per 10,000 properties connected to a current PR14 average of 1.26 – a decrease of c29%.

Figure 2-2: Flooding risk score (overloaded sewers) against PR14 performance commitment

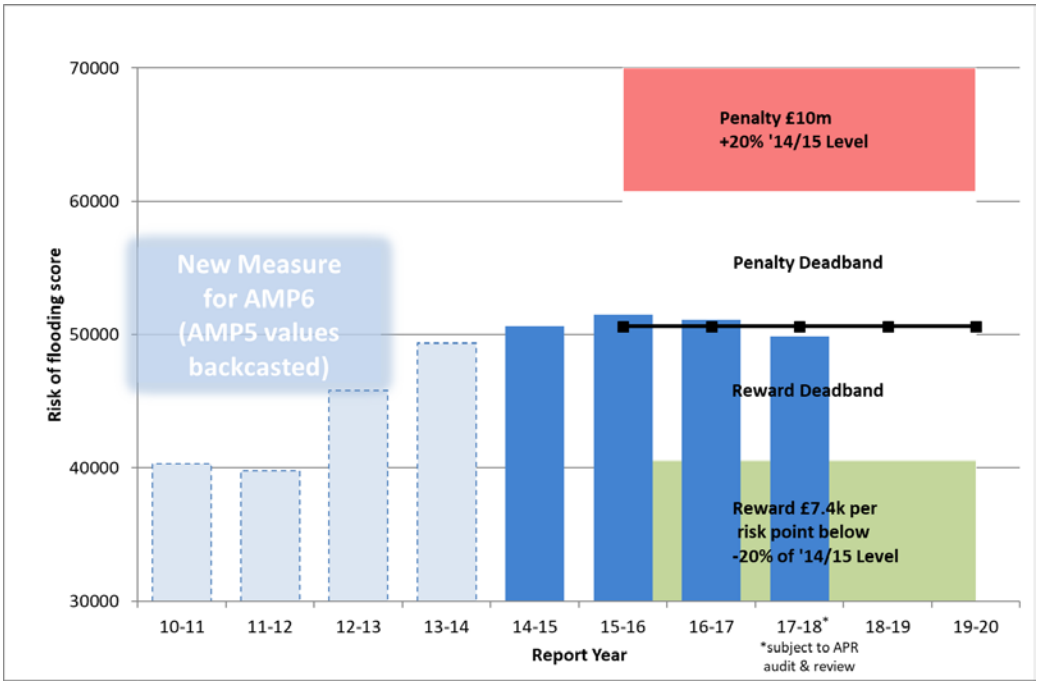


Figure 2-2 demonstrates that the risk score has been maintained around the target performance level and well within the confines of the penalty and reward dead band.

2.3 PR19 approach

The proposed flooding programme for PR19 is focused on both internal and external flooding incidents, and overloaded sewers with one common and two bespoke performance commitments:

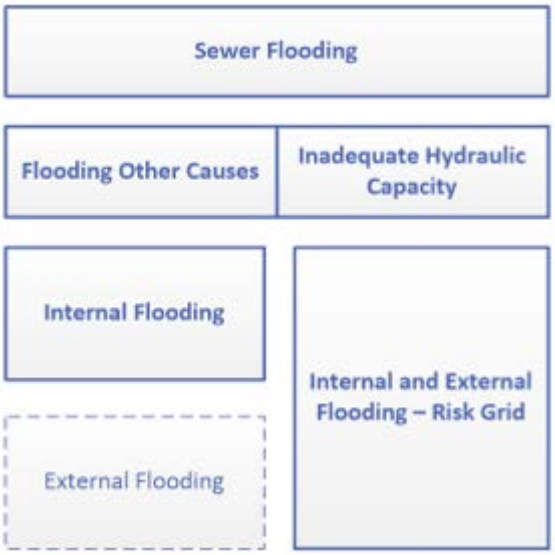
- F1: Customer property sewer flooding (internal) – common performance commitment
- F2: Customer property sewer flooding (external)
- R3: Sewer flooding resilience risk.

The customer property sewer flooding (internal) is one of Ofwat's common performance commitments. This is different from our PR14 performance commitment for internal flooding as it covers all causes of flooding and severe weather.

The customer property sewer flooding (external) is a bespoke performance commitment for flooding and mirrors the external flooding shadow reporting measure in the Shadow Reporting table 3S as part of the annual performance report (APR)[1].

The adoption of the external flooding measure also expands the flooding performance commitments to cover all areas of flooding, as the PR14 performance commitments didn't cover external flooding caused by blockages, collapses and equipment failures.

Figure 2-3: PR14 performance commitment coverage of sewer flooding



Both of the incident based performance commitments will be following the sewer flooding guidance published by Ofwat.

[1] https://www.ofwat.gov.uk/publication/2017-18-apr-excel-tables/

The second bespoke performance commitment is sewer flooding resilience risk which is the PR14 performance commitment 'Risk of flooding from public sewers due to hydraulic inadequacy' renamed; there have been no other changes apart from a change in the incentive type from financial to reputational.

PR19 guidance has stipulated that no performance commitment should duplicate financial benefit for an element of performance. As a result the sewer flooding resilience risk performance commitment is a reputational measure rather than a financial measure. Incidents attracting a risk score are also counted in both proposed incident measures which have financial incentives.

As there is a very strong willingness to pay for reducing internal flooding (see Section 5.2), the proposed target for PR19 is to reduce all internal flooding incidents by a further 22% beyond industry leading performance and externals by 10% whilst maintaining stable risk for overloaded sewers; to achieve this an increased focus on reducing flooding incidents from other causes (e.g. blockages) will be required.

3. Need for cost adjustment

In this section we provide evidence that the cost claim is not included in Ofwat's modelled baseline; and, that the allowances would, in the round, be insufficient to accommodate special factors without a claim.

This claim concerns an increase in cost due to the step change in service with the additional costs not reflected in historic costs or in Ofwat's baselines, given our industry leading internal flooding performance level (based on shadow reporting evidence).

Achieving a further 22.5% reduction in the number of internal flooding incidents over five years will require a significant step change in investment in how we tackle flooding incidents. Investment will be required to continue to achieve a stable risk position for properties at risk of flooding from overloaded sewers whilst absorbing the risk of severe weather on performance figures because of the common performance commitment definition change (to include severe weather). This change in investment is not allowed for in our historic costs or in Ofwat's baselines.

To achieve the step change in flooding performance will require additional capital and operational investment; it is estimated that the totex expenditure required over the 2020-2025 period is £86.8m for the flooding programme which is a significant increase on our current expenditure. This includes the £12.7m allowance for DWMPs, summarised in Section 6.4 and explained further in supporting document 5.4, Section 3.

Our total wastewater network plus totex for PR19 is forecast to be circa £1,480m. The cost adjustment claim as a proportion of totex is - 5.9% - i.e. greater than the 1% materiality threshold that Ofwat set out in its final methodology.

4. Management control

4.1 Severe weather

The simplification of the definition for sewer flooding is welcomed. By the removal of most of exclusions it will make it easier for customers to compare performance between WaSCs.

With no exclusion for severe weather, the management control against excessive rainfall is very limited as most of the sewerage asset base is designed to provide 1 in 20 year protection against internal flooding and 1 in 10 year protection against external flooding. Although in recent years, this has changed to 1 in 30 year protection for internal and 1 in 20 year protection for external in PR04/PR09, and where cost beneficial to 1 in 50 year and 1 in 30 year respectively in PR14, these design standard changes only affect a very small proportion of the asset base.

The introduction of the common performance commitment for resilience will help identify network catchments that are particularly susceptible to excessive rainfall.

4.2 Sewer misuse

Behaviour of customers is difficult to guarantee, especially when receiving mixed messages from outside of the industry, in particular regarding what products are truly flushable.

The large sewerage asset base, especially the recently transferred private assets, are prone to sewer misuse i.e. inappropriate items being disposed down the sewer. To combat this there are various approaches to try and reduce flooding incidents which are dependent on the particular situation. These are covered in Section 6.2.

4.3 Urban creep pressures

As well as assessing the sewer capacity headroom for future housing, our computer hydraulic models are used to simulate how the performance of the trunk sewer system in the region will deteriorate further because of urbanisation (urban creep) and climate change.

This phenomenon has the effect of increasing rainfall runoff, increasing the risk of flooding, pollution and CSO spills.

The UKWIR report (Ref 10/WM/07/14) researched this in 2009 by studying aerial photography of over half a million houses. The conclusion was that urbanisation rates of between 0.4m^2/house/year and 1.1m^2/house/year. When applied this increased predicted flooding volumes by 20% and CSO spills by 29%.

Wessex Water Urban Creep Study (2008)[10]: Richard Allitt Associates Limited (RAA) was commissioned by Wessex Water (WSX) to undertake a pilot study to assess the increase in impervious areas due to the phenomenon known as urban creep. The definition of Urban Creep used in this study was:-

"The additional surface water load to the sewerage network (foul or surface water) caused by increased impermeable area from developments at sub-property level."

This study examined the actual changes in impermeable surfaces against time by assessing many different sources of data, including: historic and current mapping, aerial photography and site visits to confirm drainage types. This complex analysis was applied to 30 study areas, which were carefully selected to allow a direct comparison of targeted areas. Ten study areas in three towns were selected to ensure a controlled mix of combined, partially separate and fully separate areas to allow a balanced sample to be assessed. This pilot study was not intended to be statistically representative (this would require a much larger sample of study areas and towns) but was commissioned to provide an indicative insight into possible trends.

An average impermeable area increase of 0.38 m^2 per property per year in foul systems and 0.7 m^2 per property per year in surface water systems was attributed to urban creep. Over time, this is a substantial increase and will clearly increase the risk of urban flooding and maybe as significant as climate change, its effects should be investigated further.

The report refers to the Urban Creep research that Wessex Water undertook, as shown in the extract above.

4.4 Climate change pressures

Climate change has a similar effect as urban creep, in that more rainfall runoff is predicted in the future which will lead to more runoff. A decade ago typically a 20% uplift in rainfall intensities were applied to allow for potential climate change.

In Ofwat's report 'Future impacts on sewer systems in England and Wales' in 2011, all WaSCs provided computer predictions of the impacts of development, urban creep and climate change. The predicted increases in sewer flooding from the above pressures (growth, urban creep and climate change) are shown in the table below. Climate change will have the largest impact if rainfall intensities increases by 2040 as expected.

Future Impacts on Sewer Systems in England and Wales

Summary of a Hydraulic Modelling Exercise Reviewing the Impact of Climate Change, Population and Growth in Impermeable Areas up to Around 2040

June 2011

A report prepared for Ofwat

Mott MacDonald

Table 4-1: Predicted increases in sewer flooding

Median increase in sewer flooding, %	50th percentile
Population growth	5
Property creep	12
Climate change	27
Combined	**51**

Since this report, many other research projects have been undertaken, which confirm the findings. The UKWIR report Design Intensity for Sewer Design (ref 17/CL/1017) undertaken in 2017 gives a wider range of possibilities, as stated in the table below.

Table 4-2: Proposed rainfall uplift for 30 year storms

		2030	2050	2080
South east	Central estimate	10%	15%	25%
	High estimate	20%	35%	65%

Both UKWIR and the 21st Century Drainage programme have initiatives to establish how to design for the future. This is a fundamental and integral part of the Drainage and wastewater management plans (DWMP) – to establish how much investment is needed in wastewater infrastructure, now and in the future. See section 6.4 for our long-term planning.

5. Need for investment

5.1 Current performance

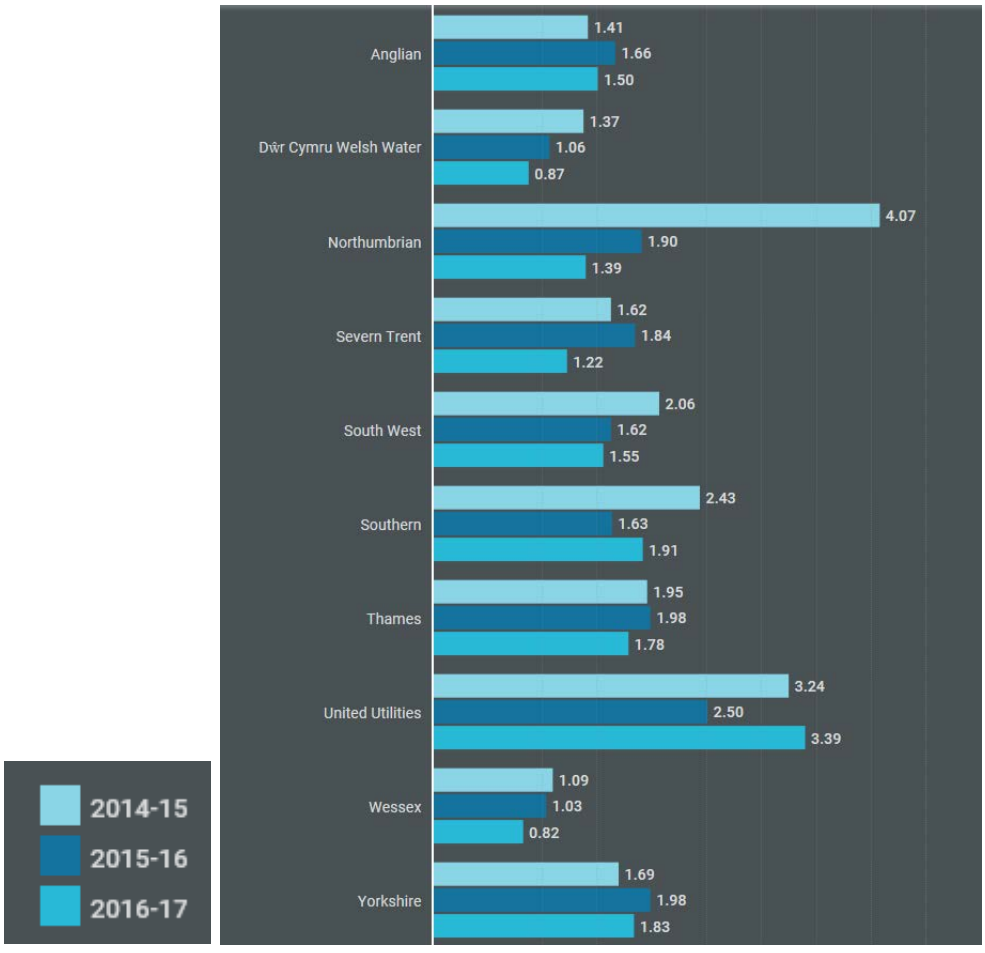
Our performance for the number of internal sewer flooding incidents is industry leading. For external sewer flooding incidents our performance is approaching the upper quartile for the industry.

Our aim for PR19 is to continue to be frontier for internal flooding incidents and continue to reduce the number of external flooding incidents to meet our customers' expectations.

5.1.1 Internal flooding

Our performance compared with other WaSCs is industry leading, shown below from Discover Water[2]:

Figure 5-1: Number of properties flooded with sewage internally (per 10,000 connections) – excludes S105A incidents and severe weather



Comprehensive flooding data for all WaSCs was shared for the first time since 2010/11 through Ofwat's shadow reporting process which started in 2016/17. The infographic on the

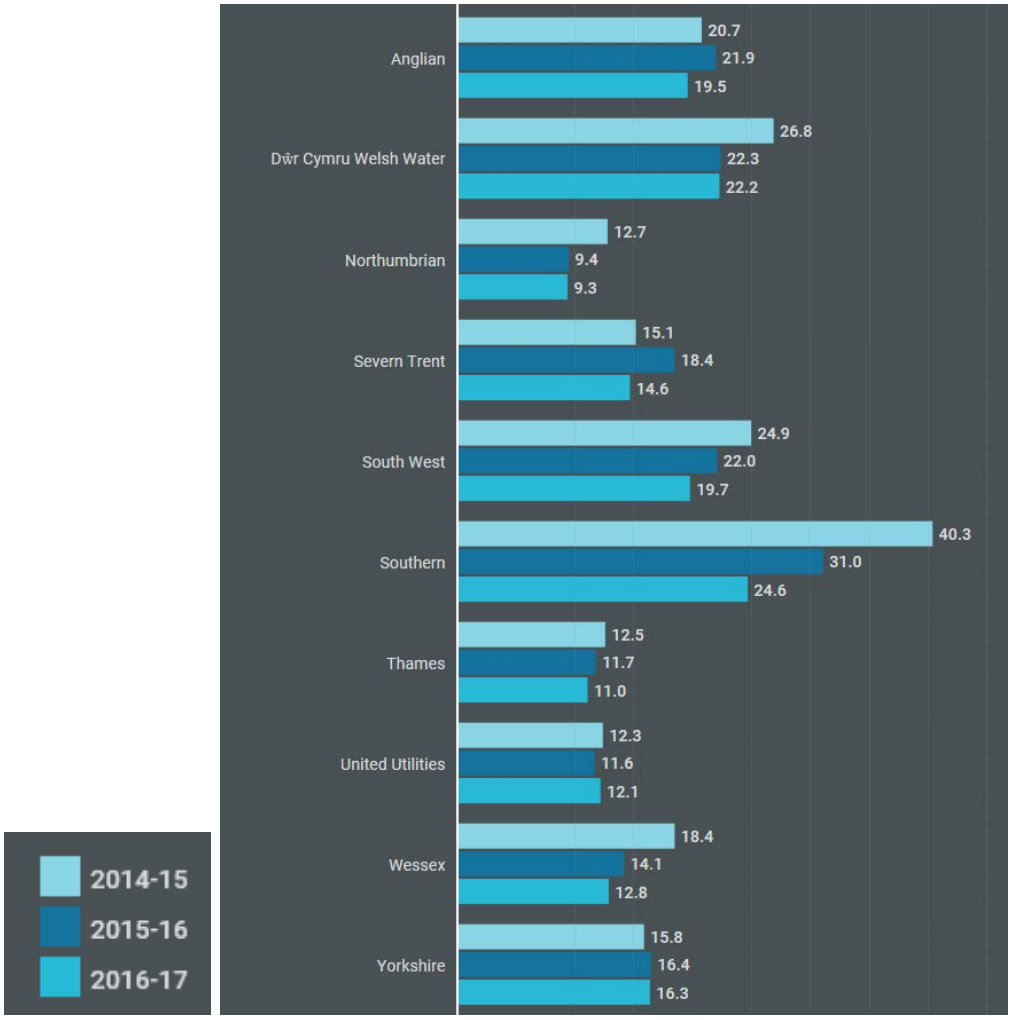
[2] https://discoverwater.co.uk/sewer-flooding

Discover Water website is the only available comparison that shows recent performance trends over a few report years for numbers of incident experienced by customers.

5.1.2 External flooding

Our performance compared with other WaSCs is fourth, as seen below:

Figure 5-2: Number of properties flooded with sewage externally (per 10,000 connections) – excludes S105A incidents and severe weather

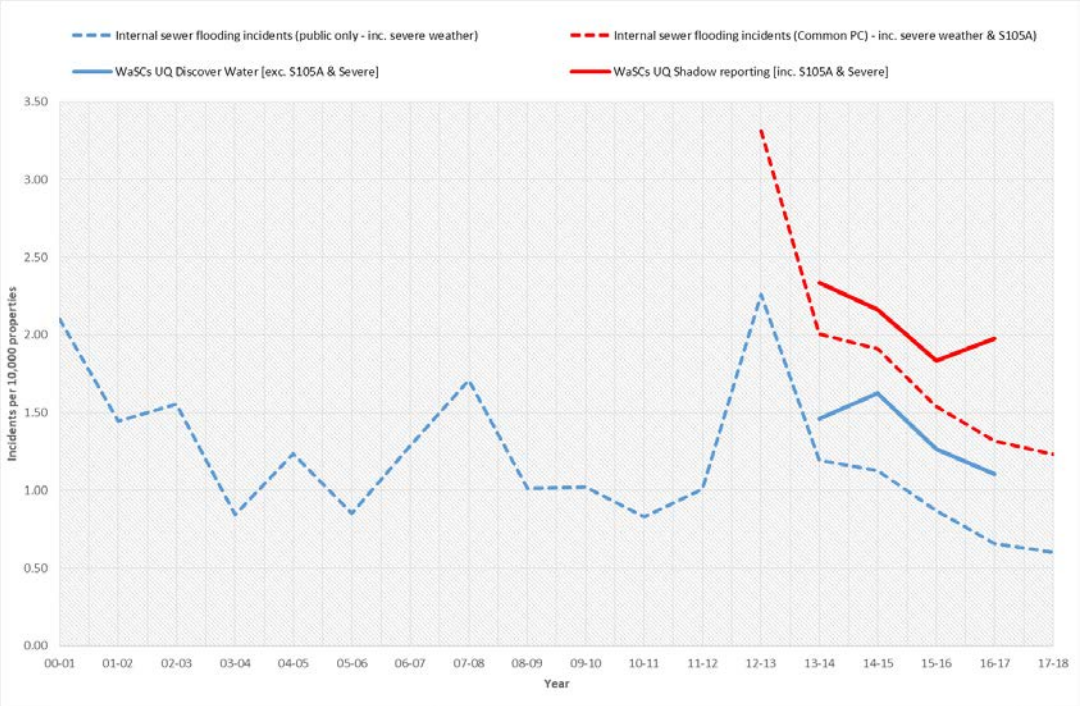


5.1.3 Upper quartile analysis of WaSCs performance

Available data regarding the number of internal flooding incidents suffered by customers in different WaSCs regions is limited to 2016/17 shadow reporting and the Discover Water website.

The development of common definitions for flooding for both internal and external incidents through an industry working group, led by Water UK, demonstrated that the majority of WaSCs were reporting internal incidents with similar definitions – allowing for some comparative analysis, although with a small data set, as shown in the graph below.

Figure 5-3: Wessex Water number of internal flooding incidents compared with WaSCs upper quartile performance



The graph demonstrates that our performance is clearly upper quartile for the number of internal flooding incidents.

The same analysis for external flooding incidents couldn't be undertaken as the industry working group demonstrated that WaSCs were reporting external flooding incidents differently.

5.2 Customers willingness to pay

Sewer flooding is the worst service failure that customers can experience. Our customer engagement highlighted that internal sewer flooding, external sewer flooding and restricted toilet use were the top three most impactful service failures that customers could experience, ranking higher than restrictions to essential water use, supply interruptions, and any environmental impact. In fact, internal sewer flooding was around 10 times more impactful than supply interruptions. Details are provided in supporting document 1.1 and appendix 1.1.D.

6. Best option for customers

6.1 Overview

As there are many different causes for flooding from intentional and unintentional sewer misuse, local defects (e.g. displaced joints, sewer jetting) or overloaded sewers various approaches are needed to tackle the underlying causes of sewage flooding.

This section outlines the approaches proposed for PR19.

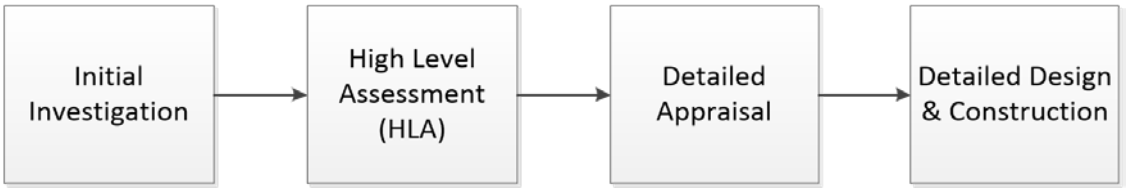
6.2 Overloaded sewers

6.2.1 Flooding scheme delivery

Where the underlying problem is due to overloaded sewers the solution is likely to involve some form of capital expenditure either providing additional capacity or preventing groundwater or surface water getting into the sewer.

Within Wessex Water, there are four main stages to delivering solutions for overloaded sewers; the initial investigation, a high-level assessment, a detailed appraisal and detailed design & construction.

Figure 6-1: Delivery stages of the flooding programme (overloaded sewers)



Initial investigation

The initial incident investigation establishes the cause of incident e.g. blockage, overloaded sewers etc. and will involve the crew in the first instance on attendance of the original incident. Technical staff within Operations may determine further investigation works may be required to confirm if there is an underlying problem that hasn't been identified, this would involve additional CCTV, site surveys etc.

High level assessment (HLA)

If incident is deemed to be because of overloaded sewers then an HLA is produced for that particular flooding issue. This is primarily a desktop exercise looking at all available information to establish the underlying cause and propose solutions (which are costed). Some additional investigation works may be carried out including e.g. CCTV site surveys, infiltration investigations, impermeable area surveys etc. to confirm that overloaded sewers is indeed the cause of the flooding incident/s.

Figure 6-2: Options reviewed at HLA stage

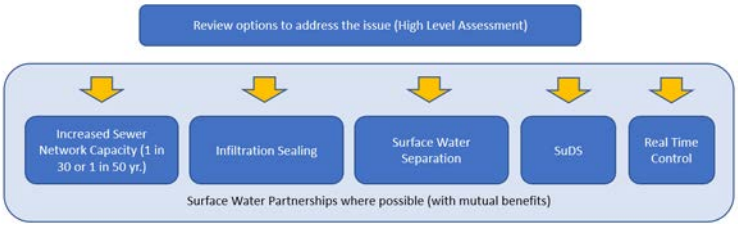


Figure 6-2 shows the range of potential solutions the HLA will explore to remove the risk of flooding. These include:

- **Increased sewer network capacity:** enlarge the sewer to a higher design standard to attenuate high flows (i.e. 1 in 30, 1 in 50).
- **Surface water separation:** Creation of a surface water sewer to provide additional capacity in the combined sewer
- **Sustainable Urban Drainage Schemes** (SuDS): Divert surface water out of the combined sewer into SuDS for local attenuation
- **Infiltration sealing:** reduce ground and surface water entering the sewer networks to provide additional capacity.
- **Real Time Control:** Use technology to maximise effluent storage within the sewer network.

Where possible, sustainable and often cheaper solutions are investigated i.e. trialling sewer infiltration reductions ahead of more expensive capital sewer enhancements. This reduces the risk of sewer upgrades if they are not needed.

We share this level of information with local authorities and surface water partnerships to try and identify synergies regarding the wider flood risks within catchments to maximise benefits and apportion costs.

Detailed appraisal

If a HLA is cost-beneficial then a detailed appraisal will be undertaken. The scope of the detailed appraisal will be very dependent on the problem and available information held. The purpose of the appraisal is to produce a fully costed buildable solution to the flooding problem. This may involve producing a computer model of the network, carrying out flow surveys, examining existing services (e.g. gas, electricity, etc). Appraisals are approved technically and then financially by a central group made up of technical experts within the organisation; the Networks Review Meeting (NRM).

Detailed design & construction

Once a scheme has been technically and financially approved it will be programmed for delivery depending on the priority of the scheme. The length of time to undertake detailed design and construction of a flood alleviation scheme will be dependent on the elements of works required by the scheme.

The proposal for resolving overloaded sewers in PR19 is a continuation of the PR14 approach.

6.2.2 Partnership working

Annex A contains a few case studies of flood alleviation schemes, which also contain partnership working. A good example of partnership working and delivering the best options for our customers in the ✂ project, Weston-super-Mare, below.

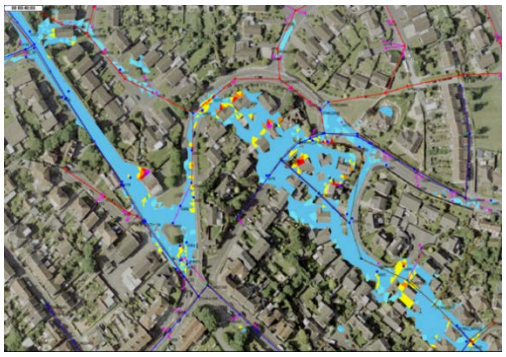
Case Study 1: ✂

Need: 20 properties (8 internally) and highways were subject to frequent flooding.

Solution: Our initial intention was to develop a sustainable solution, by separating flows out of the combined sewer into a new system and crate storage system. This solution was estimated to cost £10m because the only location for crate storage was some distance away. The solution was not viable. We offered mitigation, such as flood doors, to all properties at risk.

A traditional solution of storage tanks was then designed using a new hydraulic computer model, which was able to replicate the overland flow (see right). The storage solution was estimated to cost £3m and comprised of 2 large underground storage tanks and several hundred metres of new kerb drainage.

Picture 1: ✂ overland flow model



Partnership: Wessex Water with the Somerset Highways worked together to achieve a common outcome of reduced flood risk. We oversized the underground storage to allow highway gully connections, which was needed to drain the road, because overland flow caused internal flooding.

How it worked: Joint liaison, detailed modelling, customer engagement, optioneering and construction.

Benefits: Through co-operative working between Wessex Water and partners we reduced the risk of flooding from all sources of flooding, so our customers are better protected.

The scheme won a Partnership award. At the Institute of Highways South Western Branch.

INSTITUTE OF HIGHWAY ENGINEERS
IHE
SOUTH WESTERN BRANCH

6.2.3 Increased sewer network capacity

Traditional solutions, such as making pipes larger or providing underground storage are often the most cost effective way of solving significant flooding problems. Sustainable solutions have their place, but these are simpler to use for new development, where there is space for the attenuation ponds.

Below is a case study of a recent traditional scheme we have delivered at Brent Knoll.

Case Study 2: Brent Knoll

Need: Protect 46 properties from flooding within Brent Knoll and Burnham on Sea; 31 at risk of internal flooding and 15 properties at risk of external flooding.

Solution: Computer modelling was used to develop numerous options. The optimum solution was to build a new sewage pumping station (Picture 1) with storage shaft, several new sewers, two rising mains over 3km in length using directional drilling techniques.

Picture 2: New storage shaft at new SPS

Through local engagement, the micro-tunnelling and road closure necessary was programmed to be undertaken during the school summer holidays which reduced disruption on the school and the general public.

Efficiencies: All works where competitively tendered through three framework qualified contractors to achieve the most competitive quotes. The contractors were then invited to discuss their tenders within the conditions and requirements confirmed to ensure the delivery of the scheme would be efficient and within budget.
During construction c£300k was saved through not stripping over 3km of easement

Costs and delivery: This £5million scheme was completed by Wessex Water in December 2017.

6.2.4 Infiltration reduction

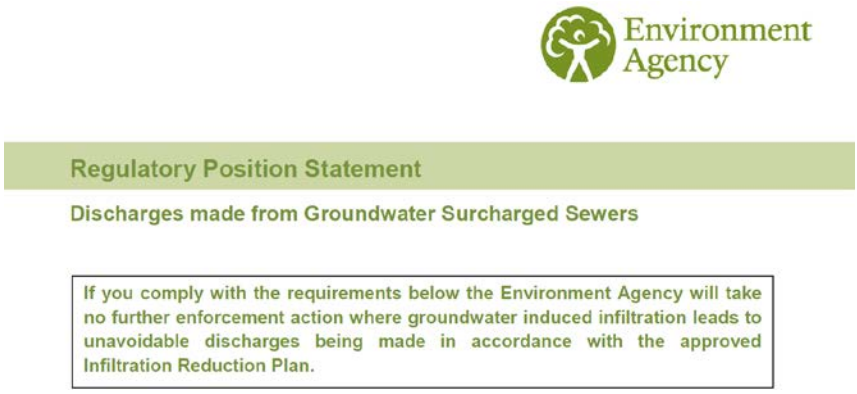
During wet winters, the groundwater table can be high for several months, especially in the chalk valley in Wessex. This groundwater can enter the public sewers and private sewers from cracks in the pipes or manholes. This groundwater infiltration can inundate sewers continually for weeks. This increases the risk of flooding and CSO spills and in some catchments, can lead to discharges from the sewers for weeks when the groundwater table is high. The phenonium of groundwater inundation is prevalent in the Wessex area, where the chalk geology can funnel groundwater to the low-lying properties in the chalk valleys.

Figure 6-3: Groundwater education video[3] screen shot

In the wet winter of 2012, groundwater water inundation of sewers occurred in many villages across the Wessex Water region. To prevent property flooding, Wessex Water pumped flow from some sewers directly into rivers, as emergency mitigation. This was agreed with the local Environment Agency staff before any discharges were made.

To protect WaSCs against prosecution for discharging groundwater flows from sewers into the river, the Environment Agency issues a Regulatory Position Statement. See extract below:

Figure 6-4: Extract from EA Regulatory Position Statement



[3] https://youtu.be/Geo_iD2Se7c

We have since produced detailed Infiltration Reduction Plans for 12 villages and summary plans for a further 38 hamlets.

Annex B contains a summary of the infiltration reduction we have achieved in the past two years. This also contains the Piddle Valley case study, where we built two permanent pumped relief stations, so that properties would be protected in this vulnerable catchment.

6.3 Flooding other causes

Activities to reduce the number of flooding incidents due to other causes (e.g. blockages) cover three areas, customer engagement, operational intervention and enforcement, these are described in more detail below.

6.3.1 Customer engagement

A significant majority of sewage flooding incidents are due to blockages caused by sewer misuse.

The misuse of sewers from the flushing of wet wipes and disposal of fats, oils and greases into kitchen drains is typically caused by customers that are unaware of the consequences of their actions. Our engagement with customers on this issue is made more difficult because some wet wipes are labelled by manufacturers as 'flushable'. We, like other water companies, are keen to promote the simple message that only the three P's should be flushed. In 2016 we led the industry in trying to tackle this issue directly through our report to the Advertising Standards Agency[4] and the whole water industry (via the 21st Century Drainage Programme) subsequently raising the issue with Trading Standards calling for a ruling on the misleading advertising claims that certain wipes are 'flushable'. Both consumer organisations declined to make a ruling and instead proposed that it was a matter for the courts to consider.

Ongoing issues

Wet wipes are used for many practices around the home from personal hygiene to cleaning and child care. To reduce the number of wipes that are flushed, our strategy includes making customers aware of and/or providing alternative products (e.g. gel sprays to moisten regular toilet paper) or alternative disposal methods (e.g. bathroom bins) to encourage behavioural change.

Similarly, regular domestic cooking habits lead to the creation of waste FOGs in kitchens across our region every day. To encourage better disposal, we can provide 'gunk pots' for collecting fats.

We know from customer research that customers are keen to play their part in the resilience of our systems and, from our experiences in encouraging the uptake of water efficient behaviours the key to success often lies in the removal of barriers to change.

[4] http://www.wessexwater.co.uk/binit/

In recent years we have undertaken several localised engagement trials to further our understanding of how to reduce blockages cause by sewer misuse:

Engagement trials

- In 2014 we undertook project in Salisbury where, at the time, we were experiencing our highest blockage rate. We worked with engagement specialists at the University of Bath to develop the campaign and incorporate behavioural science methods such as social norming communications and co-creation to identify engagement channels. We found that whilst the campaign resulted in an immediate reduction in blockages during the promotional period and for a few weeks afterwards, the trend was short-lived.
- In response to identifying an increase in blockage related sewerage incidents in north Tidworth, Wiltshire from a baseline of around 30 per year to 52 in 2016-17, we undertook localised engagement. This included engagement with the local council and mayor leading to information in a community newsletter plus activity on both our own and community social media channels and local radio. The impact of this focussed campaign was a significant reduction in sewerage incidents to just 21 (below the former baseline) in 2017-18 from a peak of 52 in 2016-17.
- In Swanage in late 2017 we launched our 'Stop the Block' campaign and wrote to 62 businesses with advice on how to avoid blockages and our 'managing kitchen waste' leaflet. We had a stand at a supermarket to meet domestic customers to offer free gunk pots to and a leaflet. Our press release was published in three local newspapers and our targeted Facebook advert was seen by more than 4,000 people and 'liked' 60 times.

FOG initiative example

An example of an initiative that has shown promise from a behavioural perspective about how FOG's are disposed was our offer of free Gunk Pots. One known hindrance to customer's changing a habit is their perceived lack of a suitable alternative. To combat this, we offered free Gunk Pots in our November 2017 newsletter. These are colourful, collapsible rubber containers with a lid that can be used to poor used fat, oils and grease for later disposal into the food waste or bin. The offer was featured on the cover of the newsletter and within the space of a week over 6000 were ordered. This suggests the pots offered a solution to a problem that customers were keen to address. Additionally, an accompanying article offered advice on how to avoid blockages, stressing the need to poor FOGs into suitable containers like the Gunk Pots. Further initiatives using Gunk Pots are planned.

Our future strategy will use social media, digital and traditional print channels along with partnerships with national organisations such as City2Sea to engage with as many customers as possible. Additionally, will look to increase our understanding of customer behaviour through research with academic institutions like Bath University where we have already carried out some research. Our ongoing work to discuss, develop and share ideas and knowledge through industry bodies like the Sewer Network Abuse Partnership (SNAP) and the 21st Century Drainage programme will also help to inform our strategy. We will also again make use of data analytics to identify locations where repeated blockages occur and

continue to take a more tailored approach in these communities to encourage and provide where necessary alternative products and disposal methods.

We also plan to align our sewer misuse engagement with community based citizenship programme to help people in our region understand their wider water system and how sewer blockages can impact elsewhere.

6.3.2 Operational intervention

Effective operational intervention is reliant on how the problem is investigated, identified and the type of intervention undertaken. The table below shows the number of sewerage incidents that are attended by sewerage crews.

Table 6-1: Sewerage incident volumes

No of incident	2012-13	2013-14	2014-15	2015-16	2016-17	Average
Sewerage incidents attended	31,185	29,392	26,925	26,339	26,398	28,048
Internal flooding	397	242	232	189	163	245
External flooding – inside boundary	3276	2510	2278	2057	2092	2,443

With such high volumes of incidents, sewerage crews will often clear the blockage which solves the immediate problem but often there is an underlying problem that has caused the blockage which isn't addressed; these are only addressed if additional investigation works are carried-out by customer service technicians or there is a repeat problem.

The average attendance time for a one-man sewerage crew is one and half hours which includes travel time, the proposal for PR19 is to increase the amount of time spent at particular incident types, namely internal flooding and external flooding (inside property boundary).

By increasing the time allowed at each incident the crew can carried-out a more detailed investigation of the problem, identify the underlying cause on the first visit and request the appropriate invention to resolve the issue. This would significantly reduce the likelihood of repeat visits and the risk of an external flooding incident becoming a future internal flooding incident. To allow for the increase in time for investigation additional crews will be required, the proposal for PR19 is an additional sewerage crew per sewerage area; Wessex Water has four sewerage areas.

The proposed intervention may be further customer engagement, putting lengths of sewerage on routine inspection and/or routine maintenance (e.g. jetting, root cutting etc.), identification of a local repair (e.g. displaced joint) or it may identify a significant repair is required.

Further customer engagement would be undertaken either by crews at the time of the visit or by a CST/crew on a return visit. Routine inspection/maintenance will be undertaken by either sewerage crews or jet vac crews. Approximately 20% of sewerage incidents require a local repair which would be undertaken by our in-house repairs and maintenance section (R&M) and a further 0.5% of sewerage incidents require a significant small scheme.

To increase the effectiveness of our sewerage crews additional training is being rolled-out to a Water Jetting Association course for high pressure water jetting training course. The course is a two-day course; day one focuses on general health and safety requirements when working with high pressure water jetting and day two is a module specific to clearing drains and sewers.

6.3.3 Enforcement

It is very difficult to prove that a single person or trader is responsible for sewer misuse, however, there are occasions where an individual's actions or a particular trader's actions can be identified and Wessex Water has used the threat of the Water Industry Act Section 111 in letters, where direct contact hasn't led to a change in behaviour.

Section 111 states '(1) …no person shall throw, empty or turn, or suffer or permit to be thrown or emptied or to pass, into any public sewer, or into any drain or sewer communicating with a public sewer — (a) any matter likely to injure the sewer or drain, to interfere with the free flow of its contents…'.

In the small number of cases this has been used, the threat has been enough to change the customers behaviour.

The other proposal for AMP7 is to work with local councils to either embedded water company officers' within Environmental Health departments or to sponsor Environmental Health Officers in order to utilise the councils powers to act on traders that continue to discharge fats, oils and grease into sewers which significantly increases the risk of sewage flooding.

6.4 Drainage and Wastewater Management Plan

6.4.1 Background

Long term resilience planning for drainage and wastewater is not as advanced as for water supply, partly because of the individual and diverse nature of the waste water and drainage systems.

However, following the work by the 21st century drainage programme, the industry has been encouraged by Defra and the National Infrastructure Commission to publish long-term plans for sewerage investment. These plans will be called Drainage and Wastewater Management Plans (DWMP). They will be the wastewater equivalent of the Water Resources Management Plan.

6.4.2 What is a Drainage and Wastewater Management Plan?

A framework is currently being developed and it is understood that there will be three levels of plan to suit different audiences, as summarised below and in the diagram.

- *Level 1.* At the Water company regional area, the DWMP report will be similar to the WRMP report. The DWMP report will be more complex because flooding can occur anywhere if intense rainfall occurs and because of the interactions with other risk management authorities
- *Level 2.* Strategic planning areas will be based on River Basin catchments (four areas in Wessex). The expectation is that we will host catchment partnership meetings to influence our approaches
- *Level 3.* Drainage Strategies at treatment works catchment level.

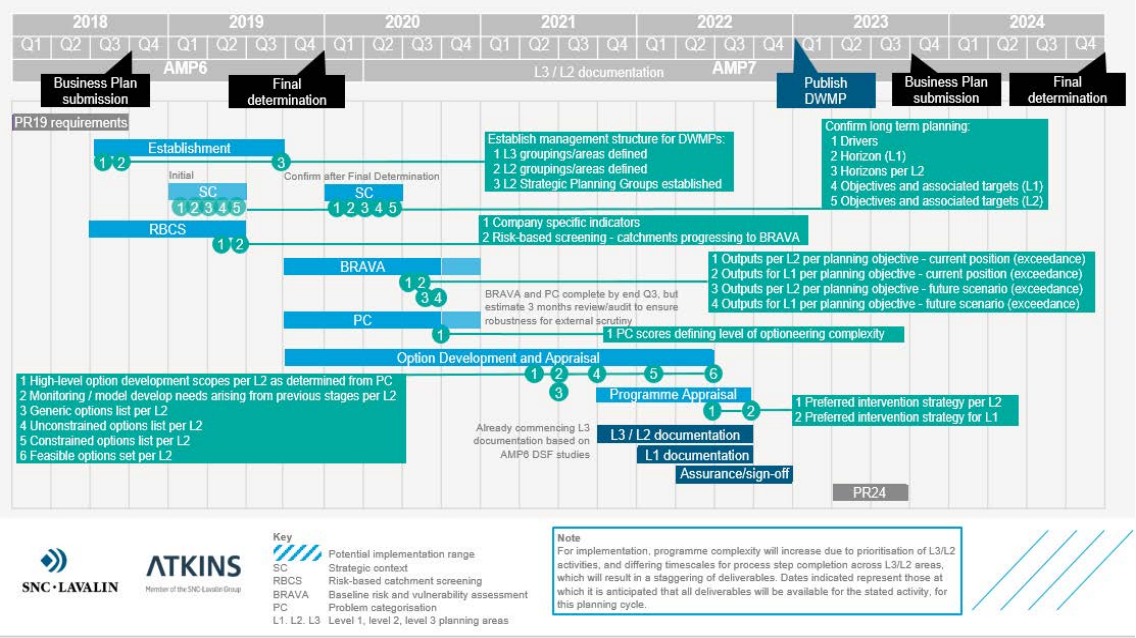
DWMP framework

The overall aim is to develop plans for anywhere that could be at risk of flooding now or in the future, due to intense rainfall, development and other drivers, so that a holistic long term picture of the "sewerage deficit" can be formed.

DWMPs are not currently a legislative requirement. We are expected to deliver the plans by 2023, in order to inform PR24.

A draft programme of activities to achieve this is shown below:

Figure 6-5: Proposed delivery timetable for DWMPs



6.4.3 Our draft Drainage and Wastewater Management Plan

<u>The challenges we face</u>

The Wessex Water region continues to face above average population growth and changing weather patterns driven by climate change along with urban creep are putting out drainage system under pressure.

<u>What we will be doing to 2025</u>

We aim to stay at the top of the table for internal sewer flooding incidents and to reduce external flooding further by:

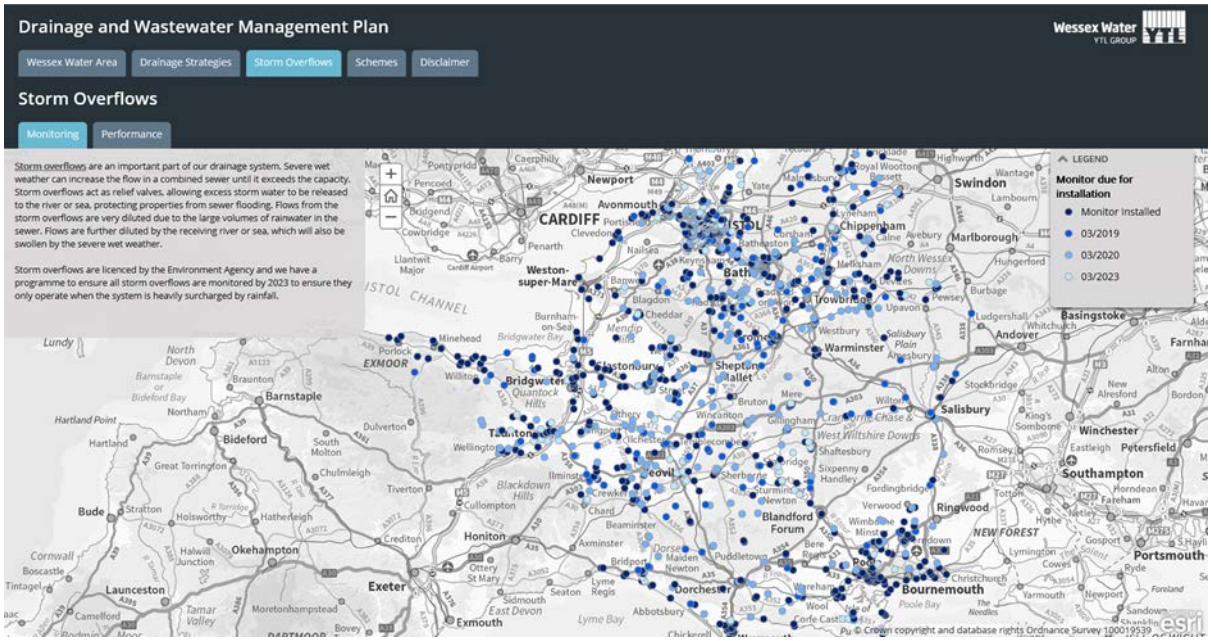
- continuing to work with customers to raise awareness about the types of things that can cause blockages
- working with local councils to stop takeaways and cafes putting fat, oil, grease and food waste down the sewers
- investing in new and/or larger sewer capacity where there is new building/housing
- continue to develop better planning tools so that we can work with developers on providing appropriate capacity in our sewerage network
- Increasing proactive CCTV and jetting

We have over 85% of our foul and combined sewerage system modelled and continue to work to complete modelling of all of our sewer network, combined overflows and surface water drainage. We are developing a long-term sewerage capacity graphical information portal giving visible information to customers and stakeholders of our long-term drainage and wastewater management plans and capacity information. This will be rolled out on a catchment by catchment basis using a risk-based approach with high risk catchments the first to be delivered.

We already follow the principles of the drainage area planning and capacity assessment frameworks that have been developed by Ofwat, the Environment Agency and the 21st century drainage programme. We will use the proposed national capacity assessment tool and our drainage water management plans to justify our long-term investment in our drainage network.

To give visibility of our Drainage Strategies we have developed a Drainage and Wastewater Management Plan area on our website (here). The DWMP website also includes an option of showing information geospatially, using a Geographical information system (GIS).

Figure 6-6: Drainage and wastewater information portal



We will continue to work with local lead flood authorities and other stakeholders to identify joint schemes that provide value for money sustainable solutions that reduce flooding.

Section 3 of Supporting document 5.4 contains more information on our approach to implementing the DWMP framework.

6.5 Cost benefit analysis

Our methodology and the results of cost benefit analysis are described in supporting document 3.3 Cost-benefit analysis.

Cost benefit analysis considers the three elements of the programme – internal flooding, external flooding and the sewer flooding resilience risk (flooding risk score) – and demonstrates that the proposals are cost beneficial individually and as a strategy.

6.6 Proposed targets

The table below shows the proposed targets for the PR19 flooding programme.

Table 6-3: Proposed PR19 targets for the flooding programme

Measure	Proposed target	Reason
Internal flooding incidents	22.5% reduction	Industry leading, worst service failure, very strong willingness to pay, aiming to maintain frontier performance
External flooding incidents	10% reduction	Approaching upper quartile (limited dataset for comparison), however, definition changes brings uncertainty whether all companies have reported consistently
Sewer flooding resilience risk	Stable risk score	Move to reputational measure, innovative PR14 measure that Wessex Water would like to retain as investment linked to this improves resilience of sewerage assets

7. Robustness and efficiency of costs

7.1 Programme summary

Providing capacity to reduce flooding incidents caused by overloaded sewer is primarily capex driven, where as to reduce flooding incidents due to other causes (FOCs) (e.g. blockages) requires a mixture of capex and opex solutions whether that is through customer engagement or through local remedial works.

The proposed AMP7 programme totex is outlined in table 7, the follow section covers how different elements are procured to ensure best cost to ourselves and our customers.

Table 7-1: TOTEX summary of proposed AMP7 flooding programme

Activity	Cost £m	
	Capex	Opex
Flooding risk (hydraulic)	47.51	0.5
Infiltration	9.52	0.00
DWMP modelling	12.67	0.00
Flooding incidents (FOC)	10.28	6.33
Total	**79.98**	**6.83**
TOTEX	**86.81**	

7.2 Overloaded sewers

7.2.1 Flooding programme

The proposed PR19 approach is a continuation of the PR14 approach in the flooding programme with the inhouse Engineering & Construction team delivering the programme. The programme is fluid in terms of which schemes will be delivered, as the priority of any scheme will change as costs and needs are continually refined/updated through the flooding programme process.

The flooding programme is primarily concerned with reducing the risk of flooding to customers through removing risk points. The total risk is dynamic as points will be added to the total risk score through flooding incidents as well as being removed through the flooding programme, as shown in table 7-2.

Thus, on average approximately 2,100 risk points are added each year. Our programme will hold the risk score at a stable value, in the face of additions each year and the pressures of urbanisation and climate change.

Table 7-2: Summary of AMP6 flooding programme

	2014-15	2015-16	2016-17	2017-18+	Total
Total Risk Score	50,651	51,509	51,125	49,990	
Risk points removed through flooding programme		986	2,468	2,022	5,476
Expenditure, £k (2017-18 price base)		9,057	8,327	8,389	25,773
Cost per risk point, £k		9.19	3.37	4.15	4.71
Internal outputs*		18	62	62	160
External outputs*		33	55	25	136
Total number of outputs		51	117	87	296
Risk points added through incidents	3,266	2,031	2,153	1,016	8,466

*Note: Output equals any reduction of risk not removal of risk to a particular standard

+Note: Subject to APR audit and review

7.2.2 Robust and efficient costs

Our approach is to competitively tender design and construction work from the market. The main steps in the procurement process are outlined below:

- Our procurement team manage the procurement for the whole of Wessex Water. Framework contracts are let for AMP periods. At the beginning of this period lots/types of work is advertised utilising the Achilles Utilities Vendor Database (UVDB) as the call for competition. This is a long established and well-known Qualification System utilised by the Utilities industry.

- Typically, the Achilles database advertises the framework requirements as per legal requirement under European legislation for the Official Journal of the European Union (OJEU) for quantities of work of this size and value. Contractors are invited to join the database and register for a variety work types they wish to deliver. Achilles connects the clients and the deliverers.

- Significant contractors and consultants are invited to submit financial and quality submissions about their businesses and how they deliver the relevant types of work.

- Contractors and consultants are invited to interviews and submissions are scored within Wessex Water, with site visits to previous works they have carried out for other clients. Areas under review are financial rates, Health and Safety performance, quality of construction or product feedback. In this scoring process, financial performance is heavily weighted to ensure best value for Wessex Water.

- At the end of this process, the six top scoring contractors are selected to be framework contractors, with the top two being offered relevant work through the negotiated NEC Option C (Target cost) contract. If the top two contractors don't perform in regards to financially or quality of product then the next qualified contractors from the six get offered future work from the Wessex Water programme. Consistently poorly performing contractors can lose their framework status and thus future work.

- Target prices are negotiated by the Wessex Water Engineering and Construction estimating group, who provide specialist input into the procurement process. Construction information is sent to the relevant framework contractor, the contractor returns a detailed target price and then through numerous reviews with the Wessex Water estimator agrees the final challenging target price.

- The NEC Option C form of contract is utilised extensively for major projects by Wessex Water. This is an actual cost contract with a pain/gain mechanism. Where the contractor can share in the saving if the project is delivered less than the agreed target price, thus encouraging good performance. Also, the contractor will share in any over spend of the target price, again encouraging good performance.

- Similar procedures and processes are utilised with design consultants, with scope of works provided in briefs and consultants submitting target prices. With a pain/gain mechanism to promoted effective performance.

- Other forms of contract can be utilised for smaller value schemes to ensure that Wessex Water procurement is robust and effective for relative values of projects.

- Other smaller local contractors also must qualify before tenders are offered for pricing to ensure high quality and good value for Wessex Water.

All projects or sub contracts being procured that are valued at greater than £5k that are not suitable tier 1 framework contractors must be competitively tendered and three prices obtained to ensure robust and good value priced projects for customers.

In addition, we carry out benchmarking exercises to ensure that procurement processes and forms of contract that are systematically utilised in delivering programmes and projects are robust and ensure good value for the customer.

Small groups of projects are selected to be benchmarked at the start of each financial year. With additional procurement time added to the delivery programme to enable project targets to be met.

In 2018/19, six networks projects are programmed to be externally tendered to non-framework contractors to deliver. Prices will be requested from three different contractors to ensure competition. These prices and programmes returned will be compared with internally pricing exercises to review any differences.

Learning events from the benchmarking exercises are fed back to the Engineering and Construction senior management team to review processes and delivery options to be considered going forward.

This ongoing review process ensures efficient delivery and value to Wessex Water and customers.

7.3 Flooding other causes

7.3.1 Operational activities

Wessex Water operates an efficient in-house sewer operation and maintenance establishment comprising three divisional teams. The transfer of private sewers into public ownership in 2010 had a significant impact by nearly doubling the length of the adopted sewer network. Little was known about the condition of the transferred sewers and drains, or the corresponding workload that would be generated.

Following the transfer Wessex Water now offers a one-stop-shop for blockage clearance for all sewers and drains, both public and private. Because the volume of work varies Wessex Water utilises a mix of in-house teams and peak lopping contractors to manage this fluctuating volume of reactive jobs.

Since the transfer in 2010 volumes of jobs and detailed costs are now better understood. A comparison of costs between in-house crews and contract crews has provided useful benchmark evidence to show that the in-house operation is more cost effective than external contractors.

The audited in-house costs are inclusive of all overheads and are significantly lower than the external contractors. This is thought to be due to a number of factors:

- Wessex Water can leverage scale efficiencies in terms of vehicle, equipment and fuel purchasing
- Corporate overheads are likely to be less than those in smaller companies as they are shared across a larger organisation
- Wessex Water costs do not incorporate an element of profit which external contractors costs would.

The table below summarises the relative volumes and costs for reactive private blockage clearance jobs in each division, based on 2018/19 budgets.

Table 7-3: Reactive private blockage clearance rates by Sewerage Division

Division	Work volume, 2018/19	Rate
North in-house	2645	£65
North contractor	75	£173
Total work volume, North	2720	
West in-house	2220	£65
West contractor	1200	£113
Total work volume, West	3420	
South in-house	1815	£65
South contractor	230	£92
Total work volume, South	2045	

8. Customer protection

In this section we set out how customers are protected if the performance outcome is not achieved.

Following consultation with customers and stakeholders and development of our 25-year Strategic Plan, we are proposing eight outcomes across the five price controls for PR19.

These eight outcomes have 41 associated performance commitments. In addition, we will continue to measure and report performance against other statutory and regulatory obligations. These will be included in management reporting and exceptions reported in our Annual Performance Report.

Performance commitments related to sewer flooding are set out in the following sections.

8.1 Performance commitment: F1 Customer property sewer flooding (internal)

Internal flooding incidents is a common performance commitment that measures the number of internal flooding incidents suffered by our customers. This will be reported using the Ofwat reporting guidance[5].

The definition of performance commitment is the number of incidents per 10,000 connections. If the proposed internal flooding incident target is not achieved Wessex Water will be subject to underperformance payments. See supporting document 3.1.A for more details.

Table 8-1: Performance commitment - F1 - Internal flooding

	Unit	2020-21	2021-22	2022-23	2023-24	2024-25
PC	No/10,000 sewer connections	1.54	1.47	1.41	1.34	1.24

8.2 Performance commitment: F2 Customer property sewer flooding (external)

External flooding incidents is a bespoke performance commitment that measures the number of external flooding incidents suffered by our customers. This will be reported using the Ofwat reporting guidance and is also reported through the shadow reporting table as part of the annual performance report (APR)[6]: APR Table 3S.

The definition of performance commitment is the number of incidents per 10,000 connections. If the proposed internal flooding incident target is not achieved Wessex Water

[5] https://www.ofwat.gov.uk/publication/reporting-guidance-sewer-flooding/

[6] https://www.ofwat.gov.uk/publication/2017-18-apr-excel-tables/

will be subject to underperformance payments. See supporting document 3.1.A for more details.

Table 8-2: Performance commitment – F2 – External flooding

	Unit	2020-21	2021-22	2022-23	2023-24	2024-25
PC	No./10,000 sewer connections	17.07	16.73	16.38	16.03	15.68

8.3 Performance commitment: F3 Sewer flooding risk

Sewer flooding risk is a bespoke performance commitment that measures the overall risk of flooding based on the flood risk grid score, which covers flooding (inside properties and external flooding including roads) due to inadequate sewer capacity. This is a bespoke performance commitment continued from the innovative measure introduced in 2015.

When properties are confirmed to be at risk of hydraulic flooding, they are added onto their respective risk square in the grid (See Figure 8-1). The grid has an impact score based on our customer research, which gives internal flooding a score of 10, where-as external flooding scores depends on type and volume of flooding. The likelihood of flooding is the probability of flooding occurring, with more frequent flooding have higher scores. The risk score for each property is the product of the impact score and the likelihood score.
The risk scores all the properties that are in the unacceptable risk zone (blue in the grid in Figure 8-1) are summed to give an overall risk score. This was 50,651 in 2015 when this performance commitment was first developed. We are aiming for a stable score over time.

Figure 8-1: Sewer flooding risk grid score (2015 baseline)

Sewer Flooding Risk: Number of Properties / areas				Impact						
				Very Low				Very High		
				Fields (Surface water) Minor Garden (s/w) Roads (Surface water)	Major Garden (Surface) Fields (Combined)	Road (Combined) Minor Garden (Combined)	Major Garden (Combined)	Internal	Nr of Properties /areas above the line of acceptable risk	Total Risk Score
				2	3	5	6	10		50651
Probability	Very High	5	2:10yr	26	30	188	140	31	415	11158
		4	1:10yr	47	32	335	190	65	668	14232
		3	1:20yr	8	11	16	47	363	444	11971
		2	1:30yr	26	16	227	69	532	870	11470
	Very Low	1	1:50yr	7	12	195	52	182	182	1820

When we implement a hydraulic flooding alleviation scheme (funded through this flooding programme) to reduce the risk of flooding, we move the properties and areas that are better

protected to their new location on the grid. If a full design standard solution (e.g. 1 in 50 year solution for internal flooding) is delivered they are no longer considered to be at-risk. If a full scheme was not cost-effective and say only a 1 in 10 year solution was provided, then they remain on the grid, but with a lower risk score.

With new additions occurring annually due to new rainfall events occurring creating newly reported hydraulic flooding problems, if we did not invest in the sewer flooding programme, then the risk score would increase annually. We are aiming for a stable level of risk, so we need to proactively need to reduced known risks to counter the new additions. With urban creep, section 105a sewers, and implications of climate change this will be more challenging in the future.

The definition of performance commitment is the overall risk of flooding as measured by sewer flooding risk grid score. This measure for PR19 is reputational only. See supporting document 3.1.A for more details.

Table 8-3: Performance commitment F3 – Sewer flooding risk grid score

	Unit	2020-21	2021-22	2022-23	2023-24	2024-25
PC	Index	50,651	50,651	50,651	50,651	50,651
Underperformance dead band	Index	55,716	55,716	55,716	55,716	55,716

9. Affordability

The programme of work described in this supporting document was included in our draft business plan that was tested with customers between January and June 2018.

The customer research is designed to test whether customers find the plan acceptable and affordable. The stimulus material covered our overall package of service improvements, statutory enhancements and bill impacts. We tested our plan with household customers, business customers, retailers, those in vulnerable circumstances and industry stakeholders. Results were triangulated across a variety of qualitative and quantitative methodologies to maximise the robustness of both the sample and conclusions.

Testing has shown that 96% of our customers find our business plan acceptable. Acceptability is above 80% across all demographic subgroups. Those in vulnerable circumstances were slightly less accepting of the plan than other groups, but still at a very high level.

A large majority of household customers (92%) consider our plans are affordable for them. Over 90% of businesses found the plan to be affordable. Vulnerable customers also found the plan acceptable and affordable and were positive about the assistance that we provide to this group.

Full details of our acceptability testing can be found in *Supporting document 1.1 Summary of research findings* and details of how we address affordability and vulnerability are in included in *Supporting document 2.1 Vulnerability strategy.*

10. Board assurance

The proposals have been subject to our board assurance process, which is described in detail in section 12 of the main business plan narrative and supporting documents 12.1 to 12.8.

Section 12 of the main business plan narrative includes the following statements that are relevant to this supporting document:

> The full Board confirms that, in our view, the proposals within the Business Plan are consistent with and should allow the company to deliver against its statutory obligations, now and up to 2025.
>
> We, the Board of Wessex Water, understand our accountability for this Business Plan. We are unequivocal in our assurance that the Plan is both high-quality and deliverable. We also confirm that it is consistent with our long-term vision for the company and our strategy.
>
> The Board assures that this plan is informed by customer engagement and the views of the Wessex Water Partnership (WWP), and that the performance commitments contained within it reflect customer priorities, are stretching and reporting is robust.
>
> The Board confirms that the expenditure projections contained within this Business Plan are robust and efficient, and that large investments are deliverable and best for customers.

Annex A. Case Studies

Weston-super-Mare Superpond (date)

Partnership Schemes

Need: to reduce spills from a major overflow in the catchment to comply with the Bathing Water Directive.

Solution: 21,000 m3 of storage at the treatment works and a surface water separation scheme.

Partnership: Additional storage secured as part of North Somerset's council's superpond scheme planned to accommodate run off from new development and compensatory floodplain storage.

How it worked: By working closely with partners additional storage was provided to allow Wessex Water to discharge 4,000 m3 of surface water during rainfall events. Wessex Water contributed to North Somerset Council for the design, construction, use of the land, and a commuted sum for the future maintenance.

Benefits: Through partnership Wessex Water realised cost savings, met bathing water standards, helped provide biodiversity and amenity and increased resilience

Cannington (2016)

Need: Sewer flooding in south Cannington attributed to inundation of the public sewer network by the Cannington brook.

Solution: Somerset Rivers Authority scheme to provide a new flood alleviation channel providing greater capacity and protecting 200 homes and the A39 from flooding

Partnership: The £4 million scheme was managed by the Environment Agency with contributions from the Somerset Rivers Authority, EDF, Wessex Water (£150k), Cannington Parish Council and Somerset County Council.

How it worked: Contribution from Wessex Water through funds and non rechargeable diversion of existing water main to facilitate the new channel

Benefits: Through partnership Wessex Water realised cost savings, helped provide reduced flood risk and improved resilience.

Partnership Schemes

Cheats Road, Ruishton (2014)

Need: To protect properties from sewer flooding caused by tide locking (River Tone) of the overflow at the receiving pumping station (Barton Lane)

Solution: New pumped overflow and increase in river capacity achieved by dredging.

Partnership: Wessex Water contribution to the dredging of the rivers Parrett and Tone.

How it worked: A contribution to a partnership fund with the Regional Flood & Coastal Committee, Somerset County Council, Environment Agency and Bath & West Society.

Dredging the River Parrett with floating equipment just upstream of Westonzoyland Pumping Station in 2014 (SRA)

Severe flooding at Cheats Road, Ruishton on 26.11.12

Benefits: Through partnership Wessex Water contributed to alleviate an issue of major concern to customers on the Somerset Levels.

Wrington Flood Alleviation Scheme (2015)

Need: 12 properties suffered external sewer flooding and 13 properties suffered internal sewer flooding as a result of fluvial and surface water flooding in 2012. 84 properties in total are at risk from flooding.

Solution: North Somerset Council led scheme upsizing of a surface water culvert in the village and construction of an attenuation pond upstream of the village on the Rye Brook. Some Property Level Protection measures were also included to mitigate flood risk during extreme events.

Phase 1 surface water culvert upsizing (EA photo)

Partnership: The £700k scheme led by North Somerset Council with contributions from Wessex Water as partner enabled a successful bid for Grant in Aid funding.

How it worked: Monetary contribution from Wessex Water.

Benefits: Through partnership Wessex Water realised cost savings, and helped provide reduced flood risk and improved resilience.

Leybourne Avenue Flood Alleviation Scheme (2013)

Partnership Schemes

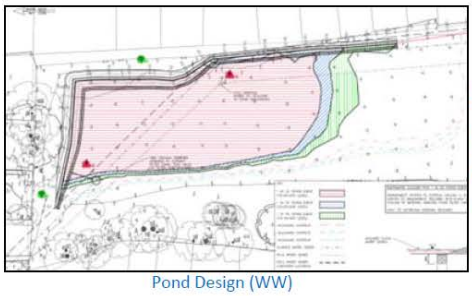
Need: 8 properties subject to frequent flooding as a result of surface water manholes flooding in the field to the south and pluvial flow from the natural catchment .

Solution: Above ground attenuation pond of some 450 m^3 storage capacity

Partnership: Wessex Water with Bournemouth Borough Council and resident input through public meetings

How it worked: Joint design and construction

Enabling works (WW)



Pond Design (WW)

Benefits: Significant cost savings through cooperative working between Wessex Water, and several departments of the local Council. The proposed solution cost a fraction of the "traditional" solution of a below-ground concrete storage tank. .

Banes WaterSpace Study (2017)

Need: Development and production of a WaterSpace Study to identify the current uses and opportunities for the River Avon and Kennet and Avon Canal running through B&NES .

Partnership: The Project has been managed by B&NES Council, with Atkins acting as key contractors, in partnership with the Canal and Rivers Trust, Environment Agency and Wessex Water

How it worked: Joint study identifying project ideas and design concepts which have the potential to enhance the water environment between Dundas and Hanham. The study has 5 key themes:

- Assets and asset management
- Moorings and navigation
- Water quality and environment
- Development and regeneration
- Leisure and recreation

Benefits: The partnership has observed common aspirations, challenges and projects, which can be delivered together. In many cases there are also similar maintenance and management responsibilities which could be combined and delivered more efficiently. The project was the overall winner and winner of the Excellence in Spatial Planning Category in the Royal Town Planning Institute's Regional and National Planning Excellence Awards, 2017.

Corsham Flood Alleviation Scheme and Natural Flood Management

Partnership Schemes

Need: 5 properties and highway subject to frequent multi-causal flooding

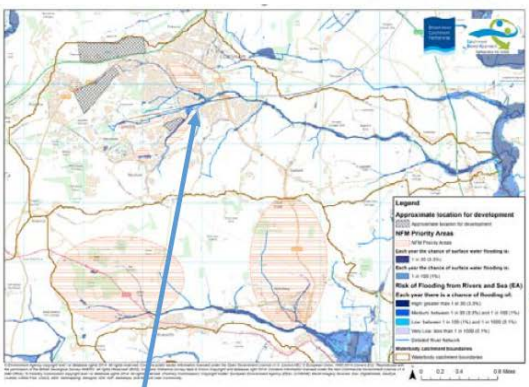
Solution: Local optioneering conducted in partnership; bid submitted for upstream Natural Flood Management Works.

Partnership: Wessex Water with the EA, Wiltshire Council and Bristol Avon Partnership

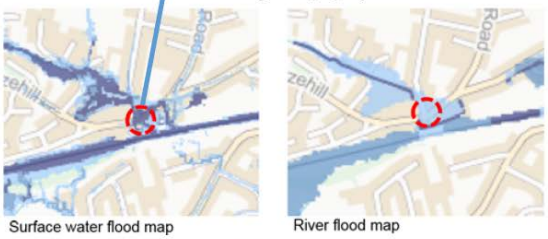
How it worked: Joint appraisal, modelling, customer engagement and optioneering

Benefits: Significant cost savings through cooperative working between Wessex Water, and partners;

demonstrating collaborative working to customers.



NFM Priority Areas Bristol Avon Partnership



Surface water flood map River flood map

EA Flood Maps

Southmead Green Street, Bristol (2015)

Need: To assist in promoting the largest urban area within Wessex Water's catchment as European Green Capital 2015

Solution: Retrofitting SuDs in Embleton Road, Southmead, Bristol.

Partnership: Wessex Water contribution to Bristol City Council and Sustrans

How it worked: A contribution to a partnership fund.

"Greening" Southmead (Bristol Green Capital photo)

Benefits: Through partnership Wessex Water improved surface water drainage to reduce the likelihood of flooding and improve water quality.

Bristol SuDs community design workshop (Sustrans)

Annex B. Infiltration reduction plan summary report

Discharges made from Groundwater Surcharged Sewers
Wessex Water response
2014 to 2016

Introduction

This report has been written in response to the Environment Agency issuing the Regulatory Position Statement (RPS) "Discharges made from Groundwater Surcharged Sewers – Version 3 December 2016" and accompanying letter, dated 19 December 2016, which asks for progress with regard to the RPS.

This report answers the six questions contained in the letter:

1. A list of where you have made controlled discharges that have relied upon this RPS.
2. Details of each controlled discharge made under the RPS with start and end dates and mitigation actions taken such as those listed in 2.4 of the RPS.
3. A list of your infiltration reduction plans and how they relate to the controlled discharges listed in point "1" above.
4. A summary of progress with each infiltration reduction plan, summarising;
   a. Investigations made, progress against milestones and findings,
   b. Infiltration reduction actions taken and quantified reductions/benefits,
   c. Your expected date when infiltration reduction will be complete/sustainable and reliance on the RPS will no longer be required.
5. Your thoughts on the current temporary RPS arrangements we have in place and how we move to a sustainable long term solution.
6. Your company's thoughts on how infiltration removal will be prioritised within your developing PR19 business plans.

Wessex Water's response to these questions are summarised in the following sections with more detail provided in this reports Appendices.

Please note that the catchment names referred to in this report are generally the name of the Sewage Treatment Works catchment. For example, the Piddlehinton STW catchment serves the villages of Alton Pancras and Piddletrenthide, as well as Piddlehinton.

For further details, please contact David Martin (david.martin@wessexwater.co.uk).

1. Controlled discharges

Three of the four recent winters have been persistently wet, causing exceptionally high groundwater tables. The summer of 2012 was also exceptionally wet, resulting in the highest recorded summer groundwater tables in the area.

We only make controlled discharges, such as pumping flow from the foul sewer into the environment, when it is necessary and after other mitigation measures cannot cope. We do this as a last resort when flooding could affect public health risk or there is a lack of sewerage service to our customers.

Appendix 1 contains a list of where we made controlled discharges under the RPS. A summary of controlled discharges is provided in **Table 1** below.

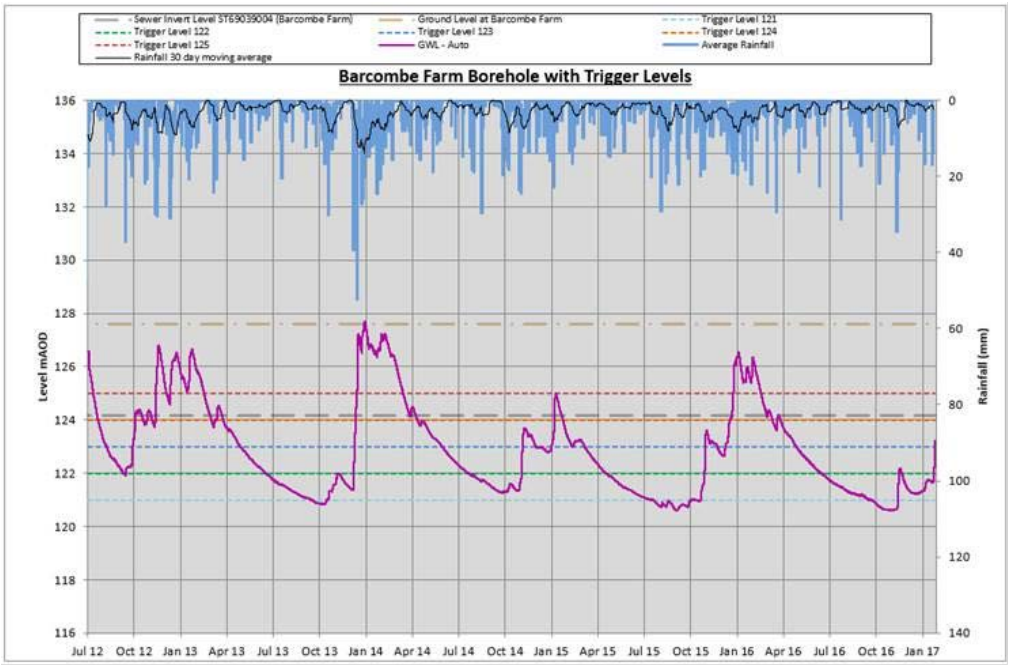
Table 1: Controlled discharge summary

	Winter 2013/2014	Winter 2014/2015	Winter 2015/2016
Number of treatment works catchments with controlled discharges	10	1	1
Number of pumping station catchments with controlled discharges	13	1	2
Maximum duration of discharge (days)	59	<1	72

The graph in **Figure 1** shows the groundwater levels at a borehole in the Piddle Valley, that Wessex Water have monitored since 2012.

We use this borehole as a trigger to get prepared for groundwater inundation in vulnerable catchments. If the level in this borehole exceeds a threshold (e.g. 123m aod) and the recent / forecast weather is wet, then the trigger is initiated and we arrange tankers and pumps to deal with the potential situation.

Figure 1: Piddle Valley groundwater levels July 2012 to 1st February 2017



2. Mitigation actions

We have developed Operational Mitigation Action Plans (OMAP) where controlled discharges may be necessary. The OMAPs contain trigger levels to warn us to get prepared for action, potential mitigation measures (e.g. tankering) and detail of potential controlled discharges, such as discharge points and sampling regimes.

Appendix 1 lists the times when controlled discharges were made in catchments.
Appendix 2 contains details of the catchments where tankering was undertaken.

The following sections summarise our mitigation activities per year.

2.1 Mitigation actions in 2012/13

Details of our mitigation activities in 2012/13 are not reported in detail in this report because at the time we did not fully record these activities in a consistent and reportable manner. The wet winter and the need to report activities made us change our processes to keep a better log of controlled discharges and mitigation measures.

Our regional expenditure indicates that the winter of 2012/13 cost £1.5m more than previous winters. This was due to additional energy costs (£780k) and mitigation activities (£770k) such as tankering due to the persistent rainfall and increased groundwater levels. Some residents complained of these activities due the deterioration of the road surface and disruption.

2.2 Mitigation actions in 2013/14

Groundwater inundation occurred in the summer of 2012 and then in the two consecutive winters resulting in a customer intolerance and escalation of complaints. Wessex Water attended Parish Council meetings and met individual members of the public to explain the

situation. We also had many meetings with Oliver Letwin, the MP for Dorset, and attended groundwater flooding property level protection workshops held by the Environment Agency.

Tankering was our main mitigation strategy. These activities suck flow from the sewers into the tanker vehicles which were driven to the nearest sewage treatment works with capacity (eg Poole) to empty the contents and then returned to tanker again. This activity can be a 24 hour continuous process.
Tankering activities cost over £500k in the winter of 2013/14, as detailed in **Appendix 2**.

In the 13 catchments where controlled discharges were made in 2013/14, we tankered as much as we could before we resorted to making a controlled discharge. When controlled discharges were made, we provided storage where possible, so that the controlled discharges were settled and screened (typically providing Copasac screens). We also continued the tankering where appropriate. When we pumped flow to the environment, we sampled the watercourse according to the RPS and OMAPs.

Clean-up operations were undertaken where necessary. This included cleaning some rivers and ditches as agreed with the local Environment Agency staff.

Where necessary we funded the local councils to provide porta-loos to provide some form of waste sanitation to be available to our customers. Some residents used their toilets in their caravans.
Other mitigation strategies were to bolt down manhole covers to prevent spring water running overland and entering our foul manhole covers. An example where we did this was in Six Penny Handley.

We have 6 mm fine screens installed at the two permanent groundwater relief pumping stations in the Piddle Valley. These were consented on the condition we progressed an Inflow Management Plan (IMP). The annual IMP report contains details including how effective the pumped relief stations are at reducing the number of customers with flooding or loss of service and that the controlled discharges did not have an impact on the environment.

The two permanent relief stations successfully reduced flooding and public health issues within a distance of 250m of the pumped relief stations. However, a temporary controlled discharge was needed in Church Lane, Egypt (500m north). External flooding also occurred in Piddlehinton, the village to the south, but was not reported to us at the time.

2.3 Mitigation actions in 2014/15

Although the groundwater table had not fully recovered from the previous seasons, fortunately, the winter of 2014/15 was not as severe and the groundwater was not as critically high.

There was one controlled discharge in Cerne Abbas, which lasted less than one day.

The relief sewers in the Piddle Valley did not operate due to groundwater inundation.

2.4 Mitigation actions in 2015/16

The groundwater levels in the winter of 2015/16 reached a critical point in January 2016, but again the persistent rain stopped and ground water levels subsided.

There were controlled discharges in the Cromhall (Bagstone SPS and the Townwell SPS) catchment. This initiated a Drainage Area Study to investigate the need for enhancement requirements in these hydraulically linked catchments. This catchment may be prone to perched groundwater inundation, rather than the chalk geology groundwater inundation in the south east.

Tankering in Cromhall commenced on 31st December 2015 and finished on 6th March 2016. Four 2000 gallon capacity tankers were initially utilised, on a continuous round. These efforts were not enough and controlled discharge started on 6 January 2017.

The relief stations in the Piddle Valley operated for a period of 62 days due to groundwater inundation. Bacti sampling was also undertaken as well as the normal sampling. All results were provided to the local Environment Agency Officer.

In May 2015, we wrote to the Planning Authorities requesting embargoes on development sites in catchments vulnerable to groundwater inundation. The aim of this was to raise awareness of ground water inundation, not to prevent development. We wanted any new assets to be watertight to ensure there was no increased risk of flooding. We issued the Planning Authorities with drawings showing numerous villages and towns that we wanted to implement this embargo.

The strategy was successful. An example is in Downton, where we encouraged the Lead Local Flood Authority, to develop a ground water strategy, before the development could commence.

We are currently producing more detailed drawings showing where we would like this approach to be implemented in the future.

3. Infiltration Reduction Plans

The term Infiltration reduction plan (IRP) has been used internally within Wessex Water to monitor and reduce infiltration in many catchments. Most of these do not currently fall under the RPS and are not strictly reportable to the EA (i.e. we have not historically made a controlled discharge), but have been included in our programme because they are at high risk. We are treating them as IRP catchments in case a severe long period of rainfall occurs in the future and we may need to take action. We have developed Operation Mitigation Action Plans (OMAPS) for all catchments which may fall under the RPS. These are local emergency plans, detailing the agreed method and locations of controlled discharges, including land owner contact details.

We also undertake infiltration reduction in other catchments that have additional reasons for reducing infiltration (such as reducing CSO operation, reducing risk of DWF exceedance, make capacity for development, reduce flood risk and energy saving).

Figure 3.1 shows the 64 catchments where we are proactively investigating sources of infiltration.

Figure 3.2 shows the 29 catchments were we have undertaken infiltration sealing in 2015 or 2016.

Appendix 4 contains these details in tabular form.

Figure 1: AMP6 Infiltration inspection programme

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N W E S

Wessex Water
a YTL company
Environment & Assets

Infiltration Inspection Programme

Date: February 2017
Author: MK

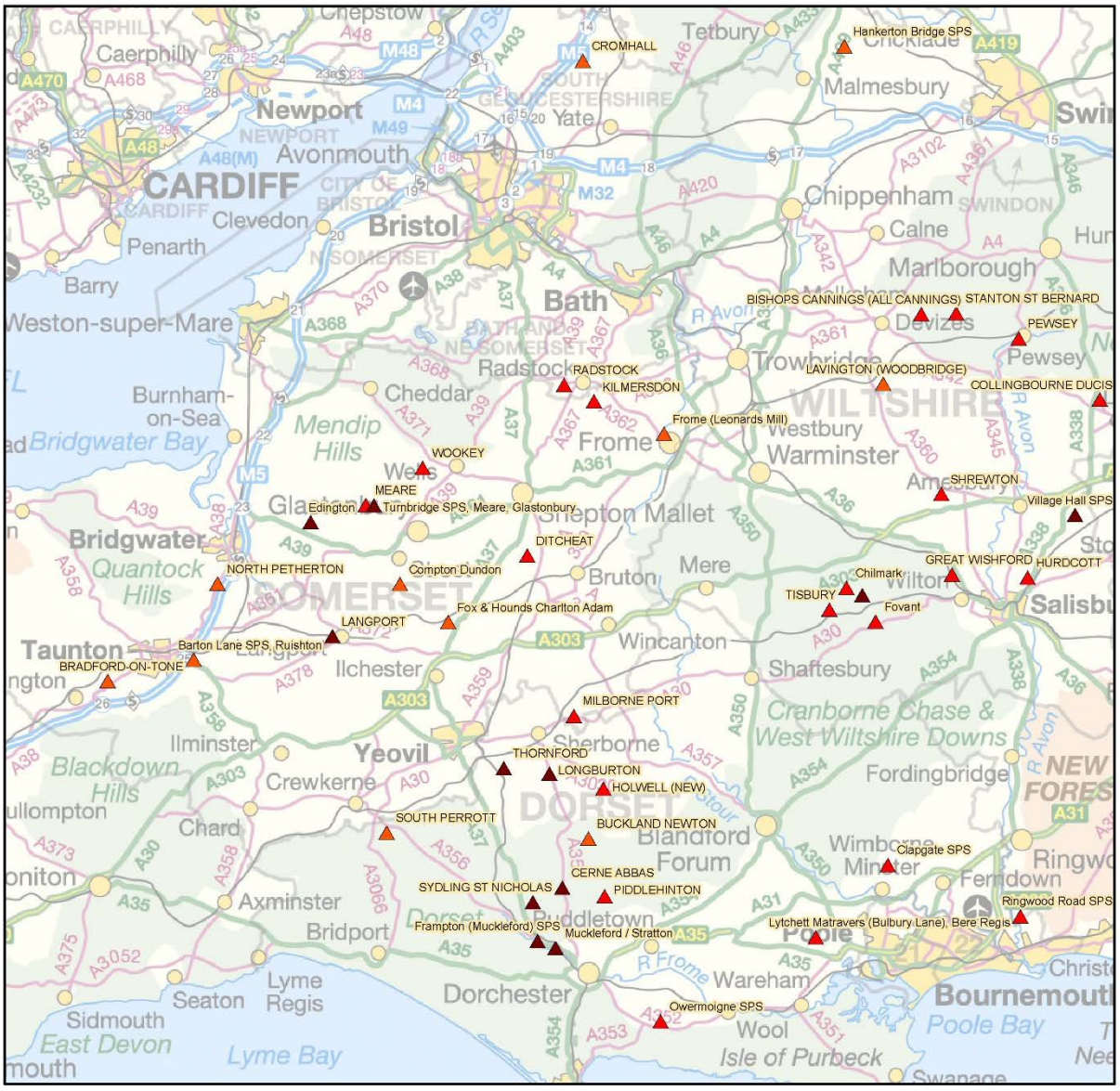
0 5 10 20 Kilometers
1:600,000

Legend

Inspection

- 2015/16
- 2016/17
- 2017/18
- 2018/19
- 2019/20

Figure 2: Sewer and manhole sealing (first 3 years of AMP6 only shown)



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N W E S

Wessex Water
a YTL company
Environment & Assets

Infiltration Sealing Programme	Legend
Date: February 2017 *Author: MK*	**Sealing** 2015/16 2016/17 2017/18 2018/19 2019/20
0 5 10 20 Kilometers 1:600,000	

Information in this plan is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. Building over or near Wessex Water's apparatus is not normally permitted.

4. IRP Progress

Appendix 4 contains a detailed list of the IRP catchments and our programme of infiltration investigations (I) and/or sealing works (S). Appendix 4 also contains the metreage of inspection and sealing works undertaken in the first 2 years of AMP6 and planned for AMP6 year 3.

Over 100km of sewers have already been inspected in the first 2 years of AMP6, with more planned for February and March 2017. A length of 9.8km of sewer sealing has been undertaken in these catchments.

Our proactive investment in infiltration reduction is summarised in **Table 2** below. **Appendix 4** provides a breakdown of the 2015 and 2016 work per IRP catchment.

Table 2: Actual / Planned proactive infiltration reduction

	2015/16	2016/17	2017/18	2018/19	2019/20	AMP6 Total
Inspection in IRP catchments (km)	58.4	50	60	60	60	288
Inspection in other catchments (km)	14.3	35.3	30	30	30	140
Total inspection (km)	72.7	90	90	90	90	433
Sealing in IRP catchments (km)	2.5	4.1	3.0	3.0	3.0	16
Sealing in other catchments (km)	2.1	1.1	1	1	1	6
Cost (£m)	0.7	0.9	1.1	1.1	1.1	5.0

a. Investigations

We have set up in-house resources specifically to investigate infiltration in sewers. One team writes and coordinates the reports and the inspections. Traditional CCTV inspections of pipes are carried out at the right time of the year, when infiltration is likely to be visible. This CCTV also inspects the manhole shafts and benching for evidence of infiltration.

We have found that sending our in-house staff to site during winter conditions provides significantly extra value. By lifting manhole covers, the Engineers can trace the infiltration in the catchment to identify remedial works, target future surveys, and can see other sources of inflow. We often undertake impermeable area surveys in problematic catchments to check that the problems are not due to rainfall runoff or runoff from fields.

Our inspections targets sewers vulnerable to infiltration. We have a geospatial planner who targets sewers likely to be vulnerable to infiltration, based on a simplified version of the UKWIR research project.

We have sewer rehabilitation Engineers who analyse, evaluate and propose the most appropriate method of making the sewers and manholes watertight.
We have also set up an in-house sewer lining team, to allow us to undertake sewer sealing more efficiently.

b. Progress

The identification and sealing of sewers is an iterative process.
Our starting point is normally to CCTV the vulnerable public sewers in a catchment. This ideally is carried out in winter conditions, but before or after the sewers are completely inundated. A review of this data will identify any remedial works necessary. We target the main sources of infiltration and normally seal these during the next summer.

The CCTV and investigations data is used to target further investigations the following winter. For example when clear flow is seen entering from a section 105a lateral, that sewer is then surveyed. The survey of the s105a sewer may then lead to investigations of private drains.

We started this iterative process in our highest risk catchments first (eg Piddle Valley, Cerne Abbas, Sturminster Marshall etc). In these catchments we have inspected significant length of private assets and have sealed any significant private infiltration - at our cost.

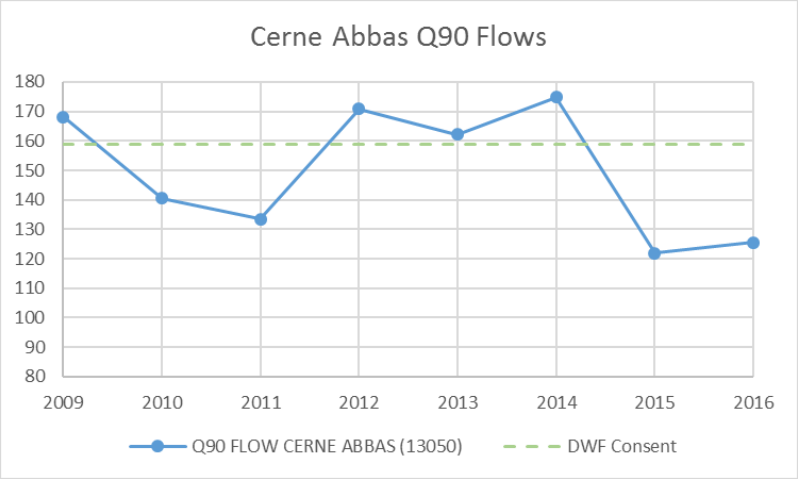
However, most catchments are at an early stage in the iterative process, so we have only inspected and sealed public sewers. There is a debate as to whether WaSCs should fund the sealing of private assets (see Section 5).

Appendix 4 shows our progress and planned programme.

Quantifying the benefits of infiltration sealing is difficult because no two years rainfall patterns and antecedent conditions are identical, making comparisons of groundwater inundation difficult. Also the groundwater levels are still high compared to before 2012.

Case study: Cerne Abbas

The Cerne Abbas catchment has flooding and dry weather flow (DWF) exceedance drivers. We therefore prioritised this catchment for investigation and sealed a length of 162 m of leaking public sewers in the summer of 2015.
The graph below shows that since the sealing works, the DWFs are significantly lower than previous years; being lower than in the dry years of 2010 and 2011. This reduction was not observed in other catchments where we did not undertake sewer sealing. This suggests that sewer sealing was beneficial in this catchment.



c. Expected end date

The scale of the problems in the Wessex area means that this process will need to continue into AMP7 and probably beyond.

It is also worth noting, that the drainage inundation may not only be caused by groundwater infiltrating into the drainage systems. We have anecdotal examples where some customers have deliberately lifted a foul manhole cover to solve their garden flooding, which was caused by springing groundwater. They may or may not be aware that that action could have resulted in other customers downstream having foul flooding problem.

5. RPS in the long term

The current RPS has been in place for over 2 years now and has protected the water industry to make controlled discharges possible to improve the sewerage service and reduce the health risk to our customers in these vulnerable catchments.

It was also successful in that it focussed WaSC infiltration activities in vulnerable catchments and improved the logging of activities.

The detailed annual IRP reports are however a burden on resources.
We would prefer to only report annual summary reports, similar to this one.

The RPS also mentions the need for WaSCs to ensure Private issues are dealt with.
Although WaSCs have a role to play, we are not responsible for private assets.

The WaterUK Sewerage Infrastructure Network (SIN) set up a task& finish group to look into best practice in reducing groundwater inundation. The group developed a best practice guide to sewer and manhole sealing in groundwater inundation vulnerable catchments. The group

then morphed into the 21st Century Drainage Programme Workstream 5: Groundwater inundation.

Wessex Water are co-chairing this workstream which includes representatives from several WaSCs and the Environment Agency. The issue of private funding is being debated and public awareness of groundwater inundation issues is being promoted. The Piddle Valley pumped relief stations are being used as a case study to show this pragmatic action to reduce the groundwater inundation problems.

6. PR19 proposals

With predictions of heavier rainfall and wetter winters due to climate change, the likelihood of groundwater inundation of drainage will increase. Perhaps this is already evident by the wet summer of 2012 and then two consecutive wet winters.

Our current view is that in AMP7 we will continue investment in infiltration reduction at the same rate as in AMP6.

APPENDIX 1: CONTROLLED DISCHARGES

The following table includes all the locations that temporary pumping form sewers to the environment occurred. It also includes the start and stop dates.

Table A1: Controlled discharges

Locality	Site Name	Start Date	Stop Date
BARTON ST. DAVID (SOMERTON)	Barton St David	06/01/2014	
SOMERTON	Somerton	06/01/2014	
SHAPWICK (BLANDFORD FORUM)	Shapwick	07/01/2014	07/03/2014
PIDDLETRENTHIDE (DORCHESTER)	Piddle Valley	07/01/2014	13/01/2014
MUCKLEFORD (DORCHESTER)	Muckleford / Stratton	07/01/2014	07/03/2014
STURMINSTER MARSHALL (WIMBORNE)	Sturminster Marshall	07/01/2014	14/03/2014
MEARE (GLASTONBURY)	Turnbridge SPS, Meare, Glastonbury	07/02/2014	25/02/2014
RUISHTON (TAUNTON)	Barton Lane SPS, Ruishton	07/02/2014	25/02/2014
PORTBURY (BRISTOL)	Portbury Hundred	07/02/2014	25/02/2014
COMPTON DUNDON (SOMERTON)	Moor Close SPS, Compton Dundon	07/02/2014	25/02/2014
CHARLTON ADAM (SOMERTON)	Fox & Hounds Charlton Adam	07/02/2014	25/02/2014
YARLEY CROSS (WELLS)	Yarley Cross, Wells	07/02/2014	25/02/2014
SPRING GARDENS (FROME)	Spring Gardens, Frome	07/02/2014	25/02/2014
CERNE ABBAS	Cerne Abbas STW	15/01/2015	16/01/2015
BAGSTONE	Bagstone SPS	31/12/2015	21/01/2016
CROMHALL	Townwell SPS	06/01/2016	20/01/2016
BAGSTONE	Bagstone SPS	23/01/2016	26/02/2016
CROMHALL	Townwell SPS	26/01/2016	02/02/2016
CROMHALL	Townwell SPS	06/02/2016	23/02/2016
CROMHALL	Townwell SPS	09/03/2016	15/03/2016
BAGSTONE	Bagstone SPS	09/03/2016	17/03/2016
BAGSTONE	Bagstone SPS	28/03/2016	05/04/2016
CROMHALL	Townwell SPS	28/03/2016	05/04/2016

Source DM#1709306: Overpumping

APPENDIX 2: MITIGATION ACTIONS

Table A2: Tankering activities

Locality	Site_ID	Site Name	Start Date	Stop Date	Estimated Cost
MARTOCK		Meadow View SPS	07/02/2014	25/02/2014	
CHEDDAR		Cross East SPS	07/02/2014	25/02/2014	
WESTPORT (LANGPORT)		Westport SPS	07/02/2014	25/02/2014	
LYMPSHAM (WESTON-SUPER-MARE)		Lympsham (Various)	07/02/2014		
MARK (HIGHBRIDGE)		Mark Causeway	07/02/2014	25/02/2014	
GURNEY SLADE (RADSTOCK)		Gurney Slade	19/02/2014	25/02/2014	
PIDDLETRENTHIDE (DORCHESTER)		Piddle Valley	13/01/2014	07/03/2014	90000
MILBORNE ST. ANDREW (BLANDFORD FORUM)		Milton Road/Stileham Bank	28/02/2014	14/03/2014	21000
BERE REGIS (WAREHAM)	14269		10/01/2014	28/02/2014	11500
MUCKLEFORD (DORCHESTER)	15493		07/01/2014	13/01/2014	25000
STRATTON (DORCHESTER)		Stratton	07/01/2014		
CHARMINSTER (DORCHESTER)		Charminster	07/01/2014	13/01/2014	9000
BRADFORD PEVERELL (DORCHESTER)		Bradford Peverall	07/01/2014	13/01/2014	
WYLYE (WARMINSTER)	14324	Wylye	07/01/2014	07/03/2014	15000
HANGING LANGFORD (SALISBURY)		Hanging Langford	13/01/2014	07/03/2014	7600
STEEPLE LANGFORD (SALISBURY)		Steeple Langford	10/01/2014	14/03/2014	7000
STOFORD (SALISBURY)	14326	Stoford	10/01/2014	14/03/2014	7000
GREAT WISHFORD (SALISBURY)		Great Wishford	13/01/2014	14/03/2014	7600
CHILMARK (SALISBURY)	14326	Chilmark	07/01/2014	07/03/2014	14500
TEFFONT EVIAS (SALISBURY)		Teffont Evias	07/01/2014	07/03/2014	7000
DINTON (SALISBURY)	14322	Dinton	07/01/2014	14/03/2014	10000
FOVANT (SALISBURY)	14340	Fovant	07/01/2014	14/03/2014	5200
TILSHEAD (SALISBURY)		Tilshead	13/01/2014	14/03/2014	8300
ORCHESTON (SALISBURY)		Orcheston	10/01/2014	14/03/2014	6500
WILTON (SALISBURY)		Wilton	28/02/2014	14/03/2014	11200
SHREWTON (SALISBURY)		Shrewton	28/02/2014	14/03/2014	6500
NEWTON TONEY (SALISBURY)		Newton Toney	10/01/2014	14/03/2014	9000
ALLINGTON (SALISBURY)		Allington (South)	13/01/2014	14/03/2014	5000
IDMISTON (SALISBURY)		Idmiston	07/01/2014	13/01/2014	
HURDCOTT (WINTERBOURNE EARLS)		Hurdcott	10/01/2014	14/03/2014	8000
SYDLING ST. NICHOLAS (DORCHESTER)		Sydling St Nicholas	10/01/2014	28/02/2014	4800
DOWNTON (SALISBURY)		Downton			15200
FORDINGBRIDGE		Fordingbridge			14000
RINGWOOD		Ringwood			2500
BRANSGORE (CHRISTCHURCH)		Bransgore			3000
SOPLEY (CHRISTCHURCH)		Sopley			4500
BURTON (CHRISTCHURCH)		Burton			2500
CERNE ABBAS (DORCHESTER)		Cerne Abbas	07/01/2014	13/01/2014	3600
TOLLER PORCORUM (DORCHESTER)		Toller Porcorum	07/01/2014		3600
ALDERBURY (SALISBURY)	14337	Alderbury			2000
WIMBORNE		Wimborne			
WEST CAMEL (YEOVIL)		West Camel	06/01/2014		
QUEEN CAMEL (YEOVIL)		Queen Camel	06/01/2014		
PORLOCK WEIR (MINEHEAD)		Porlock Weir	07/01/2014		
TYTHERINGTON (FROME)		Tytherington			
ALLINGTON (DEVIZES)	15120	Allington (North)			
Shapwick	15056	Shapwick Cross SPS	17/10/2014	08/12/2014	8000
Shapwick	15056	Shapwick Cross SPS	15/01/2015	22/01/2015	3000
Wimborne	19081	Clapgate SPS	17/10/2014	08/12/2014	5000
Wimborne	19081	Clapgate SPS	14/01/2015	27/01/2014	4000
Newton Toney	14359	Village Hall SPS	10/02/2015	18/03/2015	9000
Sopley	15216	Ringwood Road SPS	15/01/2015	20/03/2015	12000
Idmiston	14302	Idmiston SPS	16/01/2015	18/03/2015	8000
Stapleford	14320	Pelican Inn SPS	17/10/2014	08/12/2015	8000
Stapleford	14320	Pelican Inn SPS	16/01/2015	18/03/2015	10000
Dinton	14322	Bratch Lane SPS	15/01/2015	20/01/2015	4000
Owermoigne	14398	Owermoigne SPS	19/01/2015	13/02/2015	10000
Cromhall	15163	Townwell SPS	31/12/2015	06/01/2016	
Wimborne	19081	Clapgate SPS	05/11/2015		
Sopley	15216	Ringwood Road SPS	01/12/2015		
Owermoigne	14398	Owermoigne SPS	05/11/2015	13/12/2015	
Owermoigne	14398	Owermoigne SPS	07/01/2016	02/03/2016	
Owermoigne	14398	Owermoigne SPS	02/03/2016		
Martinstown	15497	Martinstown	04/02/2016		
Sturminster Marshall	15064	Stewards Lane SPS	07/12/2015	02/03/2016	
LOCKING	17323	Fir Tree Avenue, Locking	06/02/2016	06/02/2016	
RAF LOCKING	19505	RAF Locking	06/02/2016	08/02/2016	
MARK	13197	Mark Vac SPS	07/02/2016	07/02/2016	
MARK	13197	Mark Vac SPS	13/02/2016	14/02/2016	

Source DM#1709306: Tankering

APPENDIX 3: INFILTRATION REDUCTION PLANS

This appendix contains the drivers for infiltration reduction per treatment works catchment.

The tables list the Sewage Pumping Station (SPS) sub-catchments that were affected, stating where

- controlled discharges were made
- where we have Operational Mitigation Plans (OMAP) and
- Dry Weather Flow exceedance drivers

Infiltration reduction drivers – North

STW Site ID	STW Name	SPS Site ID	SPS Name	Controlled Discharge	OMAP	DWF Exceed.
13013	AVONMOUTH	13013	AVONMOUTH		Y	
13004	BISHOPS CANNINGS (ALL CANNINGS)	13004	BISHOPS CANNINGS (ALL CANNINGS)			
13041	BURTON	13041	BURTON			Y
13071	COLLINGBOURNE DUCIS	13071	COLLINGBOURNE DUCIS		Y	
13086	CROMHALL	13086	Bagstone SPS and Townwell SPS	Yes, Bagstone and Townwell	Y	
13136	GREAT BADMINTON	13136	GREAT BADMINTON			
13164	KEEVIL	13164	KEEVIL			Y
13177	LAVINGTON (WOODBRIDGE)	13177	LAVINGTON (WOODBRIDGE)		Y	Y
13193	MALMESBURY	14202	Hankerton Bridge SPS			
13196	MARDEN	13196	MARDEN		Y	
13237	PEWSEY	13237	PEWSEY			
13252	RADSTOCK	13252	RADSTOCK			
13287	STANTON ST BERNARD	13287	STANTON ST BERNARD			
13298	SUTTON BENGER	13298	SUTTON BENGER		Y	
13309	THORNBURY	13309	THORNBURY			
13320	UPAVON	13320	UPAVON		Y	

Infiltration reduction drivers – South

STW Site ID	STW Name	SPS Site ID	SPS Name	Controlled Discharge	OMAP	DWF Exceed.
13024	BLACKHEATH	13024	BLACKHEATH		Y	
13024	BLACKHEATH	14220	Lytchett Matravers (Bulbury Lane), Bere Regis		Y	
19031	BUCKLAND NEWTON	19031	BUCKLAND NEWTON			Y
13050	CERNE ABBAS	13050	CERNE ABBAS	Y	Y	Y
13066	CHRISTCHURCH	13066	CHRISTCHURCH		Y	
13066	CHRISTCHURCH	15216	Ringwood Road SPS		Y	
13096	DORCHESTER	13096	DORCHESTER		Y	
13096	DORCHESTER	15493	Frampton (Muckleford) SPS	Yes	Y	
13096	DORCHESTER	14407	Muckleford / Stratton		Y	
13096	DORCHESTER	14398	Owermoigne SPS		Y	
13099	DOWNTON	13099	DOWNTON		Y	
13128	FORDINGBRIDGE	13128	FORDINGBRIDGE		Y	
13129	FOVANT	14340	Fovant		Y	Y
13129	FOVANT	13129	FOVANT		Y	Y
13353	GREAT WISHFORD	13353	GREAT WISHFORD		Y	Y
13140	HALSTOCK	13140	HALSTOCK			Y
13143	HARMANS CROSS	13143	HARMANS CROSS			
19685	HOLWELL (NEW)	19685	HOLWELL (NEW)			
13158	HURDCOTT	13158	HURDCOTT		Y	Y
13158	HURDCOTT	14359	Village Hall SPS		Y	Y
13182	LONGBURTON	13182	LONGBURTON			Y
13212	MILBORNE ST ANDREW	13212	MILBORNE ST ANDREW		Y	
13220	NETHERAVON	13220	NETHERAVON		Y	
13238	PIDDLEHINTON	13238	PIDDLEHINTON	Yes	Y	
13250	PUNCKNOWLE	13250	PUNCKNOWLE		Y	
13255	RINGWOOD	13255	RINGWOOD		Y	
13258	SALISBURY	13258	SALISBURY		Y	
13275	SHREWTON	13275	SHREWTON		Y	
13277	SIXPENNY HANDLEY	13277	SIXPENNY HANDLEY		Y	
13280	SOUTH PERROTT	13280	SOUTH PERROTT			Y
13303	SYDLING ST NICHOLAS	13303	SYDLING ST NICHOLAS		Y	Y
13304	TARRANT CRAWFORD	13304	Shapwick and Sturminster Marshall	Yes, Shapwick and Sturminster Marshall	Y	
13310	THORNFORD	13310	THORNFORD			Y

STW Site ID	STW Name	SPS Site ID	SPS Name	Controlled Discharge	OMAP	DWF Exceed.
13311	TILSHEAD	13311	TILSHEAD		Y	
13313	TISBURY	14362	Chilmark		Y	
13313	TISBURY	14342	Teffont Evias		Y	
13313	TISBURY	13313	TISBURY		Y	Y
13349	WIMBORNE	19081	Clapgate SPS		Y	
13349	WIMBORNE	13349	WIMBORNE		Y	

Infiltration reduction drivers – West

STW Site ID	STW Name	SPS Site ID	SPS Name	Controlled Discharge	OMAP	DWF Exceed.
13032	BRADFORD-ON-TONE	13032	BRADFORD-ON-TONE			Y
13043	BUTLEIGH	13043	BUTLEIGH		Y	
13047	CANNINGTON	13047	CANNINGTON			Y
13057	CHEDDAR	13057	CHEDDAR		Y	
13094	DITCHEAT	13094	DITCHEAT			Y
13131	FROME	13131	FROME	Yes, Spring	Y	
13131	FROME	14115	Frome (Leonards Mill)		Y	
13145	HATCH BEAUCHAMP	13145	HATCH BEAUCHAMP			Y
13166	KILMERSDON	13166	KILMERSDON		Y	
13175	LANGPORT	13175	LANGPORT		Y	
13202	MEARE	13202	MEARE		Y	
13202	MEARE	14079	Turnbridge SPS, Meare, Glastonbury	Yes	Y	
13211	MILBORNE PORT	13211	MILBORNE PORT			Y
13223	NORTH PETHERTON	13223	NORTH PETHERTON			Y
13227	NUNNEY	13227	NUNNEY			Y
13229	OAKHILL	13229	OAKHILL		Y	
13231	OVER STRATTON	13231	OVER STRATTON			Y
13278	SOMERTON	15686	Compton Dundon	Yes	Y	
13278	SOMERTON	15334	Fox & Hounds Charlton Adam	Yes	Y	
13278	SOMERTON	13278	SOMERTON		Y	
13305	TAUNTON	15436	Barton Lane SPS, Ruishton	Yes	Y	
13305	TAUNTON	13305	TAUNTON		Y	
13514	WEST BAGBOROUGH	13514	WEST BAGBOROUGH			Y
13336	WEST HUNTSPILL	14585	Edington		Y	
13336	WEST HUNTSPILL	13336	WEST HUNTSPILL		Y	
13355	WIVELISCOMBE - STYLES	13355	WIVELISCOMBE - STYLES			Y
13358	WOOKEY	13358	WOOKEY	Yes, Yarley	Y	Y

APPENDIX 4: IRP PROGRESS

This appendix contains details of IRP progress per treatment works catchment.

The first table lists the length of sewers proactively inspected and sealed. Over 100km has been inspected in the first 2 years of AMP6, and over 9km of sewer sealing has been undertaken. The remaining tables lists, per division, the activities in each sewage pumping station (SPS) catchment.

STW Site ID	STW Name	AMP6 Years 1 and 2 (m)	
		InspectedMeterage	RenovatedMeterage
13024	BLACKHEATH	9,514	129
13050	CERNE ABBAS		296
13066	CHRISTCHURCH		400
13071	COLLINGBOURNE DUCIS		293
13086	CROMHALL	5,007	
13096	DORCHESTER	4,423	397
13099	DOWNTON		
13129	FOVANT		435
13131	FROME	3,465	
13353	GREAT WISHFORD	2,011	45
13158	HURDCOTT	2,064	783
13166	KILMERSDON	937	261
13175	LANGPORT		251
13177	LAVINGTON (WOODBRIDGE)	7,556	
13196	MARDEN		
13202	MEARE	2,520	257
13212	MILBORNE ST ANDREW		
13238	PIDDLEHINTON	1,260	138
13515	PORLOCK		
13275	SHREWTON		186
13277	SIXPENNY HANDLEY	2,691	
13278	SOMERTON	2,127	
13298	SUTTON BENGER		378
13303	SYDLING ST NICHOLAS	738	421
13304	TARRANT CRAWFORD		786
13305	TAUNTON	2,186	
13313	TISBURY	7,453	188
13320	UPAVON		
13336	WEST HUNTSPILL		686
19155	WESTON-SUPER-MARE		
13349	WIMBORNE	3,796	
13358	WOOKEY	4,690	248
IRP Total		**62,436***	**6,576**

	OTHER (eg DWF)	45,497	3,178
Total		**107, 933**	**9,754**

*More inspection is planned for February and March 2017 not included in the total

Catchment progress overview – North (I – Investigation, S – Sealing)

STW Site ID	STW Name	SPS Site ID	SPS Name	AMP6 Year 1	AMP6 Year 2	AMP6 Year 3
13013	AVONMOUTH	13013	AVONMOUTH			I
13004	BISHOPS CANNINGS (ALL CANNINGS)	13004	BISHOPS CANNINGS (ALL CANNINGS)	I	S	
13041	BURTON	13041	BURTON			I
13071	COLLINGBOURNE DUCIS	13071	COLLINGBOURNE DUCIS		S	
13086	CROMHALL	13086	**CROMHALL**	I	S	S
13136	GREAT BADMINTON	13136	GREAT BADMINTON			I
13164	KEEVIL	13164	KEEVIL			I
13177	LAVINGTON (WOODBRIDGE)	13177	LAVINGTON (WOODBRIDGE)		I	S
13193	MALMESBURY	14202	Hankerton Bridge SPS			S
13196	MARDEN	13196	MARDEN			I
13237	PEWSEY	13237	PEWSEY	I	SS	
13252	RADSTOCK	13252	RADSTOCK		IS	
13287	STANTON ST BERNARD	13287	STANTON ST BERNARD	I	S	
13298	SUTTON BENGER	13298	SUTTON BENGER		I	
13309	THORNBURY	13309	THORNBURY			
13320	UPAVON	13320	UPAVON			I

Catchment progress overview – South (I – Investigation, S – Sealing)

STW Site ID	STW Name	SPS Site ID	SPS Name	AMP6 Year 1	AMP6 Year 2	AMP6 Year 3
13024	BLACKHEATH	13024	BLACKHEATH	I		
13024	BLACKHEATH	14220	Lytchett Matravers (Bulbury Lane), Bere Regis		S	
19031	BUCKLAND NEWTON	19031	BUCKLAND NEWTON	I		S
13050	CERNE ABBAS	13050	CERNE ABBAS	S		I
13066	CHRISTCHURCH	13066	CHRISTCHURCH			
13066	CHRISTCHURCH	15216	Ringwood Road SPS		S	
13096	DORCHESTER	13096	DORCHESTER	I	I	
13096	DORCHESTER	15493	**Frampton (Muckleford) SPS**	S		
13096	DORCHESTER	14407	Muckleford / Stratton	S		

STW Site ID	STW Name	SPS Site ID	SPS Name	AMP6 Year 1	AMP6 Year 2	AMP6 Year 3
13096	DORCHESTER	14398	Owermoigne SPS		S	
13099	DOWNTON	13099	DOWNTON			
13128	FORDINGBRIDGE	13128	FORDINGBRIDGE			I
13129	FOVANT	14340	Fovant		S	
13129	FOVANT	13129	FOVANT		I	
13353	GREAT WISHFORD	13353	GREAT WISHFORD	I	IS	
13140	HALSTOCK	13140	HALSTOCK		I	
13143	HARMANS CROSS	13143	HARMANS CROSS		I	
19685	HOLWELL (NEW)	19685	HOLWELL (NEW)	I	S	
13158	HURDCOTT	13158	HURDCOTT	I	IS	I
13158	HURDCOTT	14359	Village Hall SPS	S		
13182	LONGBURTON	13182	LONGBURTON	S	I	
13212	MILBORNE ST ANDREW	13212	MILBORNE ST ANDREW			I
13220	NETHERAVON	13220	NETHERAVON			I
13238	PIDDLEHINTON	13238	**PIDDLEHINTON**	I	S	
13250	PUNCKNOWLE	13250	PUNCKNOWLE		I	
13255	RINGWOOD	13255	RINGWOOD			I
13258	SALISBURY	13258	SALISBURY		I	
13275	SHREWTON	13275	SHREWTON	I	S	
13277	SIXPENNY HANDLEY	13277	SIXPENNY HANDLEY	I		
13280	SOUTH PERROTT	13280	SOUTH PERROTT		I	S
13303	SYDLING ST NICHOLAS	13303	SYDLING ST NICHOLAS	IS		S
13304	TARRANT CRAWFORD	13304	**TARRANT CRAWFORD**	I	S	
13310	THORNFORD	13310	THORNFORD	S		I
13311	TILSHEAD	13311	TILSHEAD			I
13313	TISBURY	14362	Chilmark		S	
13313	TISBURY	14342	Teffont Evias	S		
13313	TISBURY	13313	TISBURY		S	I
13349	WIMBORNE	19081	Clapgate SPS		S	
13349	WIMBORNE	13349	WIMBORNE	I		

Catchment progress overview – West (I – Investigation, S – Sealing)

STW Site ID	STW Name	SPS Site ID	SPS Name	AMP6 Year 1	AMP6 Year 2	AMP6 Year 3

13032	BRADFORD-ON-TONE	13032	BRADFORD-ON-TONE	**S**	**I**	**S**
13043	BUTLEIGH	13043	BUTLEIGH		**I**	
13047	CANNINGTON	13047	CANNINGTON		**I**	
13057	CHEDDAR	13057	CHEDDAR			**I**
13094	DITCHEAT	13094	DITCHEAT	**I**	**S**	
13131	FROME	13131	**FROME**	**I**		**S**
13131	FROME	14115	Frome (Leonards Mill)		**S**	
13145	HATCH BEAUCHAMP	13145	HATCH BEAUCHAMP		**I**	
13166	KILMERSDON	13166	KILMERSDON	**I**	**S**	
13175	LANGPORT	13175	LANGPORT	**S**	**I**	
13202	MEARE	13202	MEARE	**I**	**S**	
13202	MEARE	14079	**Turnbridge SPS, Meare, Glastonbury**	**S**		
13211	MILBORNE PORT	13211	MILBORNE PORT	**I**	**S**	
13223	NORTH PETHERTON	13223	NORTH PETHERTON		**I**	**S**
13227	NUNNEY	13227	NUNNEY		**I**	
13229	OAKHILL	13229	OAKHILL		**I**	
13231	OVER STRATTON	13231	OVER STRATTON	**I**		
13278	SOMERTON	15686	**Compton Dundon**			**S**
13278	SOMERTON	15334	**Fox & Hounds Charlton Adam**			**S**
13278	SOMERTON	13278	SOMERTON	**I**		
13305	TAUNTON	15436	**Barton Lane SPS, Ruishton**			**S**
13305	TAUNTON	13305	TAUNTON	**I**		
13514	WEST BAGBOROUGH	13514	WEST BAGBOROUGH			**I**
13336	WEST HUNTSPILL	14585	Edington	**S**		
13336	WEST HUNTSPILL	13336	WEST HUNTSPILL			**I**
13355	WIVELISCOMBE - STYLES	13355	WIVELISCOMBE - STYLES			**I**
13358	WOOKEY	13358	**WOOKEY**	**I**	**S**	

Piddletrenthide Flood Alleviation

A case study in innovative permitting to resolve groundwater induced flooding of domestic properties

How joint working between a sewerage company, the environmental regulator and the local authority has enabled a pragmatic and sustainable solution to a long standing problem.

Groundwater Flooding

Piddletrenthide lies in a chalk valley in Dorset straddling the river Piddle. Most winters the water table rises to ground level causing localised flooding. When this occurs the sewerage system is effectively used as a land drainage network as residents have no option to protect their properties but to direct surface water down manholes. For many years the Environment Agency (EA) allowed Wessex Water, under emergency powers, to pump out the sewerage system to the local stream at two locations in the village in order to provide a positive drainage system to the residents. This was not an officially permitted arrangement and overland temporary pumping made it very unsightly.

A pragmatic and sustainable solution

A new groundwater land drainage scheme for the villages along the Piddle would have been very expensive and only been beneficial for a few weeks every year. Similarly, upsizing the sewer network's capacity and the downstream sewage works would have also been a very expensive and unsustainable option. Neither option was cost beneficial. The challenge was, how could the three parties – the EA, Wessex Water and Dorset CC, come up with a pragmatic and sustainable solution to remove the risk of property flooding for wet winter periods of high groundwater?

Pumping station weir and screening arrangement under construction

The solution involved an ***innovative permitting arrangement***. The EA agreed to permit two pumped, screened overflows only for periods when groundwater was about to cause flooding. A condition of the consent was that Wessex Water signed up to an **Inflow Management Plan** (IMP): a commitment to monitor groundwater levels, keep the integrity of the public sewer network under review (through CCTV inspection), carry out remedial work where necessary and work with the local authority to ensure private drains were also in good condition. The IMP also requires water quality sampling if and when pumping occurs in order to demonstrate that there is no adverse impact on the watercourse resulting from pumping station operation. An annual IMP report is also required to record activity carried out in the preceding year.

One of the completed and unobtrusive pumping stations next to the R. Piddle

Conclusion

Permanently reducing groundwater induced flood risk for Piddletrenthide was only possible because of an innovative and unique permitting arrangement between the EA and Wessex Water.