River Basin Catchment Summary

Teifi and North Ceredigion

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment.

1.1 Catchment Information

Teifi and North Ceredigion (see Figure 1 below) consists of 58 wastewater catchments with a total population of 136729. There is a total sewer length of 810km, where 511km is associated to the foul system, 93km is associated to the surface water system and 267km is associated to the combined system. There are 58 Wastewater Treatment Works (WwTW), 194 Sewerage Pumping Stations (SPSs), and 166 Combined Storm Overflows (CSOs) across this river basin catchment level.

The Teifi and North Ceredigion catchment covers an area from the headwaters at Llyn Teifi to the estuary at Newport Bay.

There are several main rivers in the catchment including the is the River Teifi which flows north to south-east, the River Rheidol which flows east-west discharging through the urban area of Aberystwyth. Smaller watercourses include the River Ystwyth, River Carrog, River Arth and River Aeron, amongst others, which all discharge to Cardigan Bay.

The most significant urban areas in Aberystwyth, Aberaeron, New Quay, Llangrannog, Aberporth and Cardigan.

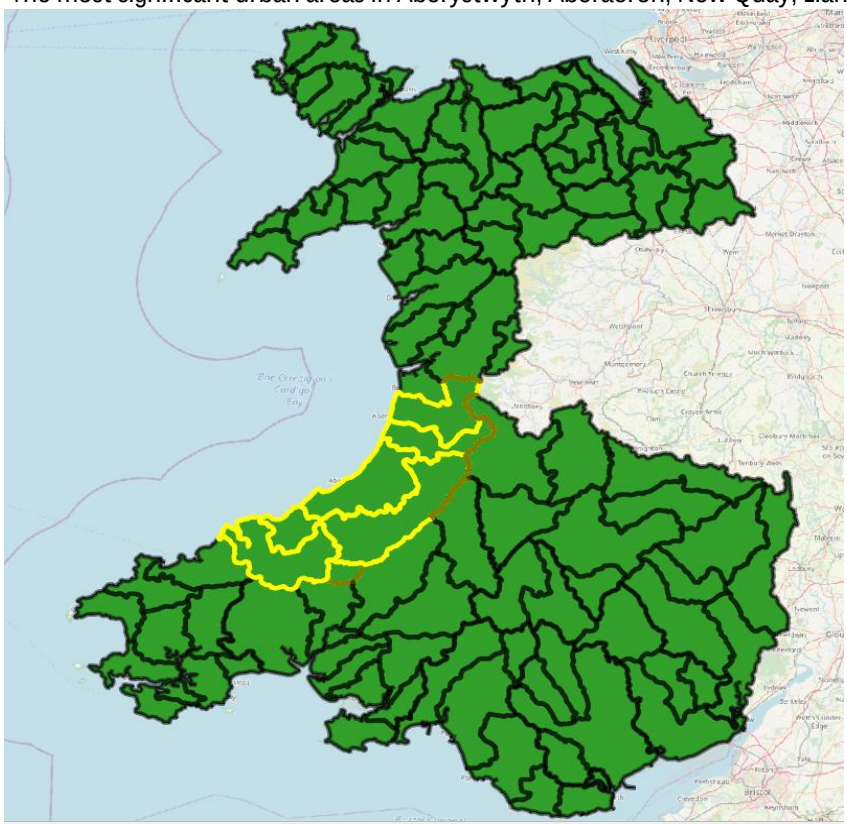


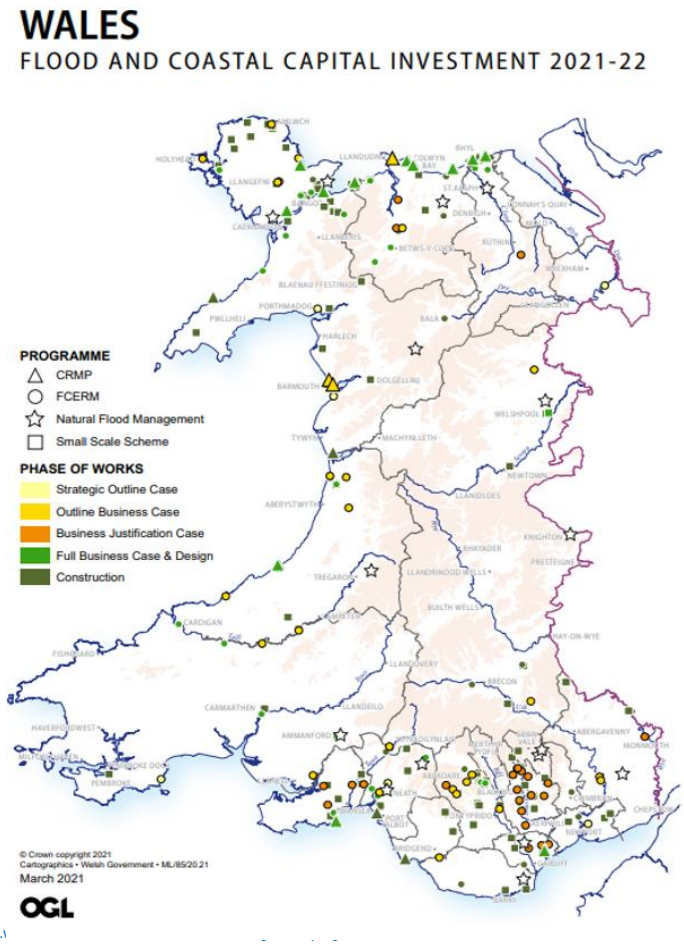
Figure 1 - River basin location detailing the associated tactial planning catchments

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that align with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Table 1 - Stakeholder opportunity partnerships

Plans	Stakeholder Engagement	Responsible Bodies/Primary Stakeholder
Local Management Plans	The catchment is covered by the Mid Wales Area Statement which can be viewed at https://naturalresources.wales/about-us/area-statements/mid-wales-area-statement/?lang=en	Natural Resources Wales Environment Agency Local partnerships
Flood Risk Management Plans (FRMP)	The Teifi and North Ceredigion Flood Risk Management Plan is located on the NRW webpage https://cdn.cyfoethnaturiol.cymru/media/675146/final_frmp_-western-wales_pk26b82.pdf?mode=pad&rnd=131466534560000000 . The DWMP catchment mirrors the FRMP catchment. The report highlights the coastal flooding caused by a combination of high tides and strong winds in 2014 which particularly impacted Aberystwyth, Cael Bangor and Cardigan. The report identifies Aberystwyth as being at highest risk of river flooding but also notes high risk area of Llanybydder, Lampeter and Cardigan. The FRMP identifies climate change and alteration in land use as the main impacts on future flooding noting the greatest modelled increase in future flood risk is likely to be seen in the communities of Aberystwyth, Llanybydder, Aberaeron and Llanrhystud.	Welsh Government Water companies Coastal Groups (local authority led) Natural Resources Wales Environment Agency Lead local flood authorities
Shoreline Management Plans (SMP)	Teifi and North Ceredigion is covered by SMP 21 St Ann's Head to Great Ormes Head	Coastal Groups (local authority led) County councils Lead local flood authorities
River Basin Management Plan (RBMP)	River Basin Management Plans (RBMP) set out how a combination of organisations and parties work together and set out to improve the catchments water quality and environment. The RBMPs can be found here: https://www.gov.uk/government/collections/river-basin-management-plans-2015 https://cdn.cyfoethnaturiol.cymru/media/679392/2016-updated-teifi_catchment_summary_nrw.pdf	Water companies Coastal Groups (local authority led) Natural Resources Wales Welsh Government Environment Agency Defra
Flood and Coastal Erosion Risk Management Programme (FCERM)	There are strategically outlined FCERM schemes planned in the region from 2021 to 2022. This is illustrated in Figure 2.	Coastal Groups (local authority led) Natural Resources Wales Welsh Government Environment Agency Defra
Local Development Plans (LDPs)	The latest local development plans have been incorportated into the plan and future iterations of LDPs will be amended into the DWMP in future cycles.	Local Councils
Other Stakeholders and Non-governmental Organisation (NGOs)	Within this cycle other stakeholder groups have not yet been engaged.	



Data is available from: https://gov.

Figure 2 - Flood and Coastal Investment overview

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

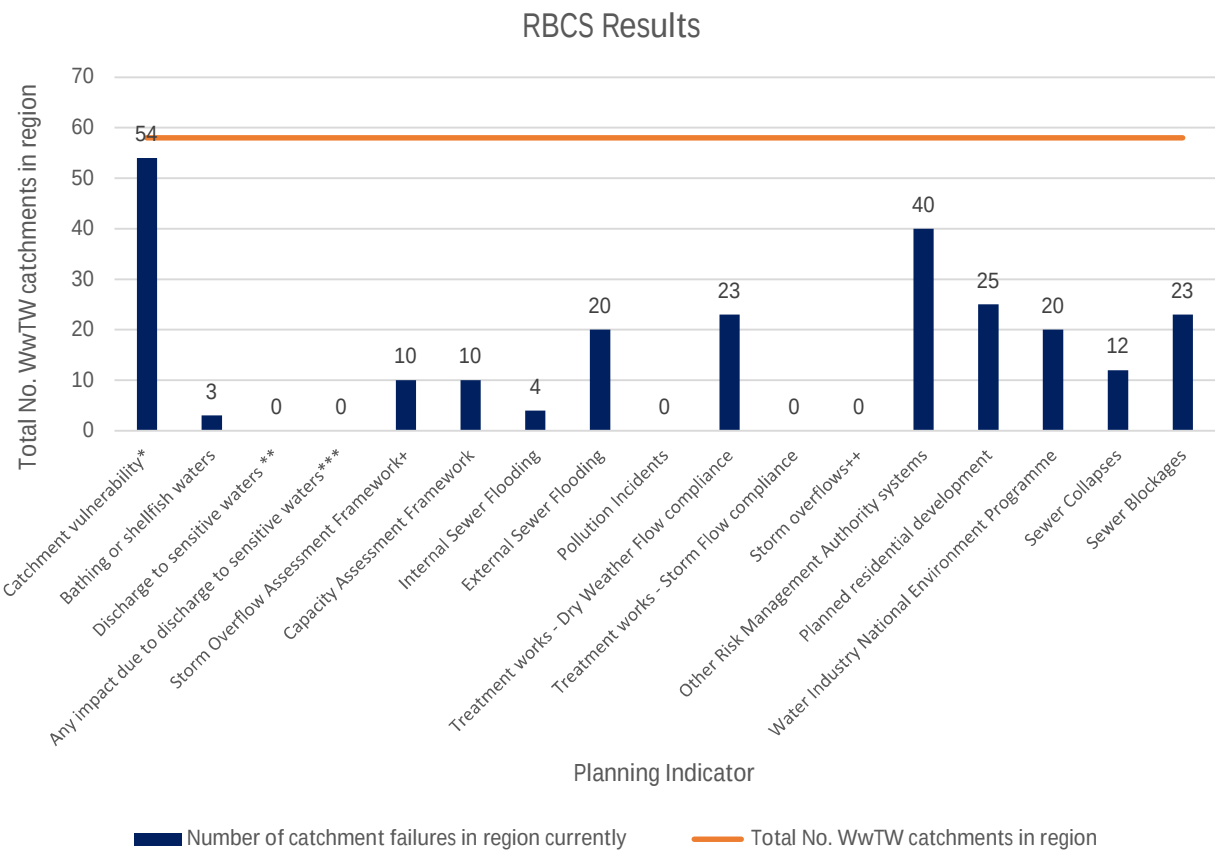
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

The population in the Teifi and North Ceredigion region is set to decrease to 122000 by 2050, a change of -11% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Maesceinion and land at Southgate in Aberystwyth with 266 units and 189 units respectively.
Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

For the Teifi and North Ceredigion catchment the biggest concerns indicated by the RBCS are Wastewater Treatment Works compliance in dry weather, catchment characterisation (based on a vulnerability assessment of flooding due to local characteristics, such as topography) and planned residential new development.



* To sewer flooding due to extreme wet weather events.
**Sensitive waters are considered as Bathing Water and Shellfish Water.
** Categorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
**** Categorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+ Frequency investigation triggered.
++Overflow risks not covered by other indicators.

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

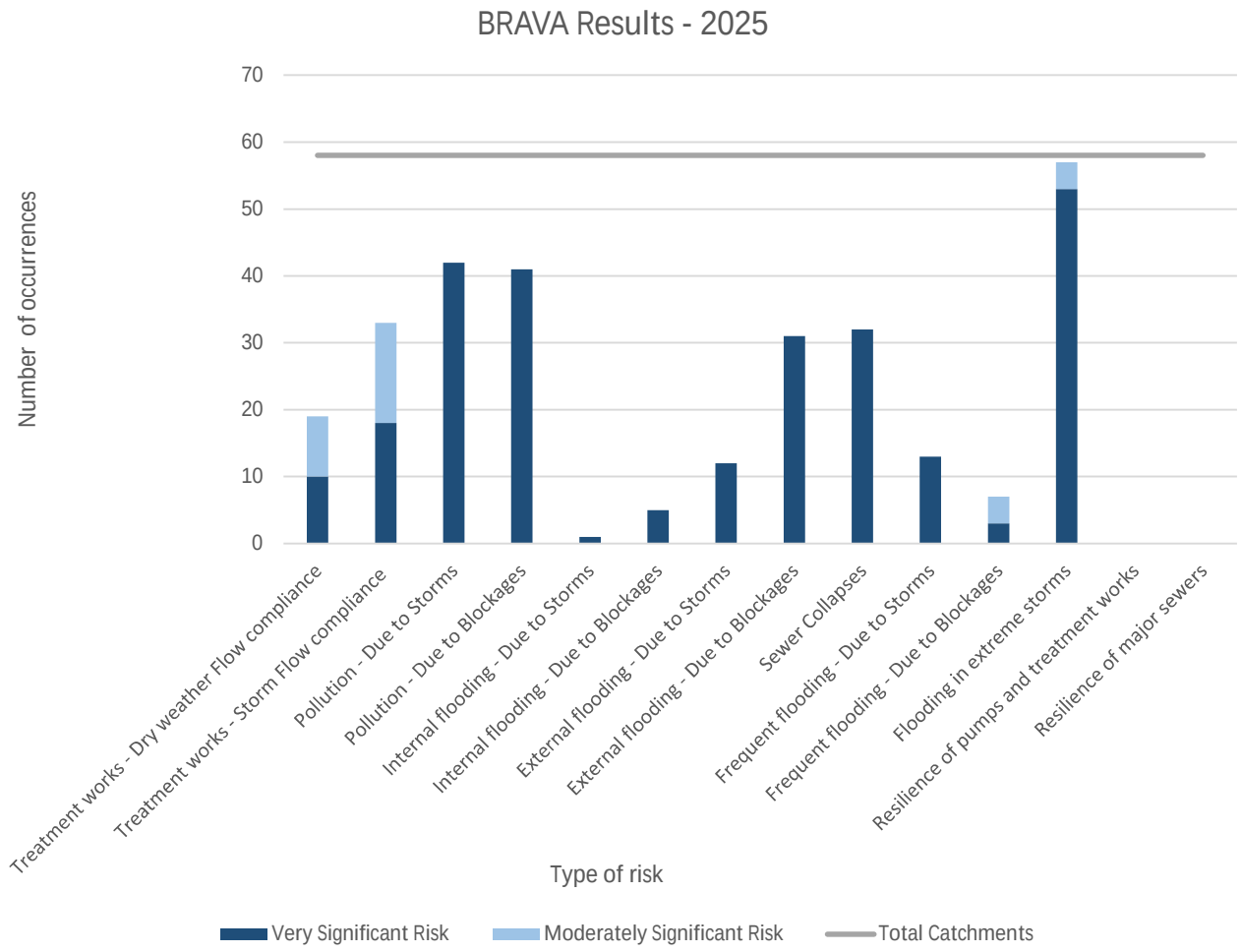


Figure 4 - BRAVA 2025 Summary

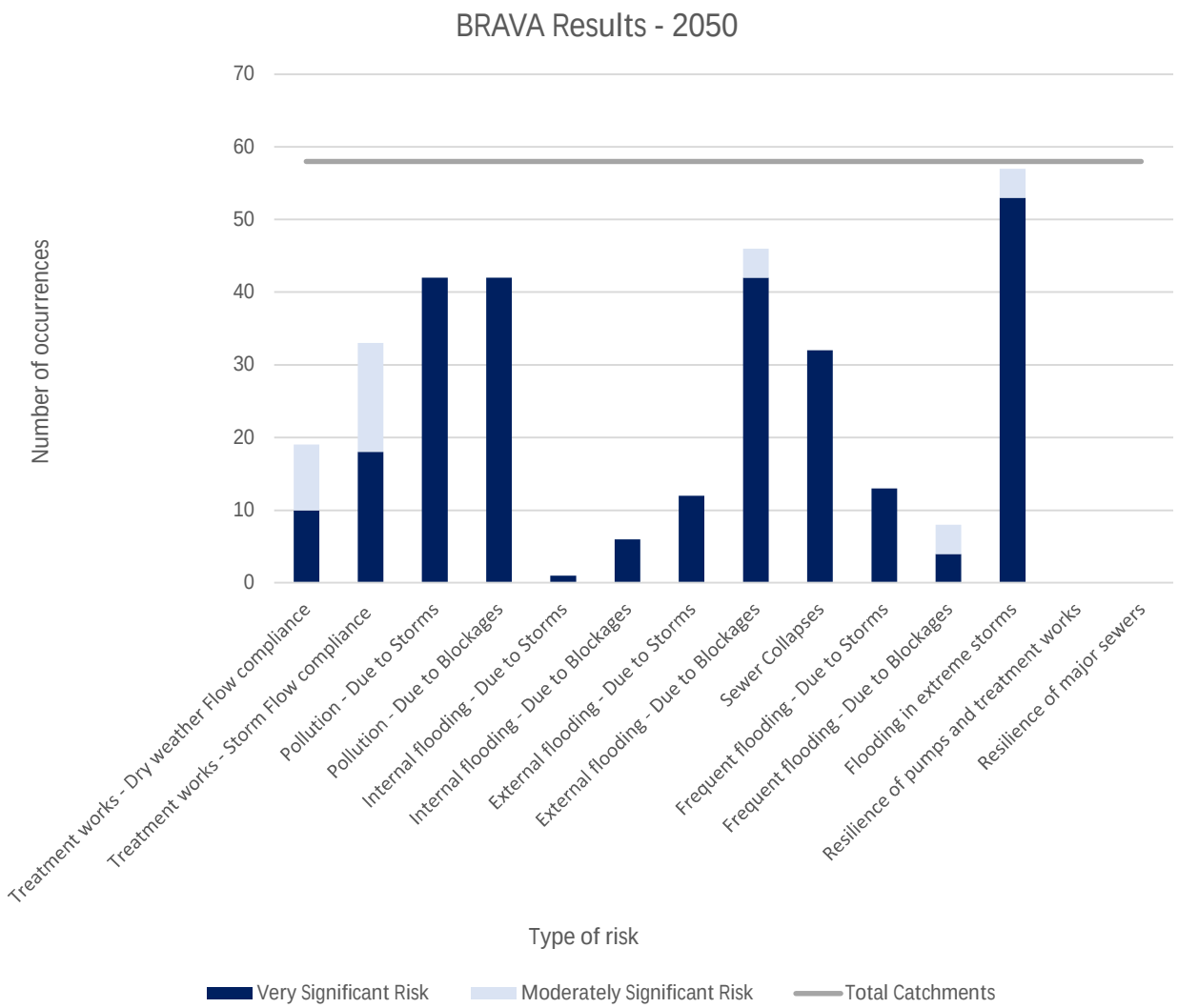


Figure 5 - BRAVA 2050 Summary

The BRAVA indicates an increased level of risk to treated wastewater quality, pollution, storm overflow operation and internal sewer flooding as a result of excessive flows causing hydraulic overload of the sewers.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

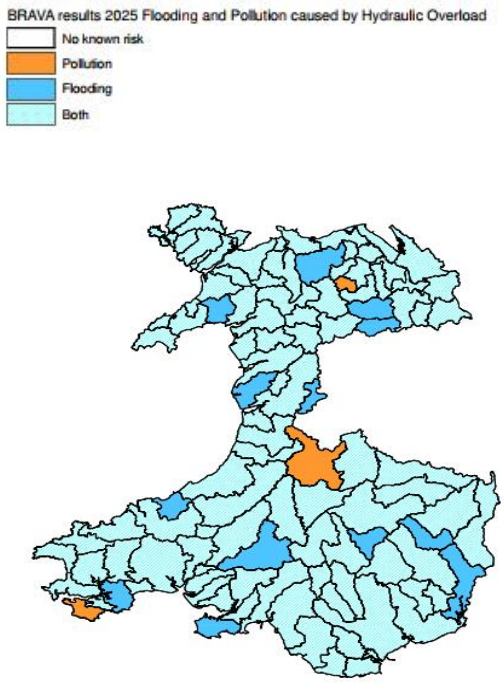


Figure 6 - Associated Strategic Planning Areas priority (2025)

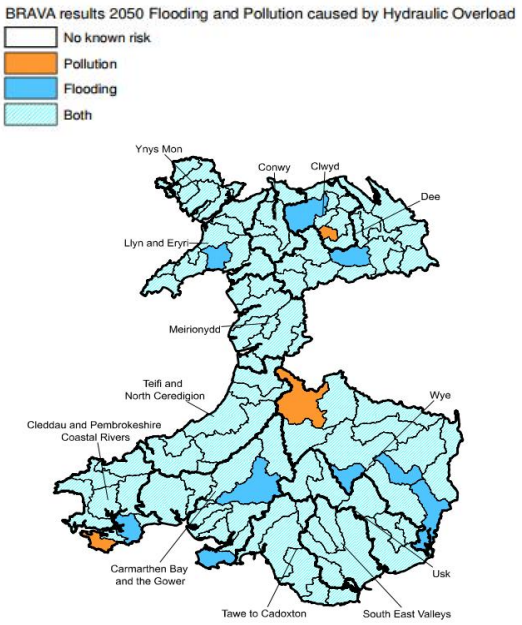


Figure 7 - Associated Strategic Planning Area priority (2050)

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry weather. The suitability of the treatment works dry weather consents is tested against forecast future growth and changes in water consumption. This assesses the region's capacity, with no allowance for error, to treat the predicted changes in DWF in the future with no spare treatment works capacity.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity, it is flagged blue for further investigation. There may be local incapacity issues at individual treatment works within the region.

L2 Area	2025	2030	2035	2040	2045	2050
Teifi and North Ceredigion						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon we have tested various types of schemes, and combination of schemes, to ensure a robust ‘best value’ plan is delivered. Figure 8 shows the 'best value' scheme types that are most likely to be beneficial in this region across the plan.

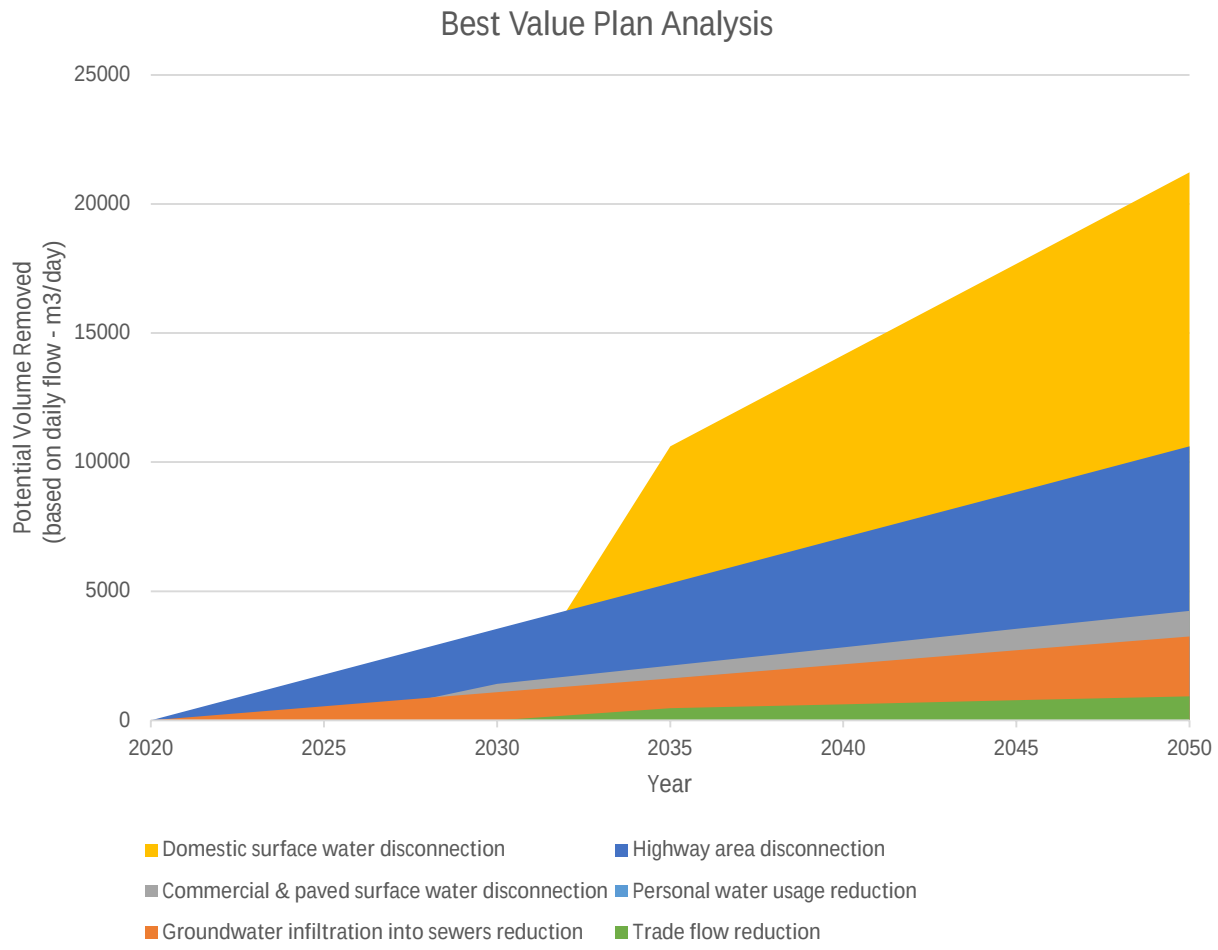


Figure 8 - Best Value Plan Analysis

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a ‘typical year’. Table 3 illustrates both the size and cost of potential mitigation measures required to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contribution to the network relative to todays cost.

Mitigating the risk posed by flooding has been assessed in terms of the probability of occurrence, we use the size of a storm event that has the probabilty of occuring once every 30 years. Table 4 illustrates both the size and cost of potential mitigation measures to mitigate varying flood risk types. These have been assessed against a ‘typical year’ of rainfall.

The choice of scenarios for storm overflow mitigation in Table 3 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 4. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£167,000,000	£248,300,000
40 spills in a Typical Year	£55,000,000	£53,000,000	£54,000,000
20 spills in a Typical Year	£93,000,000	£94,000,000	£101,000,000
10 spills in a Typical Year	£136,000,000	£141,000,000	£152,000,000
0 spills in a Typical Year	£300,000,000	£312,000,000	£328,000,000
Equivalent No. Principality Stadiums Full of Water in 10 spills scenario	1.16	1.27	1.37

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 3 - Summary of Combined Sewer Overflow Option Investment Strategy Costs

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr. (Storm Dennis)
Internal escapes	£2,000,000	£2,000,000	£2,000,000
External escapes in gardens	£4,000,000	£5,000,000	£5,000,000
Escapes in highways	£47,000,000	£59,000,000	£80,000,000
No future flooding	-	£22,000,000	£59,000,000
Total	£53,000,000	£88,000,000	£146,000,000

Table 4 - Summary of Flooding Option Investments Strategy Costs

Tables 3 and 4 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We have developed solutions which aim to provide protection, to our worst served customers and rivers designated as Special Areas of Conservation (SAC) under the Habitat Directive, as a priority against drainage and network failure which result in pollution events and flooding. The solutions developed highlight the level of investment required to bring our network to the level of protection required to mitigate against these risks.

More detailed information can be seen in the Level 3 reports. For more information on the methodology see the plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

DWMP Tactial Planning Catchment Summary

Aeron - confluence with Gwili to tidal limit

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Aeron - confluence with Gwili to tidal limit planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 11 wastewater catchments (see Figure 2 below). There is a combined population of 12447, this is set to decrease to 10027 by 2050, a change of -19%. There is a total sewer length of 130km, with a foul sewer length of 73km, a surface water length of 1km and a combined sewer length of 44km. There are 11 Wastewater Treatment Works (WwTW), 26 Sewerage Pumping Stations (SPSs), and 22 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Aeron catchment borders the Eastern coastline of Cardigan Bay with Aberystwyth in the North and Llangrannog in the South. The main watercourses in this catchment include; The River Aeron, Arth and Wyre. All confluencing into Cardigan Bay.

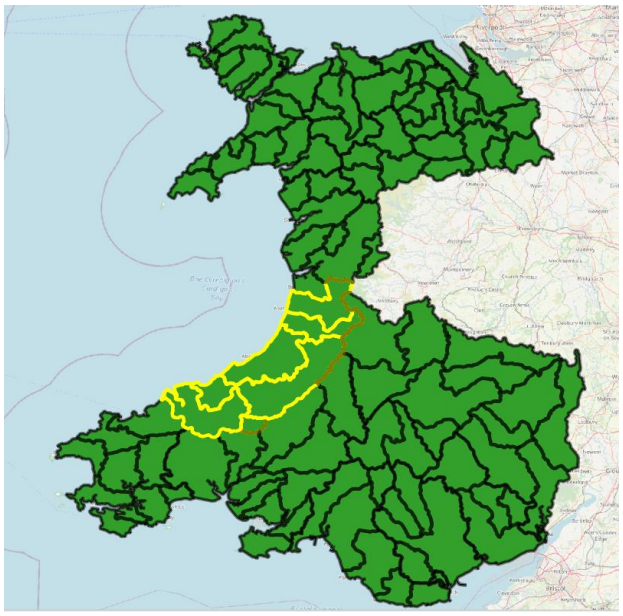


Figure 1 - River basin location detailing the associated tactial planning catchments

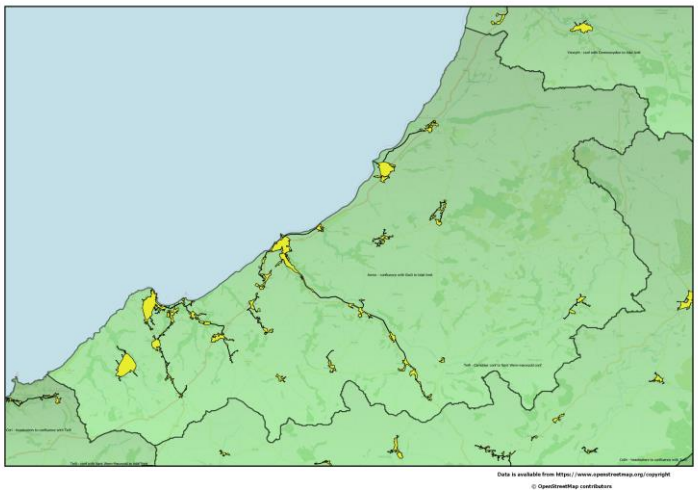


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

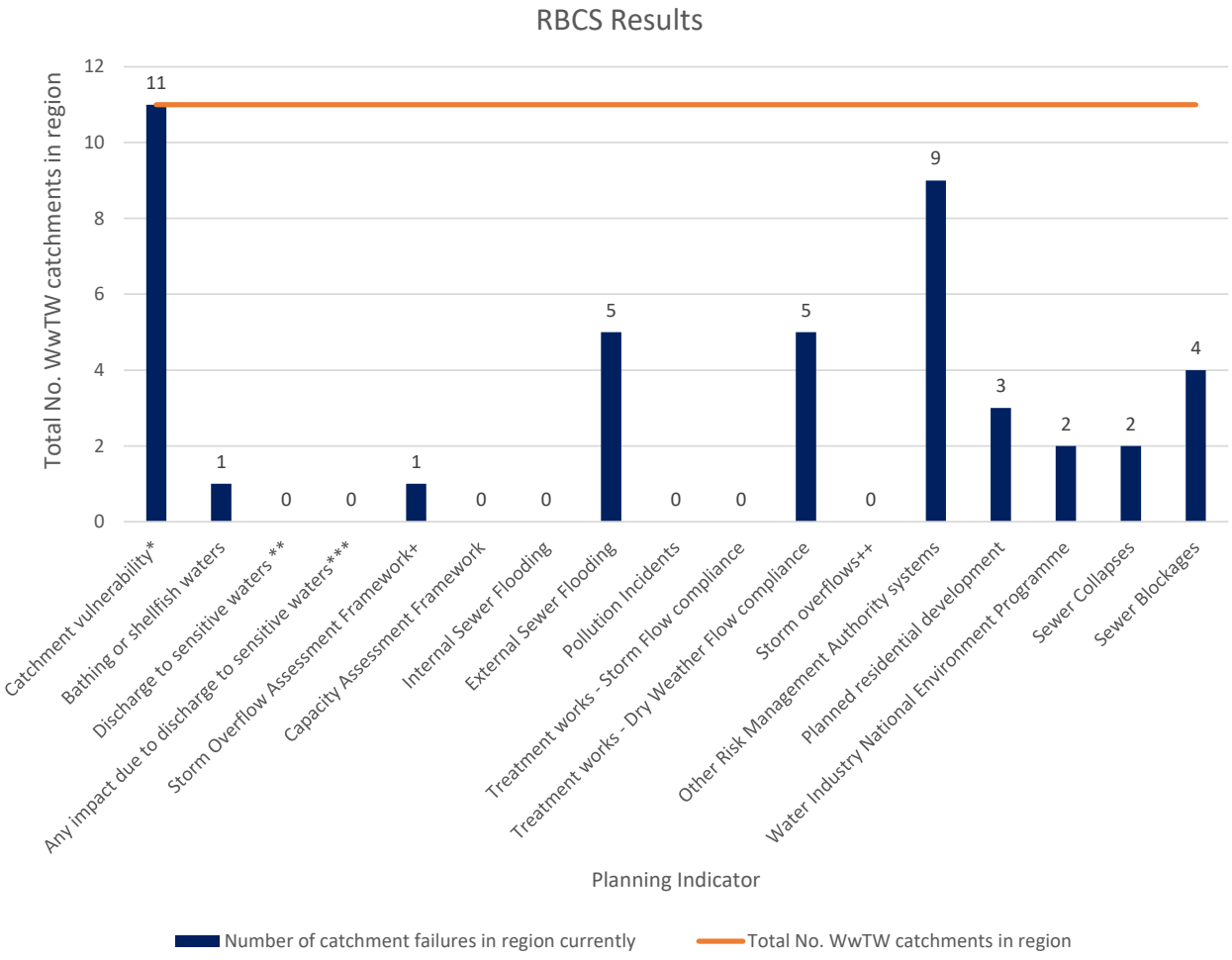
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to decrease to 10000 by 2050, a change of -19% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Cae'r Bont in Felinfach of 136 units and Land rear of Towyn Farm in New Quay with 134 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

In the event of an extreme storm 11 out of 11 catchments in Aeron are predicted to flood. In the majority of the catchments a surface water flood risks have been identified by NRW. In half of the catchments it is predicted that there will be compliance issues at the WwTW in dry conditions. It is worth noting that one of the catchments may discharge flows into bathing water.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
**Catagorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

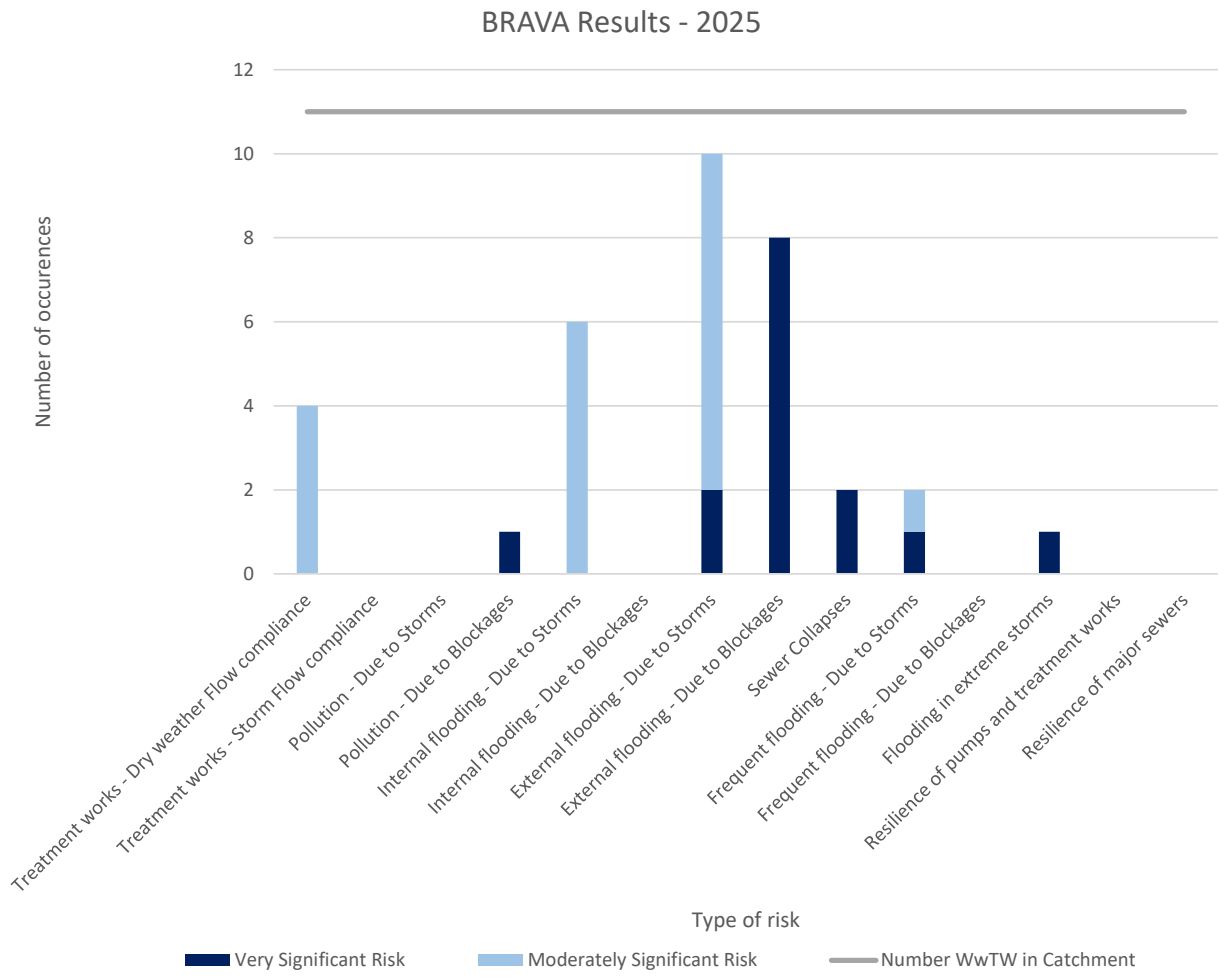


Figure 4 - BRAVA 2025 Summary

In 2025 there are no reported risks in this catchment.

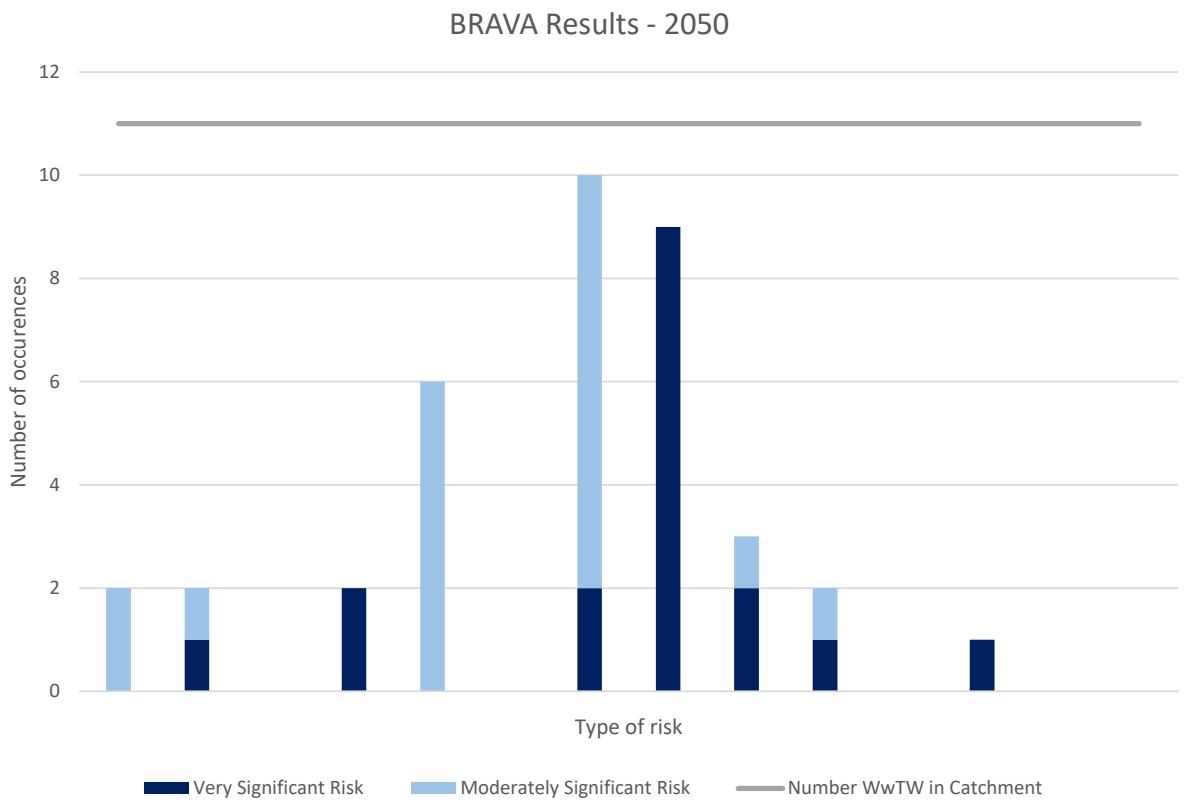


Figure 5 - BRAVA 2050 Summary

In 2050 the most significant risks are flooding, blockages and pollution during storm events. Also, it is predicted that there will be WwTW compliance issues occurring during these storm events.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

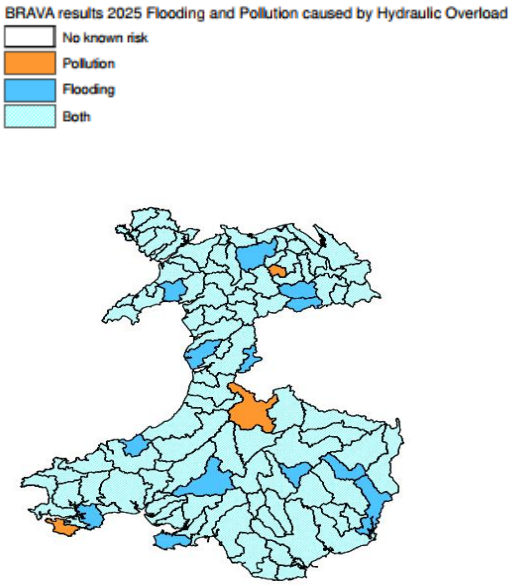


Figure 6 - Associated Strategic Planning Areas priority (2025)

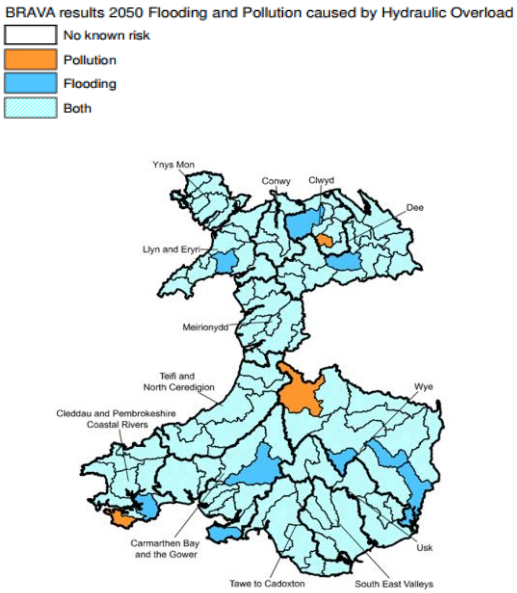


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Aeron - confluence with Gwili to tidal limit has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Aeron - confluence with Gwili to tidal limit	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

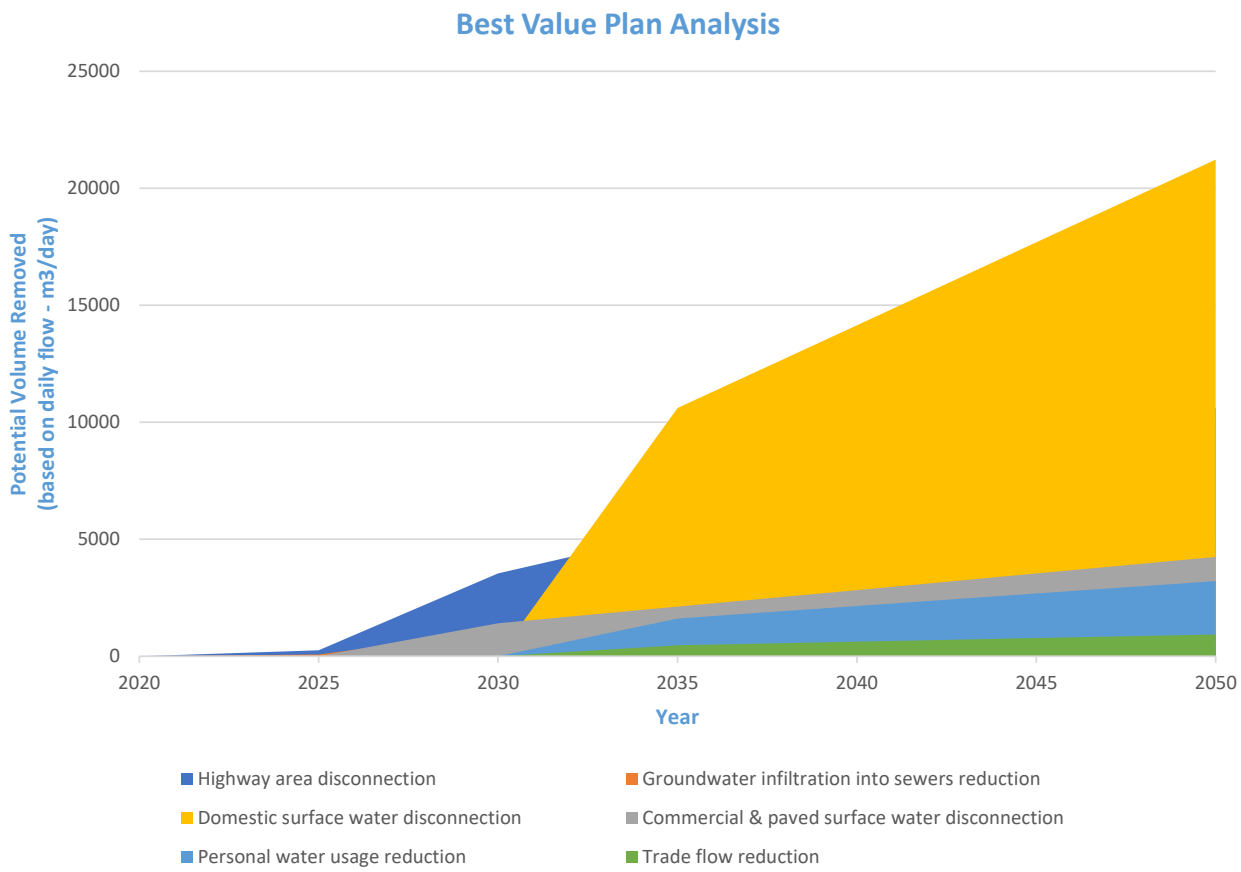


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£14,000,000.00	£20,000,000.00
40 spills in a Typical Year	£5,000,000.00	£5,000,000.00	£5,000,000.00
20 spills in a Typical Year	£18,000,000.00	£16,000,000.00	£16,000,000.00
10 spills in a Typical Year	£26,000,000.00	£26,000,000.00	£27,000,000.00
0 spills in a Typical Year	£46,000,000.00	£47,000,000.00	£47,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	42.00	46.00	47.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£1,000,000	£1,000,000	£1,000,000
External escapes in gardens	£2,000,000	£2,000,000	£3,000,000
Escapes in highways	£9,000,000	£11,000,000	£16,000,000
No flooding	-	£4,000,000	£11,000,000
Total	£12,000,000.00	£18,000,000	£31,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
LLANRHYSTUD	0
CROSS INN & NEBO STW	0
MYDROILYN	0
TAL-SARN	0
LLWYNCELYN (S OF ABERAERON) STW	0
PENNANT STW	0
DIHEWYD STW	0
LLANGEITHO	0
NANTERNIS	0
ABERAERON STW	0
LLANINA	0

DWMP Tactial Planning Catchment Summary

Ceri - headwaters to confluence with Teifi

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Ceri - headwaters to confluence with Teifi planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 5 wastewater catchments (see Figure 2 below). There is a combined population of 3721, this is set to decrease to 3504 by 2050, a change of -6%. There is a total sewer length of 39km, with a foul sewer length of 36km, a surface water length of 2km and a combined sewer length of 0km. There are 5 Wastewater Treatment Works (WwTW), 19 Sewerage Pumping Stations (SPSs), and 13 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Ceri - headwaters to confluence with Teifi is situated at the southern end of Cardigan Bay. The catchment stretches from Blaenporth in the west to Cruglas in the east, Pont Ceri in the south to Llangrannog in the north. This small catchment has numerous villages including Aberporth and Beulah. The source of the river Ceri is in the northeast of the catchment and it flows south, leaving the catchment boundary at Pont Ceri.

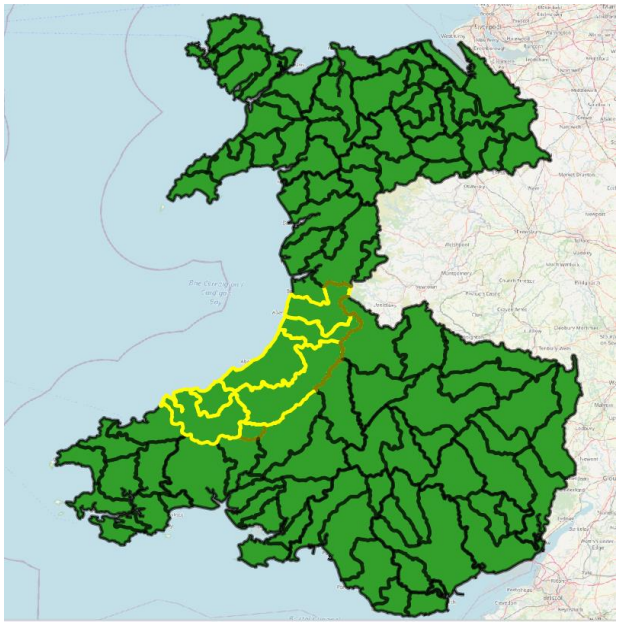


Figure 1 - River basin location detailing the associated tactial planning catchments

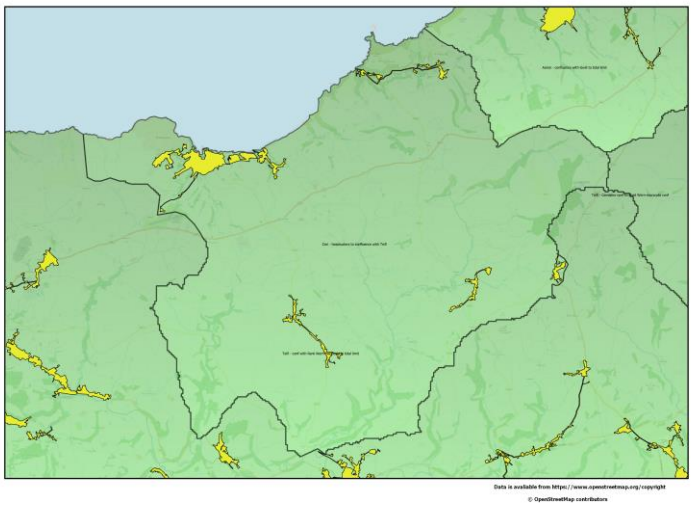


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

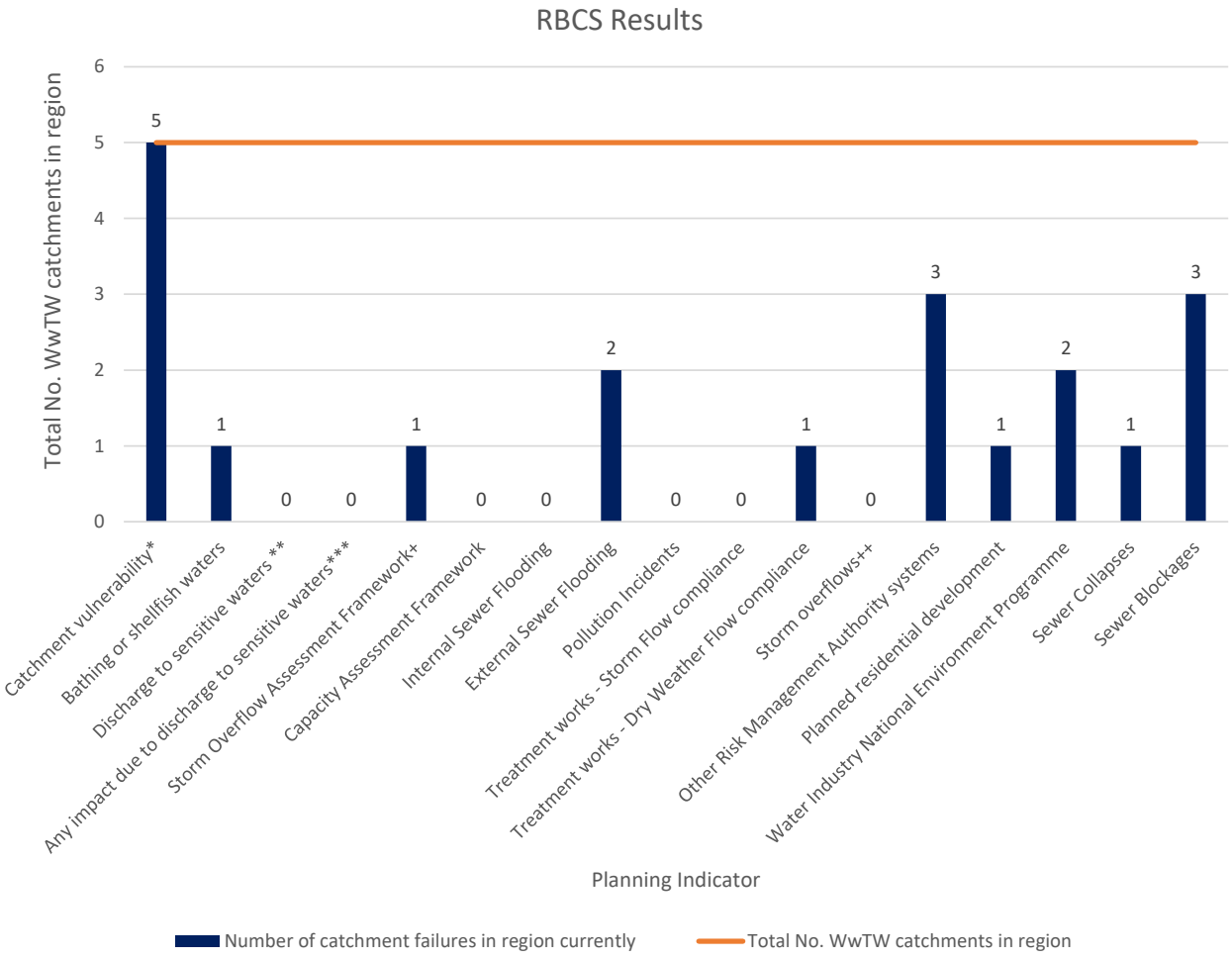
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to decrease to 3500 by 2050, a change of -6% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including the field next to Brynglas Estate with 52 units and the playing fields, Parcllyn with 48 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

The RBCS has highlighted that 5 out of the 5 L4 catchments within this L3 are likely to be vulnerable to sewer flooding due to an extreme storm event. Sewer blockages and flood risks falling under the scope of other risk management authorities were also flagged as areas of potential risk.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
**Catagorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

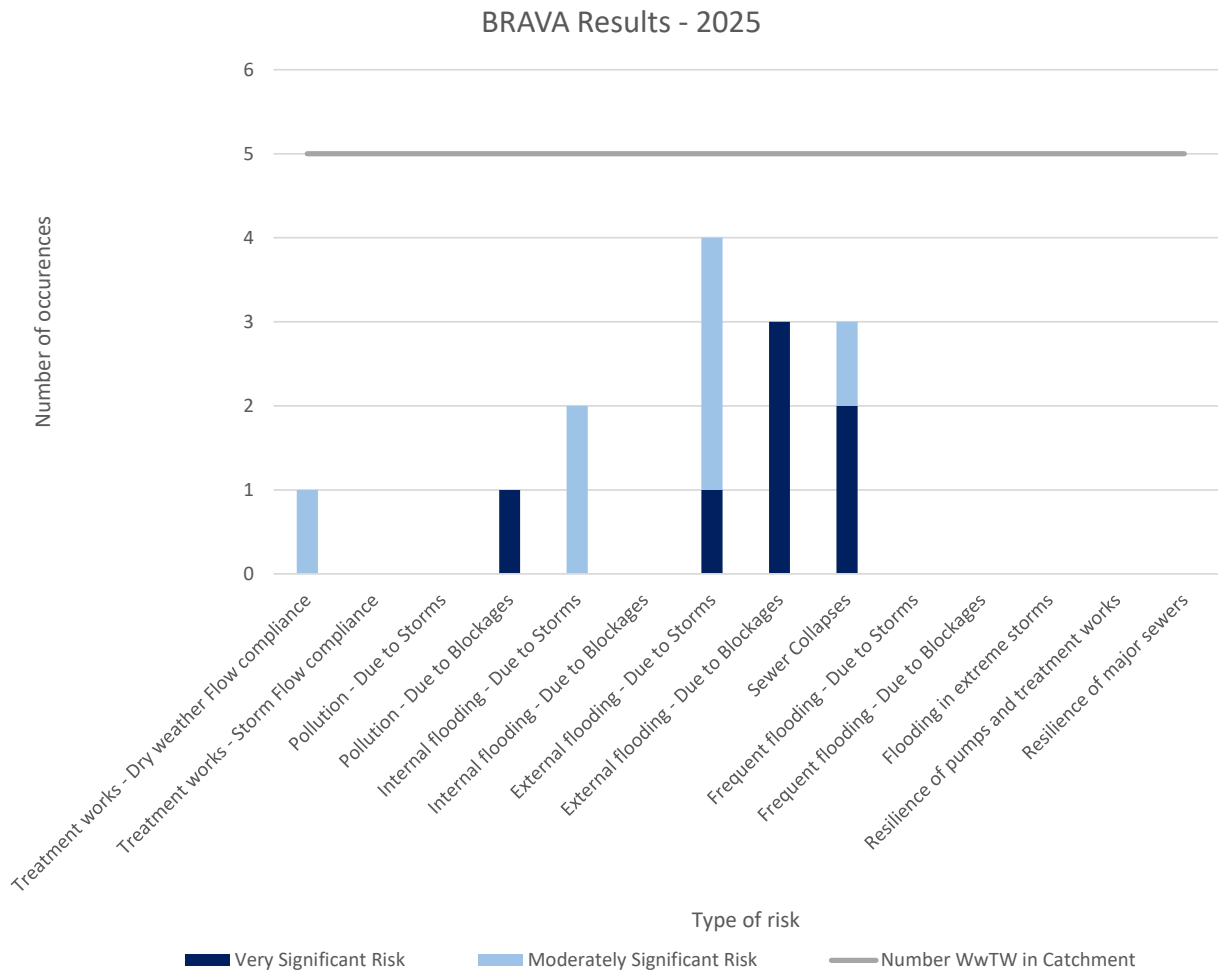


Figure 4 - BRAVA 2025 Summary

In 2025 it is expected that the risks will be pollution due to storm events and sewer blockages, and external flooding due to storm events and sewer blockages. The risk is expected to be of a similar level between these 4 risk types.

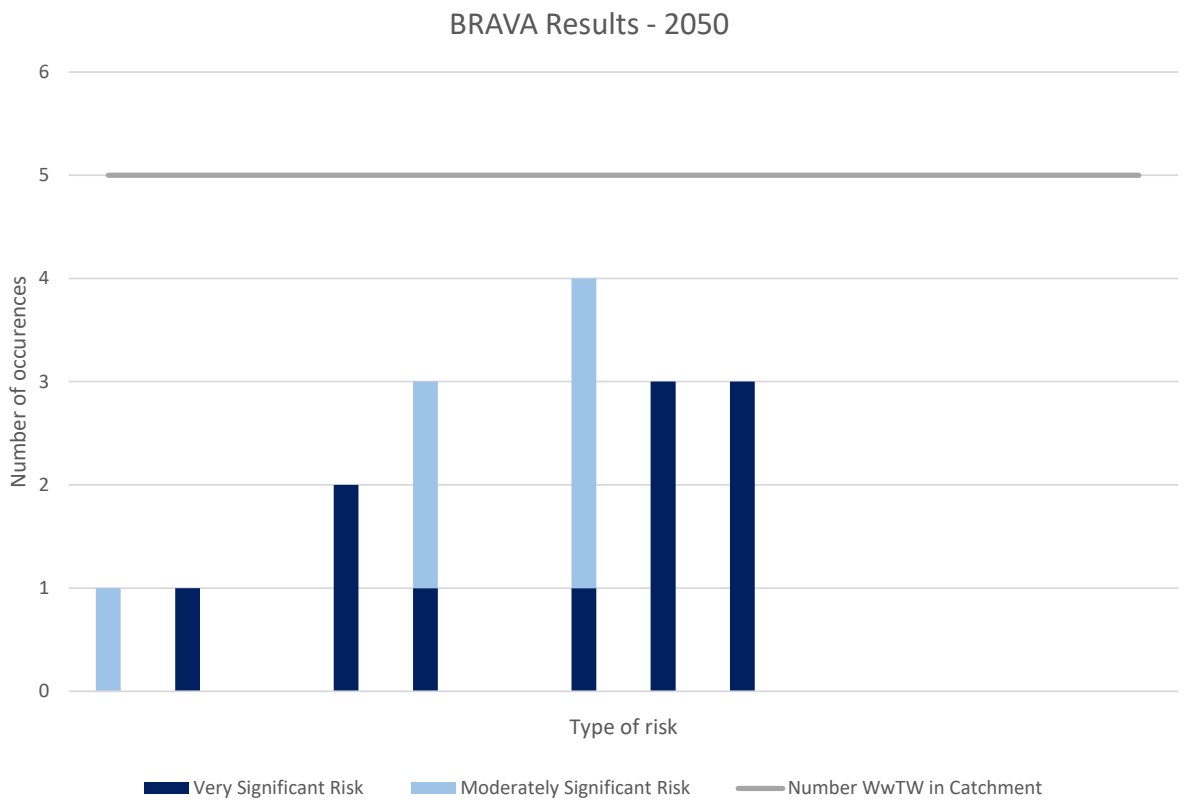


Figure 5 - BRAVA 2050 Summary

In 2050 external flooding due to storms is expected to remain a risk within this catchment. Sewer collapse and treatment work compliance due to storms are also expected to be risks within the catchment.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

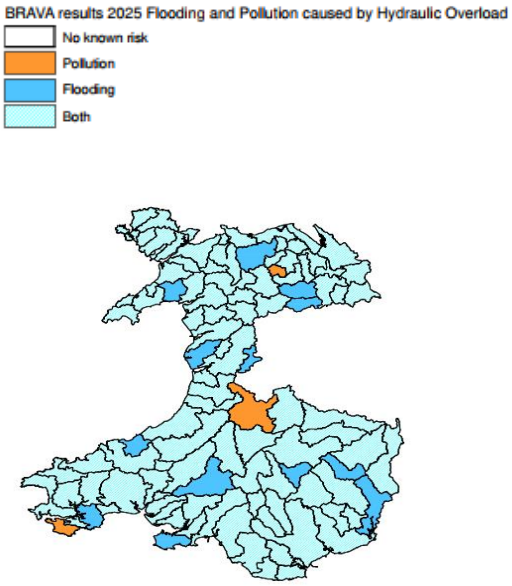


Figure 6 - Associated Strategic Planning Areas priority (2025)

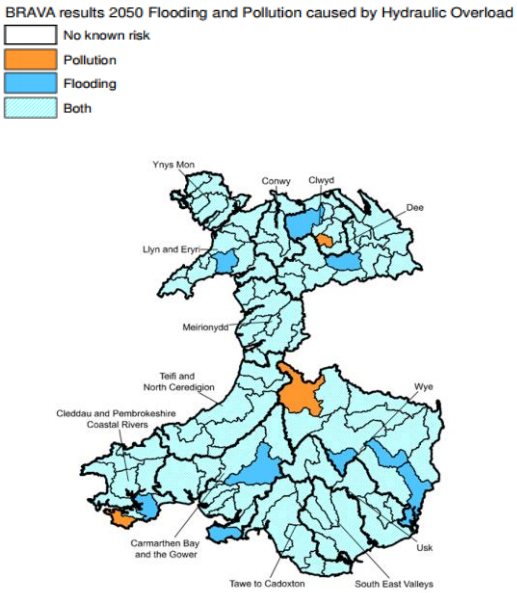


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Ceri - headwaters to confluence with Teifi has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Ceri - headwaters to confluence with Teifi	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

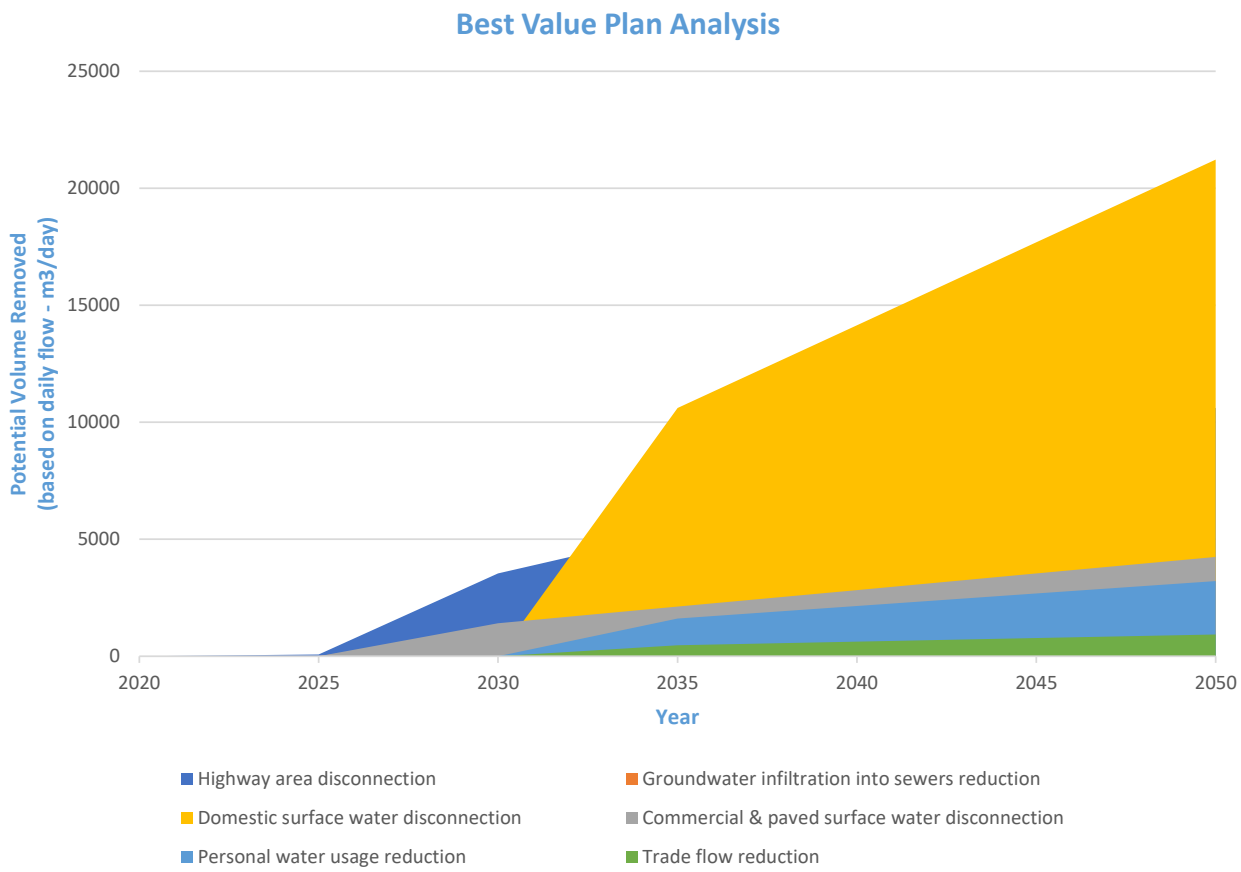


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£12,000,000.00	£17,000,000.00
40 spills in a Typical Year	£1,000,000.00	£1,000,000.00	£1,000,000.00
20 spills in a Typical Year	£2,000,000.00	£5,000,000.00	£5,000,000.00
10 spills in a Typical Year	£8,000,000.00	£13,000,000.00	£13,000,000.00
0 spills in a Typical Year	£26,000,000.00	£28,000,000.00	£29,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	33.00	37.00	40.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£0	£0	£0
External escapes in gardens	£0	£0	£0
Escapes in highways	£1,000,000	£1,000,000	£1,000,000
No flooding	-	£3,000,000	£6,000,000
Total	£1,000,000.00	£4,000,000	£7,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
ABERPORTH	1
FFOSTRASOL	0
RHYDLEWIS STW	0
BEULAH (NR ABERPORTH)	0
LLANGRANOG (NEW WORKS)	0

DWMP Tactial Planning Catchment Summary

Rheidol - confluence with Castell to tidal limit

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Rheidol - confluence with Castell to tidal limit planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 5 wastewater catchments (see Figure 2 below). There is a combined population of 33968, this is set to decrease to 22350 by 2050, a change of -34%. There is a total sewer length of 97km, with a foul sewer length of 43km, a surface water length of 4km and a combined sewer length of 50km. There are 5 Wastewater Treatment Works (WwTW), 16 Sewerage Pumping Stations (SPSs), and 12 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Rheido - confluence with Castell to tidal limit is situated in the west of Wales along a stretch of Cardigan Bay. The east of the catchment is more steep and rural, while the west is more coastal and urbanised. The main settlement in this catchment is Aberystwyth in the west, along with a number of smaller villages such as Ponterwyd. The rivers Rheidol and Clarach both fall within the catchment.

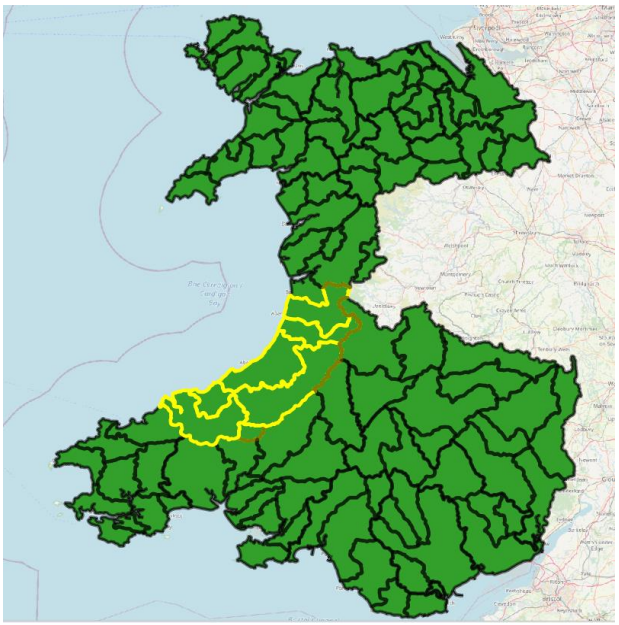


Figure 1 - River basin location detailing the associated tactial planning catchments

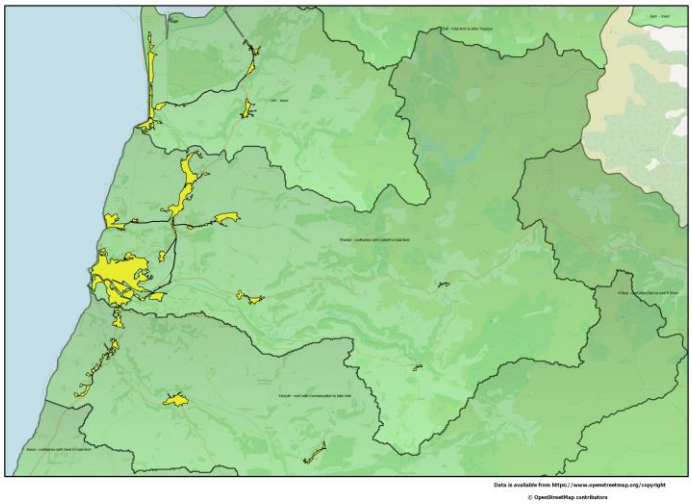


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

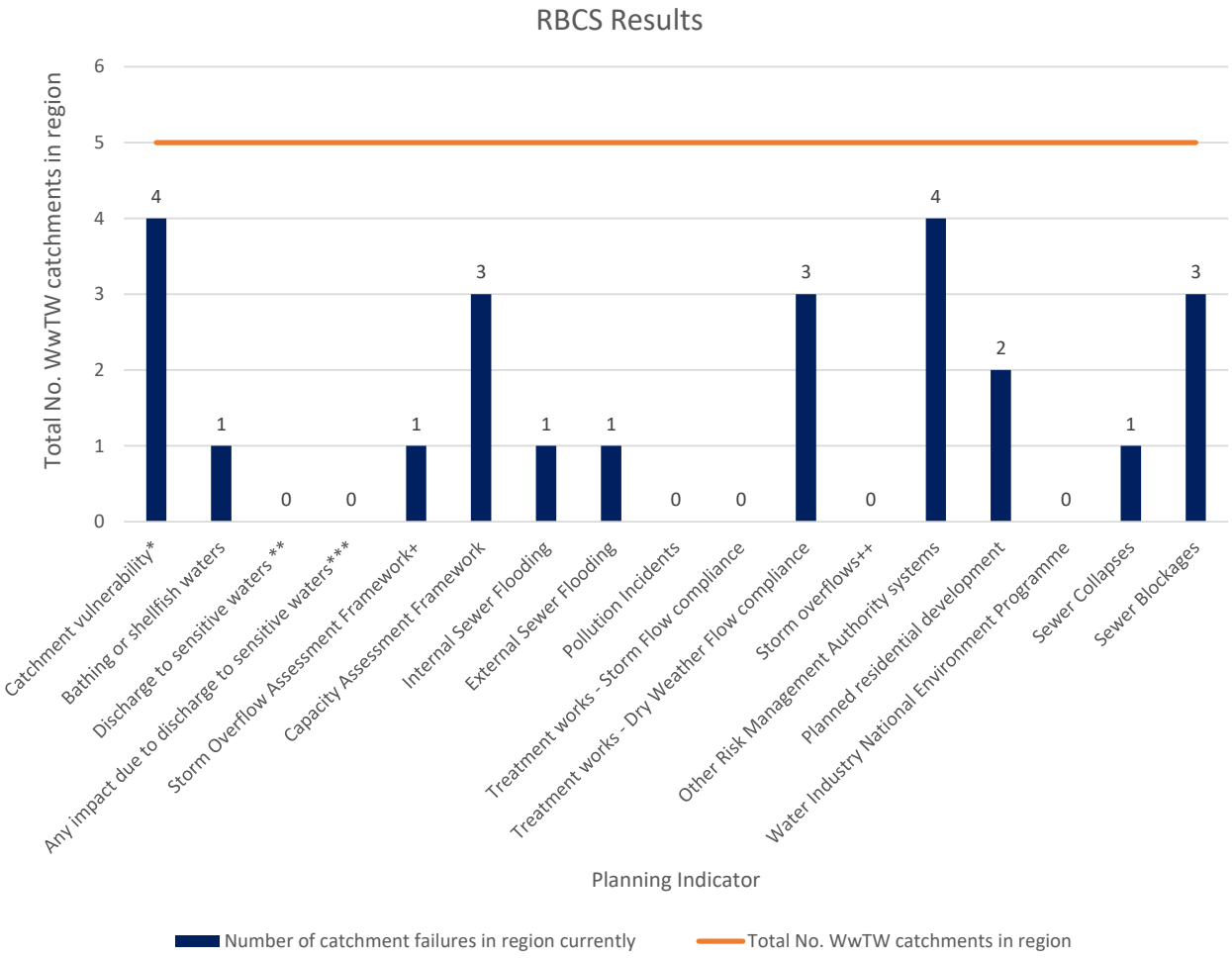
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to decrease to 22400 by 2050, a change of -34% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Maesceinion, Aberystwyth with 266 units and Hafan y Waun, Aberystwyth with 129 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

According to the RBCS 4 out of 5 L4 catchments within this L3 are expectected to be vulnerabile to sewer flooding due to extreme storm events. Sewer blockages, treatment work flow compliance and Capacity Assessment Framework issues were also flagged as areas of potential concern.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
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***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

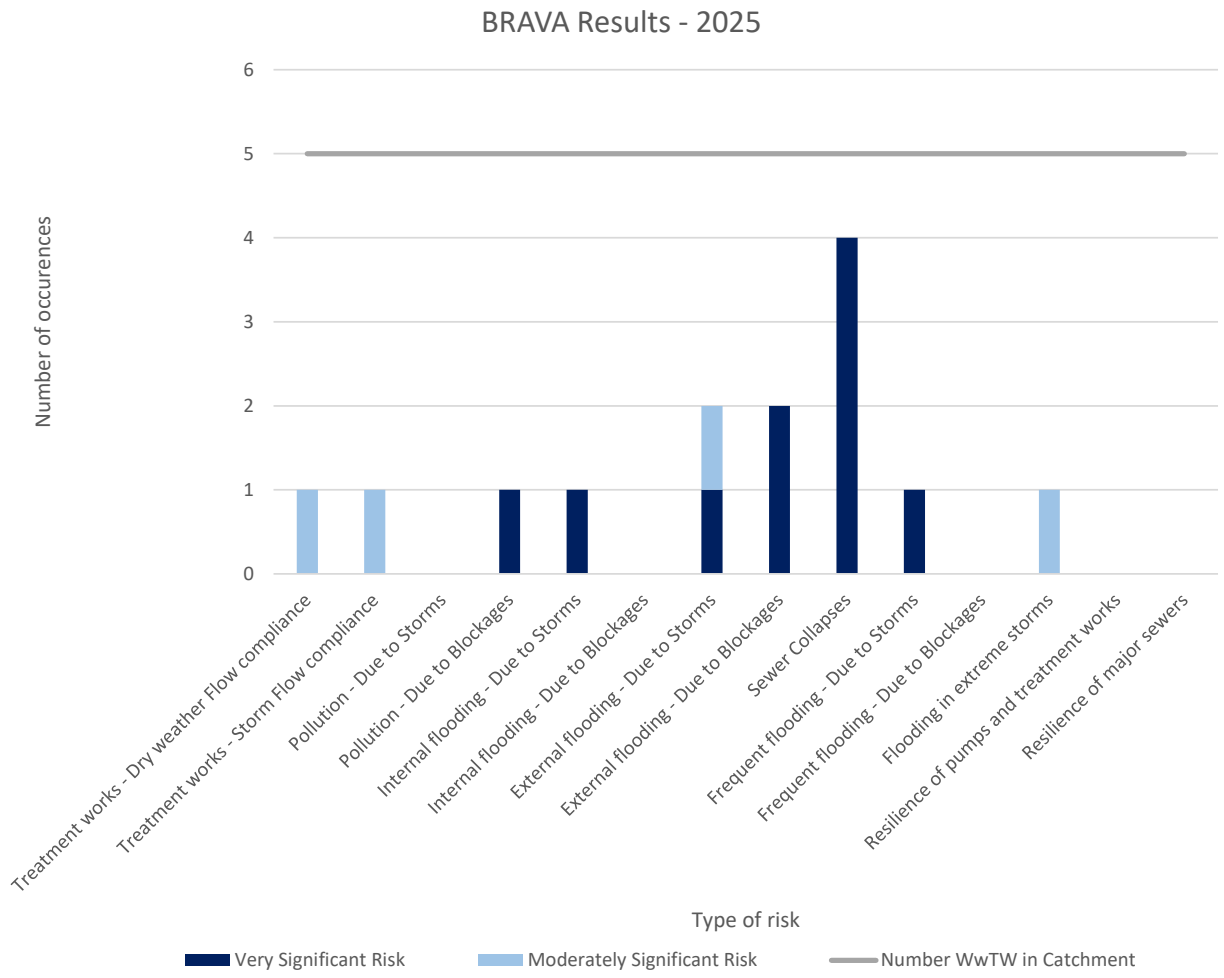


Figure 4 - BRAVA 2025 Summary

In 2025 it is expected that treatment work compliance both during dry flows and storm events will be a risk within the catchment, along with pollution due to storm events.

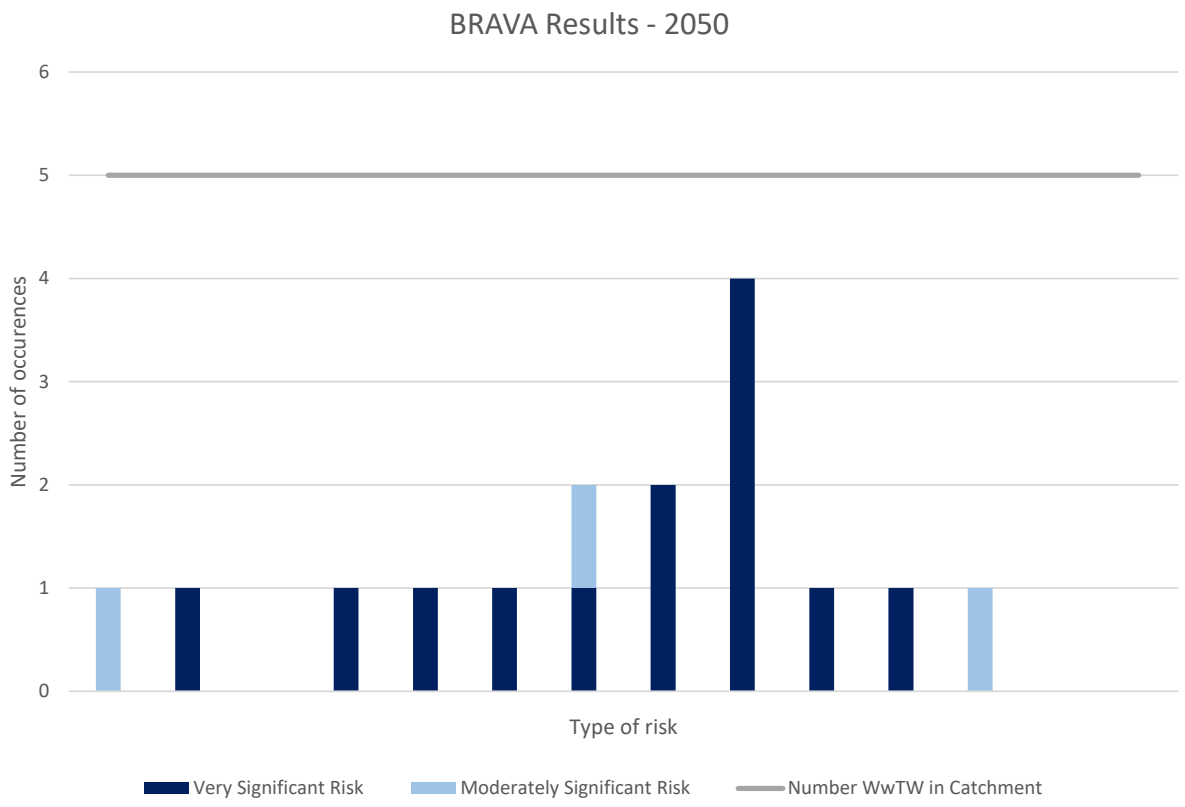


Figure 5 - BRAVA 2050 Summary

In 2050, the risks highlighted in 2025 are likely to remain the most significant risks within the catchment.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

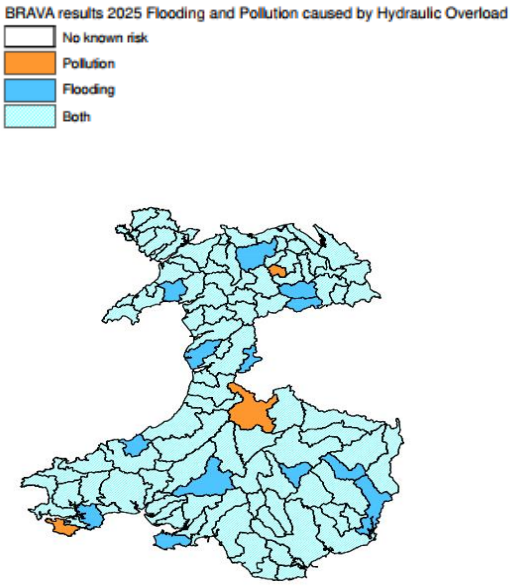


Figure 6 - Associated Strategic Planning Areas priority (2025)

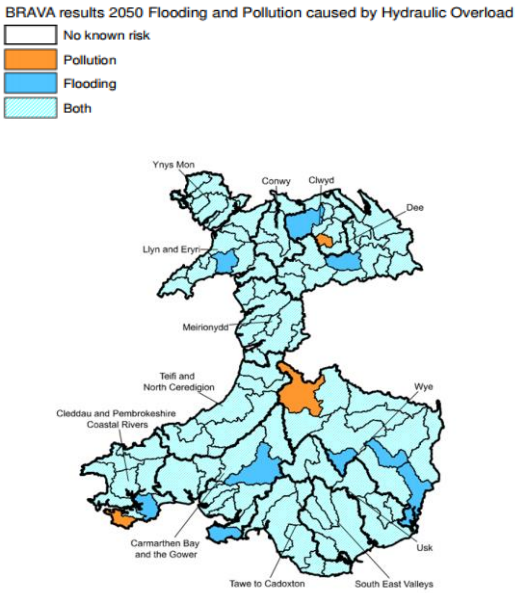


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Rheidol - confluence with Castell to tidal limit has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Rheidol - confluence with Castell to tidal limit	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

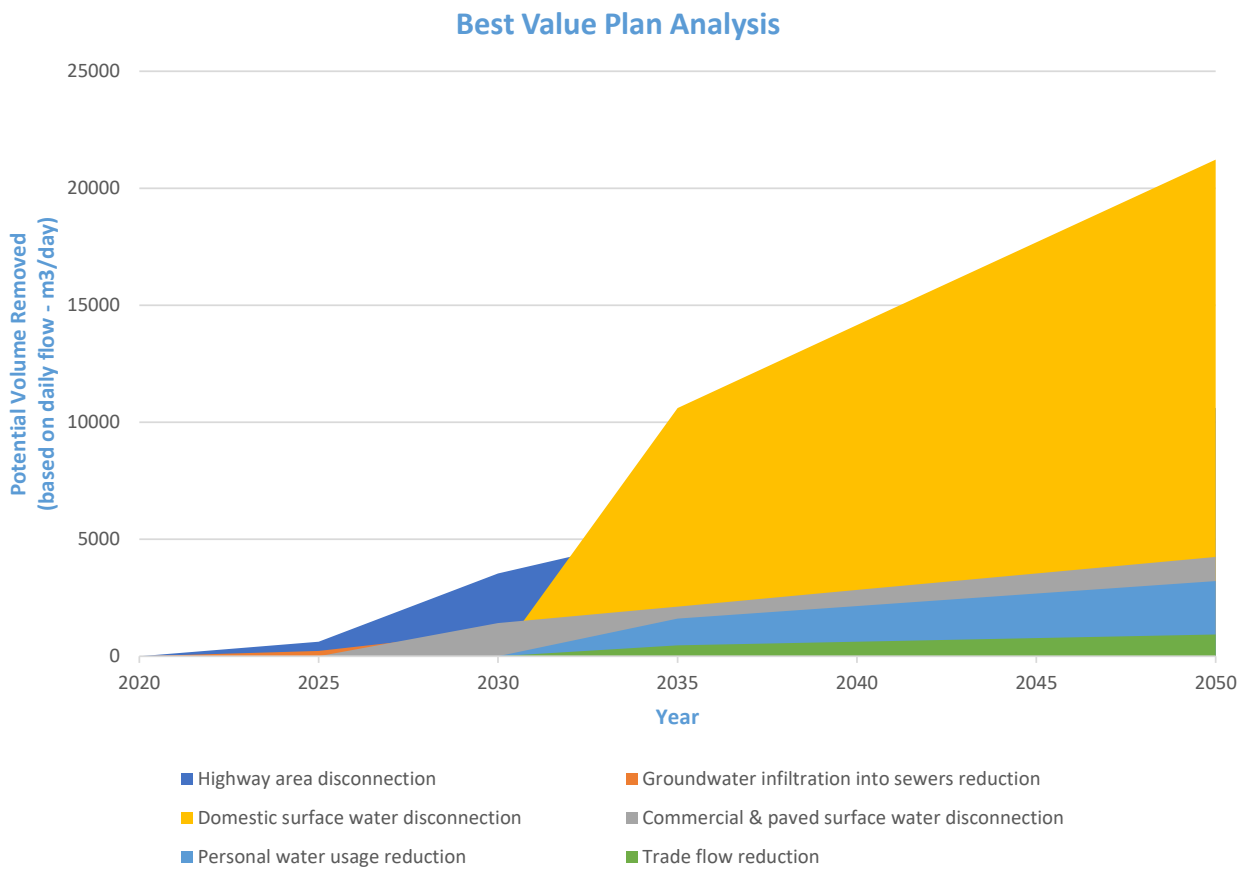


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£13,000,000.00	£16,000,000.00
40 spills in a Typical Year	£6,000,000.00	£6,000,000.00	£6,000,000.00
20 spills in a Typical Year	£8,000,000.00	£8,000,000.00	£8,000,000.00
10 spills in a Typical Year	£11,000,000.00	£12,000,000.00	£12,000,000.00
0 spills in a Typical Year	£40,000,000.00	£42,000,000.00	£44,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	50.00	54.00	62.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£0	£0	£0
External escapes in gardens	£1,000,000	£1,000,000	£1,000,000
Escapes in highways	£4,000,000	£5,000,000	£6,000,000
No flooding	-	£3,000,000	£8,000,000
Total	£5,000,000.00	£9,000,000	£15,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
ABERYSTWYTH (GLAN YR AFON)	0
DEVILS BRIDGE (PONTARFYNACH)	0
CAPEL BANGOR	0
CLARACH	0
PONTERWYD	0

DWMP Tactial Planning Catchment Summary

Teifi - Camddwr conf to Nant Wern-macwydd conf

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Teifi - Camddwr conf to Nant Wern-macwydd conf planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 16 wastewater catchments (see Figure 2 below). There is a combined population of 66034, this is set to increase to 67462 by 2050, a change of 2%. There is a total sewer length of 86km, with a foul sewer length of 62km, a surface water length of 4km and a combined sewer length of 18km. There are 16 Wastewater Treatment Works (WwTW), 74 Sewerage Pumping Stations (SPSs), and 68 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Teifi (Camddwr conf to Nant Wern-macwydd) is found on the west coast of Wales, Stretching from Cors Caron National Nature Reserve in the North down to the town of Llandysul in the South. Much of the catchment is relatively steep, rural and sparsely populated with several villages throughout. The River Teifi flows the span of the catchment with several small tributaries confluencing in at different points.

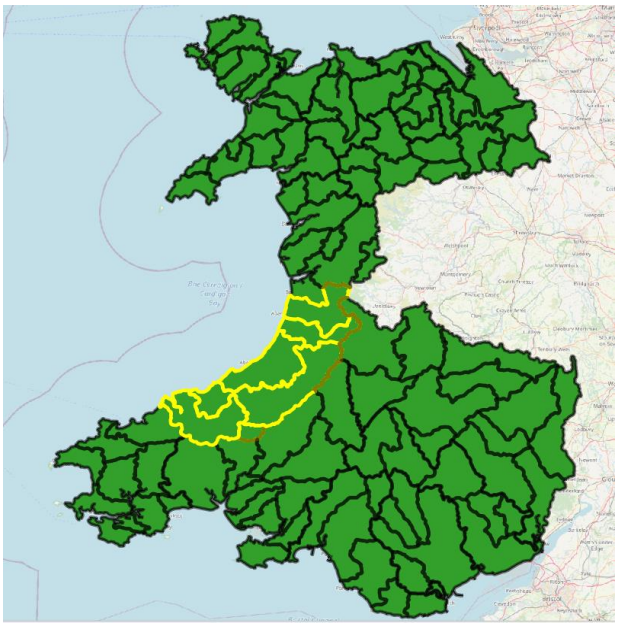


Figure 1 - River basin location detailing the associated tactial planning catchments

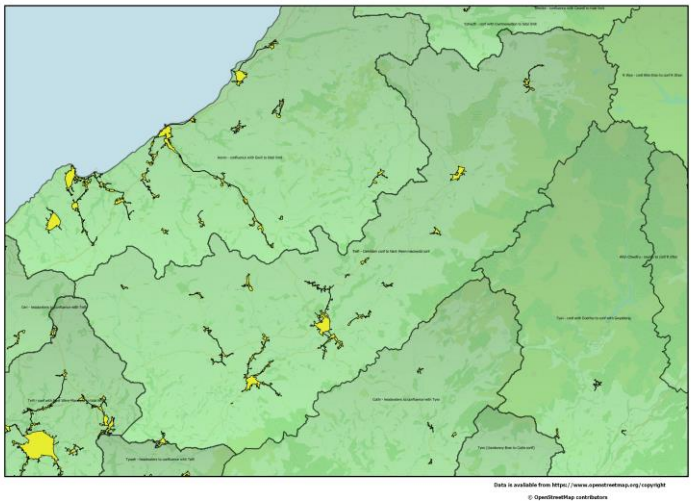


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

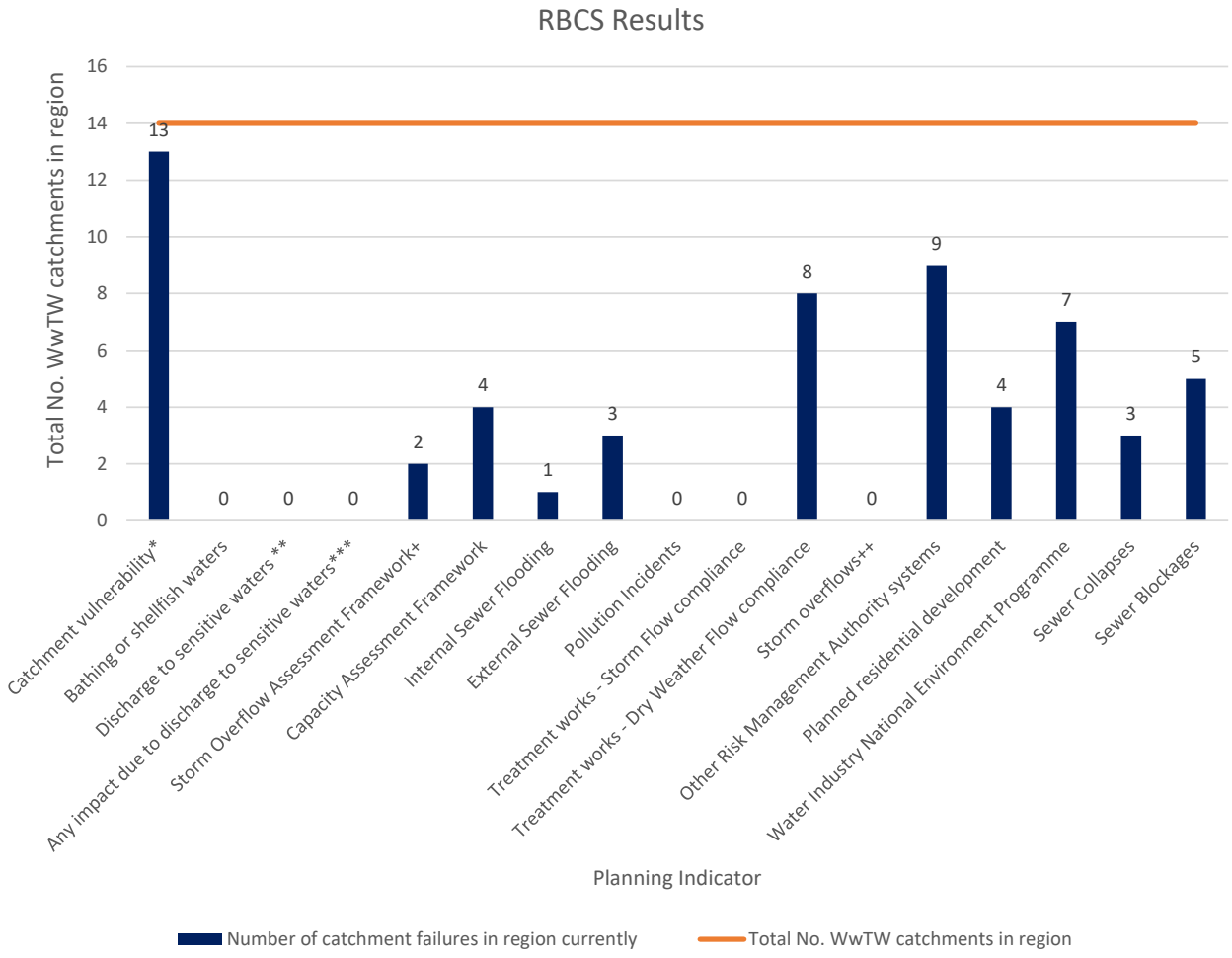
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to increase to 67500 by 2050, a change of 2% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Maes-yr-deri, Lampeter with 105 units and Forest Road, Lampeter with 90 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

According to the RBCS 14 out of 14 L4 catchments within this L3 have been classed as vulnerable to the risk of sewer flooding due to an extreme storm event. Flooding issues that fall under the purview of other risk management authorities and issues with treatment work compliance during dry weather flow have also been flagged as potential sources of risk.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
**Catagorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

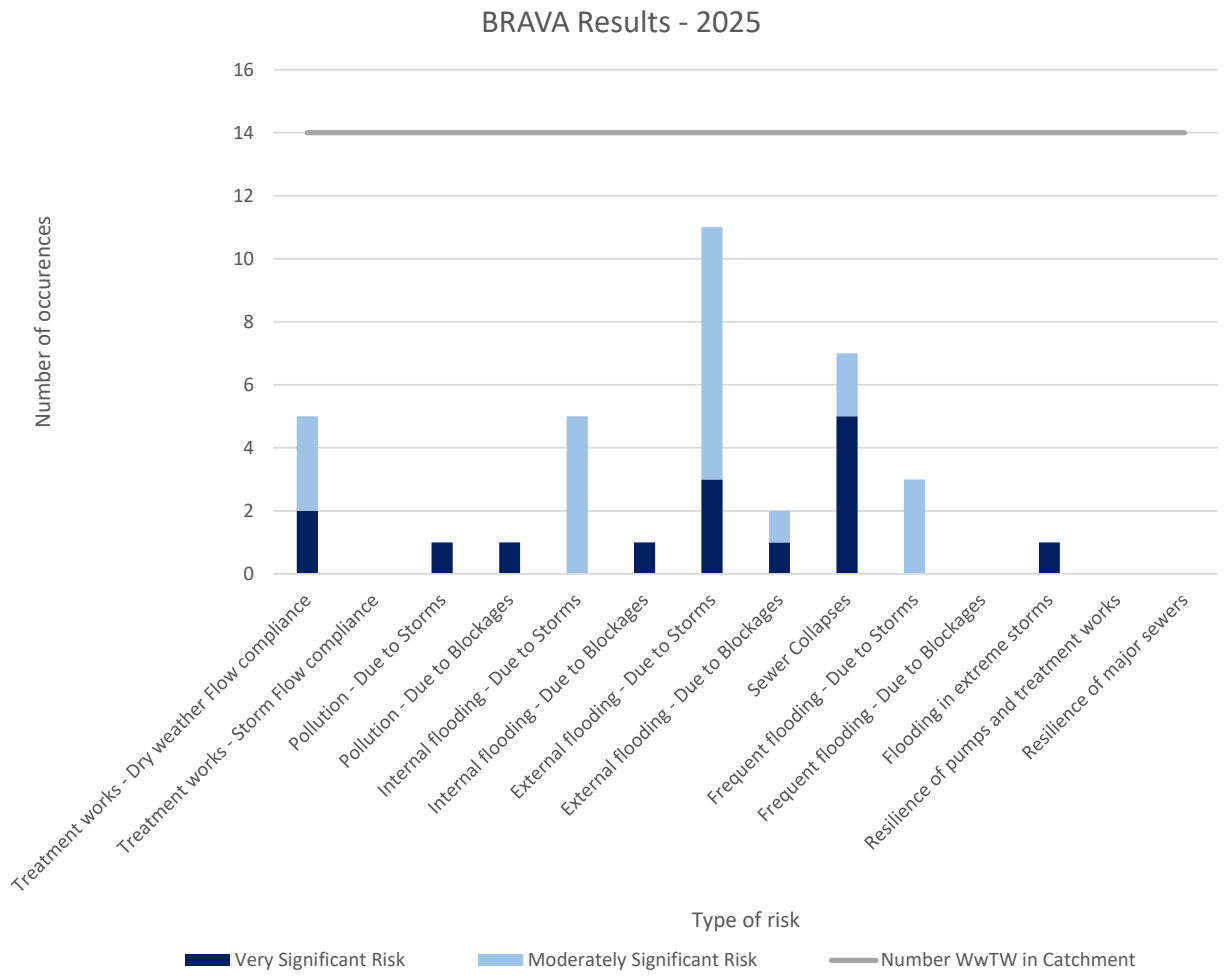


Figure 4 - BRAVA 2025 Summary

In 2025 it is expected that significant risk within the catchment will come from multiple different sources including treatment work non-compliance during storm events, pollution due to storms, external flooding due to storms and external flooding due to blockages. In total it is expected that risk within the catchment will be present from 9 different sources.

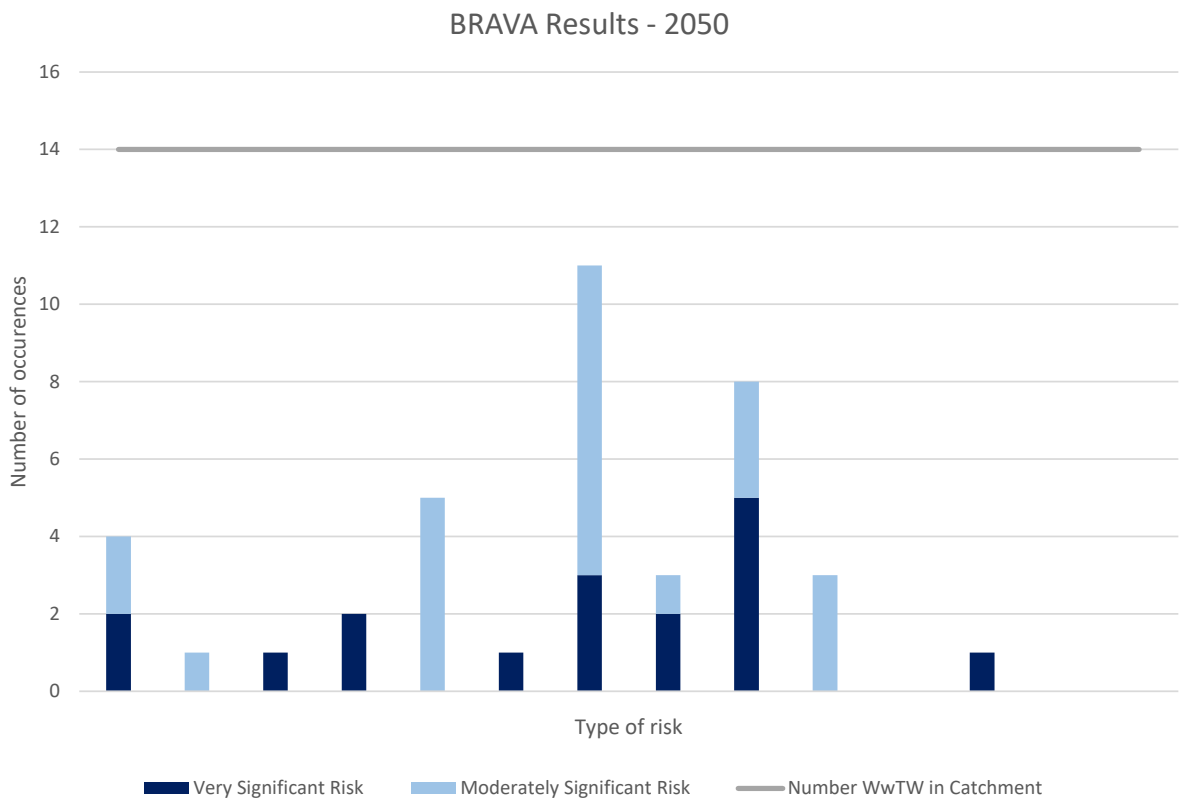


Figure 5 - BRAVA 2050 Summary

In 2050 it is expected that internal flooding due to blockages will be the most significant risk within the catchment, followed by sewer collapse. In total it is expected that risk within the catchment will come from 7 different sources.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

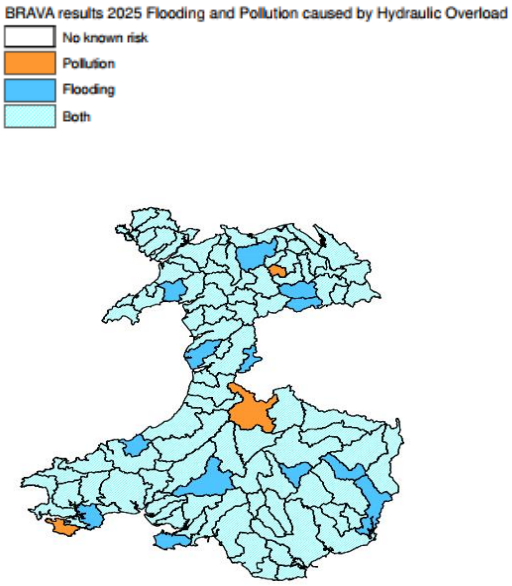


Figure 6 - Associated Strategic Planning Areas priority (2025)

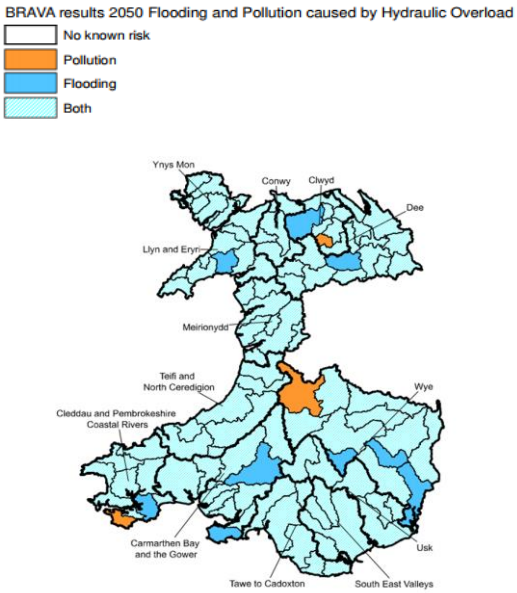


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Teifi - Camddwr conf to Nant Wern-macwydd conf has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Teifi - Camddwr conf to Nant Wern-macwydd conf	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

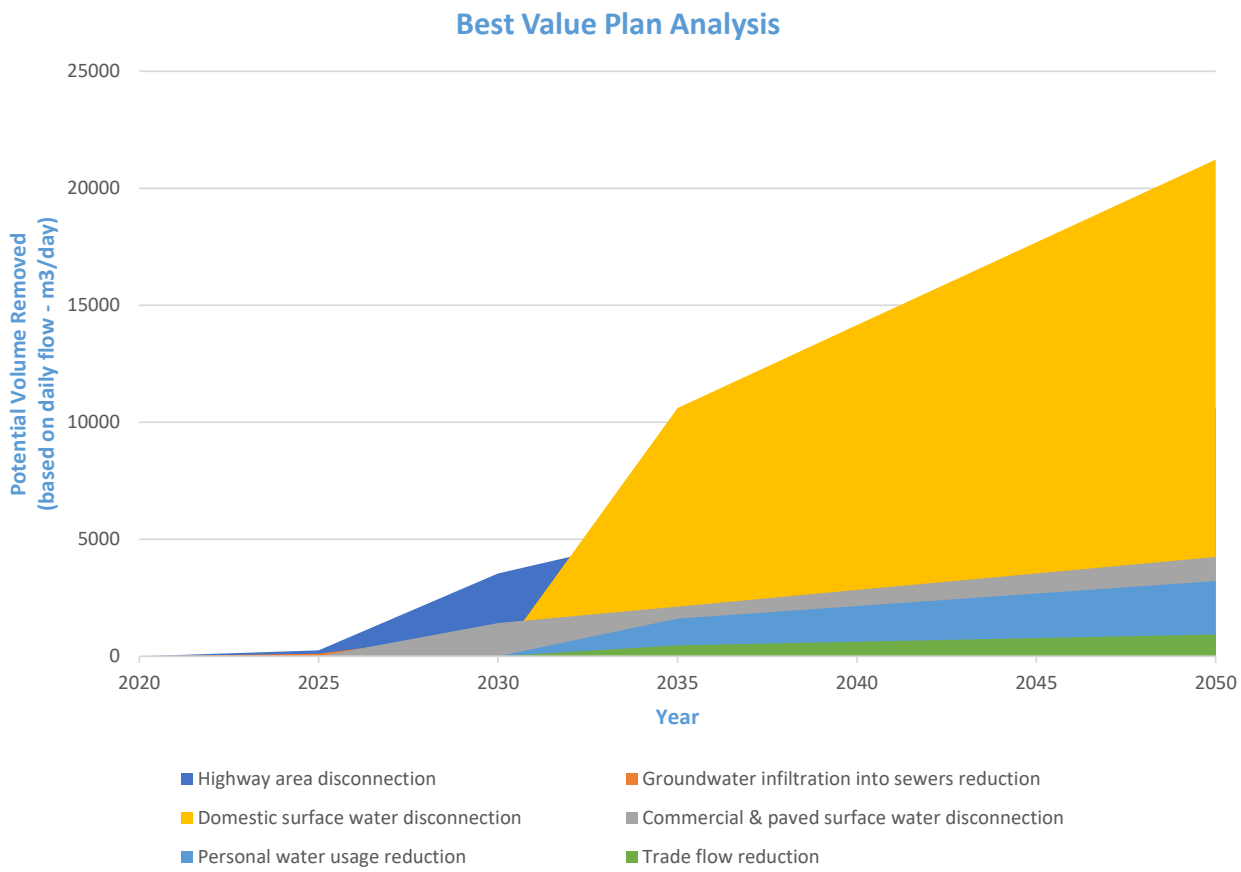


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£52,000,000.00	£78,000,000.00
40 spills in a Typical Year	£18,000,000.00	£17,000,000.00	£18,000,000.00
20 spills in a Typical Year	£26,000,000.00	£25,000,000.00	£28,000,000.00
10 spills in a Typical Year	£32,000,000.00	£30,000,000.00	£35,000,000.00
0 spills in a Typical Year	£63,000,000.00	£65,000,000.00	£71,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	251.00	276.00	297.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£0	£0	£0
External escapes in gardens	£0	£0	£0
Escapes in highways	£7,000,000	£9,000,000	£14,000,000
No flooding	-	£7,000,000	£19,000,000
Total	£7,000,000.00	£16,000,000	£33,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
GREENFIELD TERRACE (NR LLANYBYDDER)	0
TREGARON	0
PONTRHYDFENDIGAID (SE OF ABERYSTWYTH)	0
LLANYBYDDER	0
LAMPETER	0
LLANFAIR CLYDOGAU (NE OF LAMPETER)	0
GORSGOCH STW	0
TALGARREG	0
LLANFIHANGEL-AR-ARTH STW	0
LLANGYBI (NR LAMPETER)	0
CELLAN (NR LAMPETER)	0
CRIBYN STW	0
LLANDDEWI BREFI (S TREGARON)	0
CWRTNEWYDD	0

DWMP Tactial Planning Catchment Summary

Teifi - conf with Nant Wern-Macwydd to tidal limit

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Teifi - conf with Nant Wern-Macwydd to tidal limit planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 16 wastewater catchments (see Figure 2 below). There is a combined population of 17731, this is set to decrease to 15669 by 2050, a change of -12%. There is a total sewer length of 153km, with a foul sewer length of 92km, a surface water length of 1km and a combined sewer length of 56km. There are 16 Wastewater Treatment Works (WwTW), 51 Sewerage Pumping Stations (SPSs), and 46 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Teifi - conf with Nant Wern-Macwydd to tidal limit is found on the west coast of Wales, stretching from the town of Llandysul in the east past Cardigan into Cardigan Bay in the west. The northernmost part of the Pembrokeshire Coast National Park is found in the far west of the catchment along the coast. Much of the catchment is relatively steep, rural and sparsely populated with several villages and smaller settlements. The largest settlements within the catchment are the towns of Cardigan and Newcastle Emlyn. The river Teifi flows east to west within the catchment reaching the sea near Cardigan and the river Cych, a tributary of the Teifi, is also in the catchment.

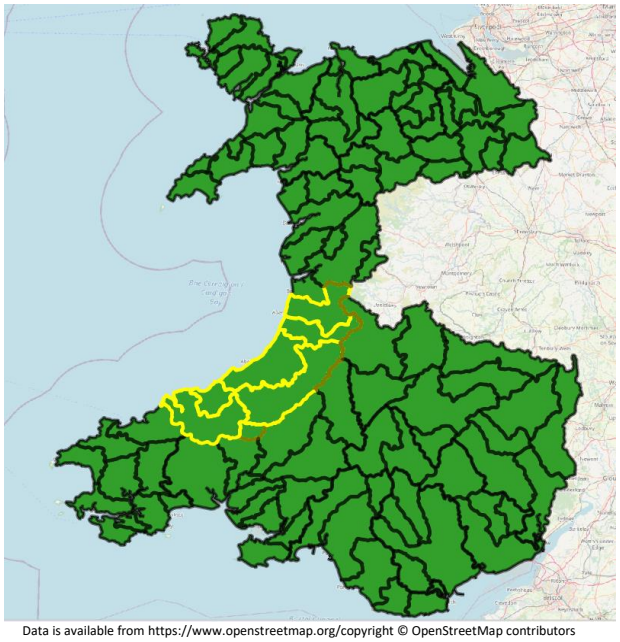


Figure 1 - River basin location detailing the associated tactial planning catchments

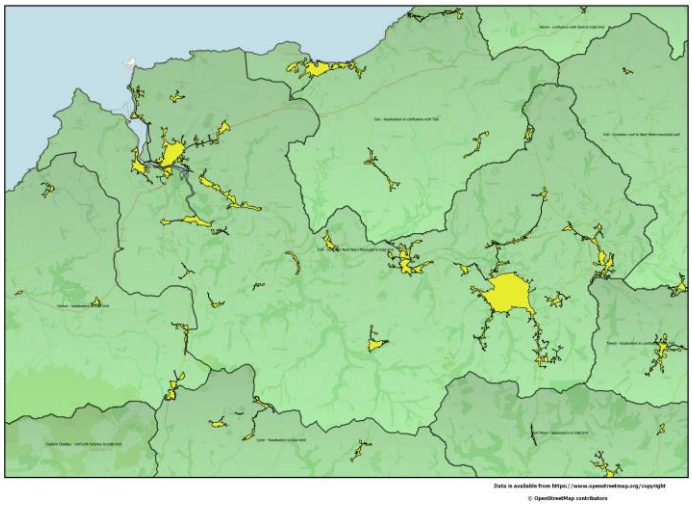


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

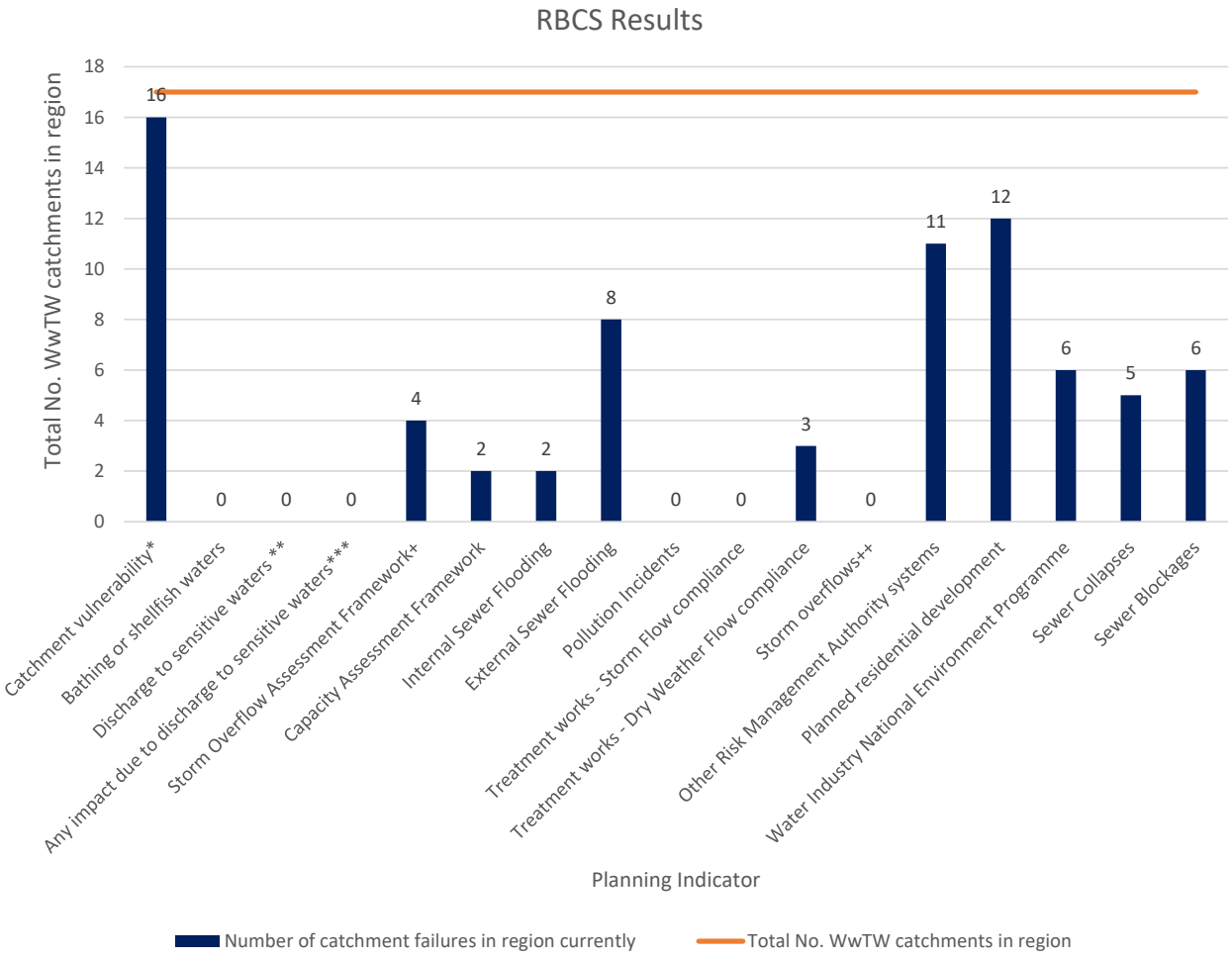
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to decrease to 15700 by 2050, a change of -12% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including the rear of the Beeches, Llandysul with 126 units and Stepside Farm, Cardigan wit 78 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

According to the RBCS 15 out of the 17 L4 catchments within this L3 have been classed as being vulnerable to sewer flooding due to an extreme storm event. Planned residential developments and flooding that falls under the scope of other risk management authorities were also found to be potentially significant risks within the catchment.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
**Catagorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

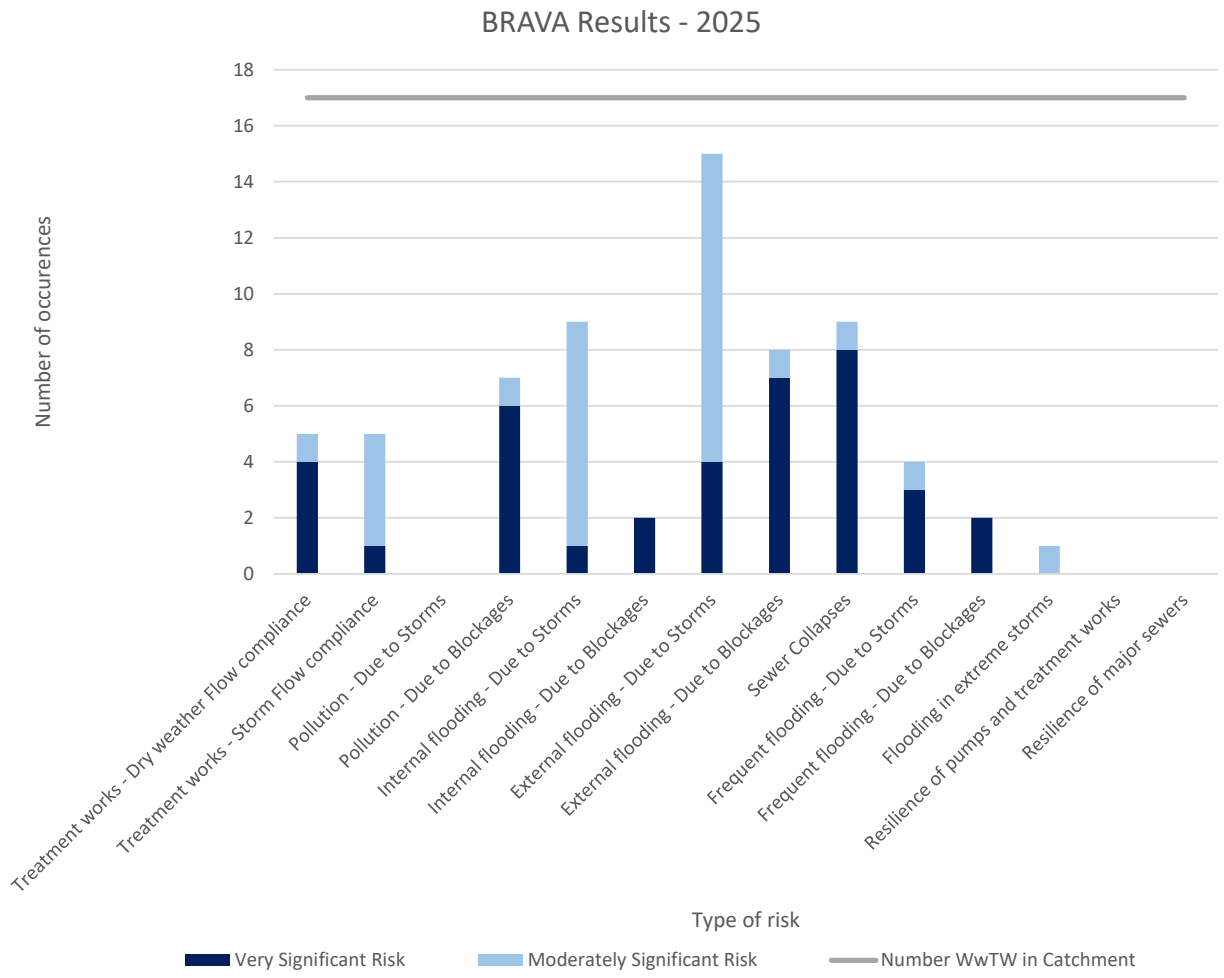


Figure 4 - BRAVA 2025 Summary

In 2025 it is predicted that the most signigicant risks for the catchment will be internal flooding due to storm events and internal flooding due to blockages within the system. The risk assessment highlighted 7 other types of risk that are expected to be of concern in 2025, however these are to a lesser extent.

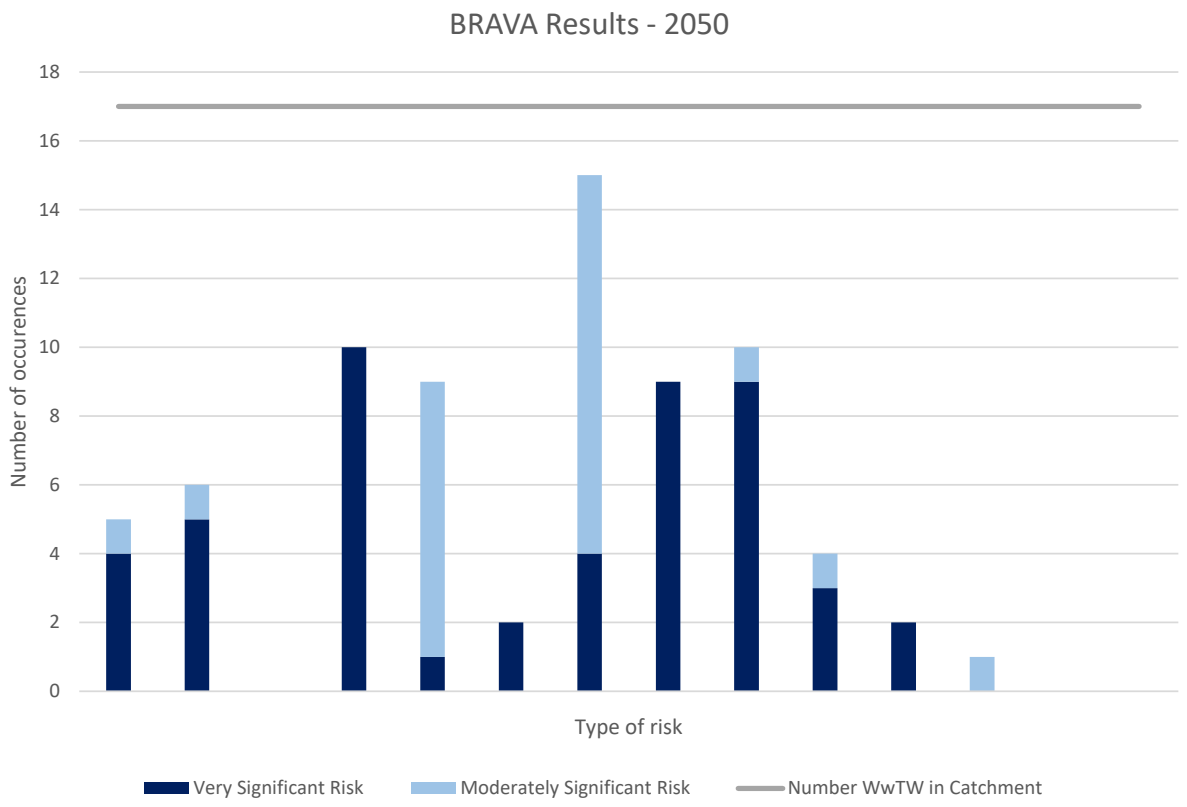


Figure 5 - BRAVA 2050 Summary

In 2050 it is predicted that internal flooding due to sewer blockages will still be a significant risk, however internal flooding due to storm events will no longer be. Other areas of risk include treatment work compliance, both during dry and wet flows, and sewer collapse.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

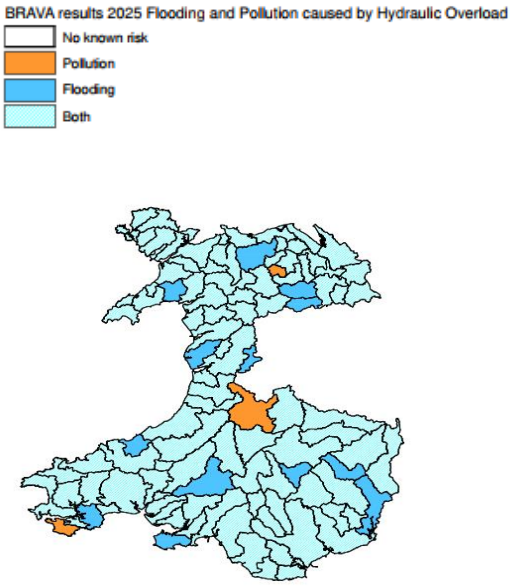


Figure 6 - Associated Strategic Planning Areas priority (2025)

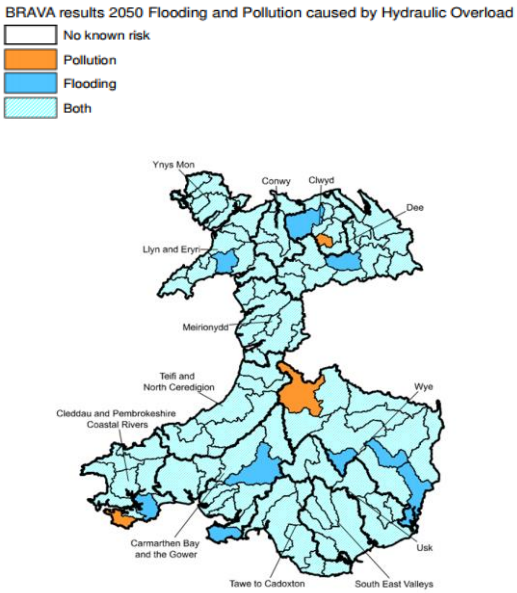


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Teifi - conf with Nant Wern-Macwydd to tidal limit has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Teifi - conf with Nant Wern-Macwydd to tidal limit	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

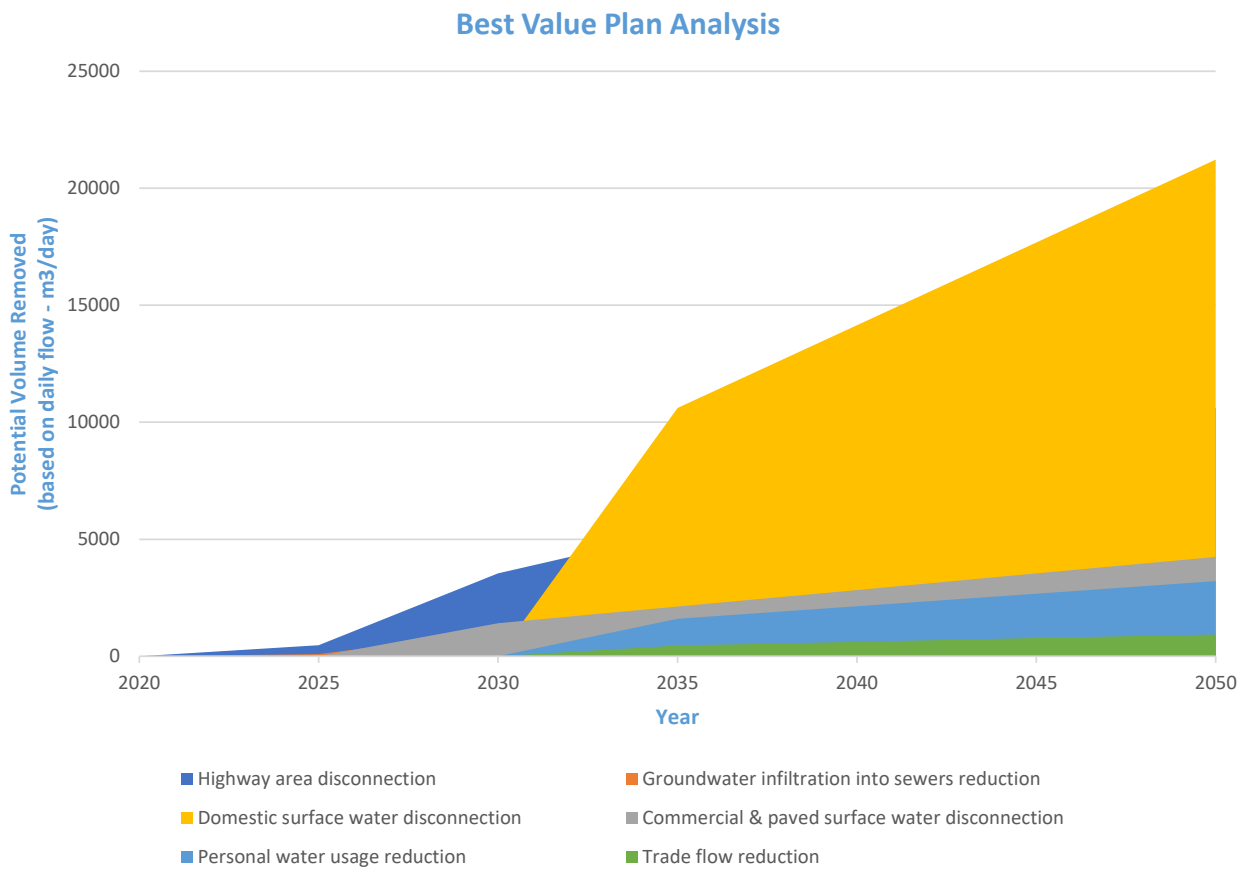


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£61,000,000.00	£97,000,000.00
40 spills in a Typical Year	£19,000,000.00	£19,000,000.00	£19,000,000.00
20 spills in a Typical Year	£33,000,000.00	£33,000,000.00	£36,000,000.00
10 spills in a Typical Year	£49,000,000.00	£50,000,000.00	£55,000,000.00
0 spills in a Typical Year	£104,000,000.00	£109,000,000.00	£116,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	267.00	292.00	314.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£1,000,000	£2,000,000	£2,000,000
External escapes in gardens	£1,000,000	£1,000,000	£1,000,000
Escapes in highways	£22,000,000	£28,000,000	£38,000,000
No flooding	-	£4,000,000	£11,000,000
Total	£24,000,000.00	£35,000,000	£52,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
CARDIGAN	0
LLANDYSUL STW	0
CENARTH (GLANYRAFON)	0
CAPEL IWAN (S OF NEWCASTLE EMLYN)	0
LLECHRYD	0
PENTRE-CWRT	0
BONCATH	0
RHOS-HILL (S OF CARDIGAN)	0
Betws Bledrws STW	0
DREFACH/FELINDRE	0
NEWCHAPEL	0
Y VERWIG	0
ADPAR STW	0
HENLLAN (NR NEWCASTLE EMLYN) STW	0
LLWYNCELYN PONTRHYDYCEIRT (NR CARDIGAN)	0
CILGERRAN	0

DWMP Tactial Planning Catchment Summary

Tyweli - headwaters to confluence with Teifi

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Tyweli - headwaters to confluence with Teifi planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 1 wastewater catchments (see Figure 2 below). There is a combined population of 1132, this is set to increase to 1163 by 2050, a change of 3%. There is a total sewer length of 12km, with a foul sewer length of 11km, a surface water length of 0km and a combined sewer length of 0km. There are 1 Wastewater Treatment Works (WwTW), 2 Sewerage Pumping Stations (SPSs), and 3 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Tyweli catchment covers an area surrounding Pencader in the southwest of wales. The catchment is located in the valleys with steep terrain surrounding the River Tyweli. There are three main rivers within the catchment; Tyweli, Gran and Talog. These rivers confluence into the River Teifi.

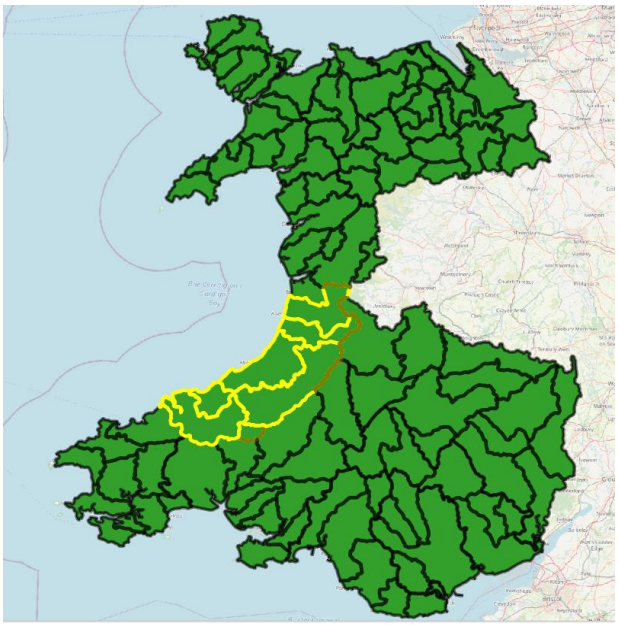


Figure 1 - River basin location detailing the associated tactial planning catchments

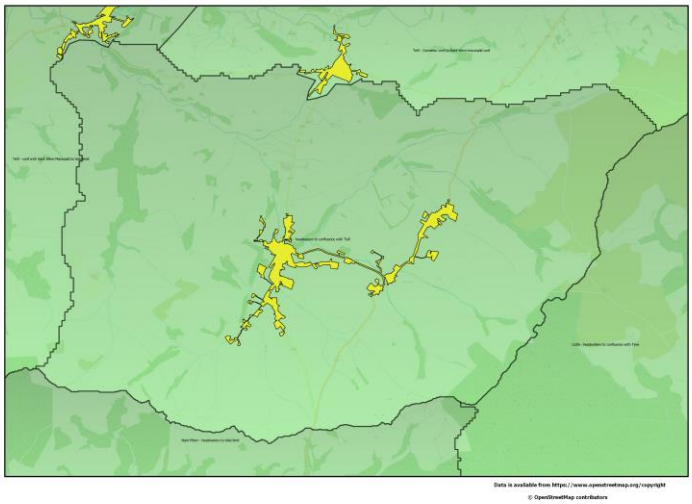


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

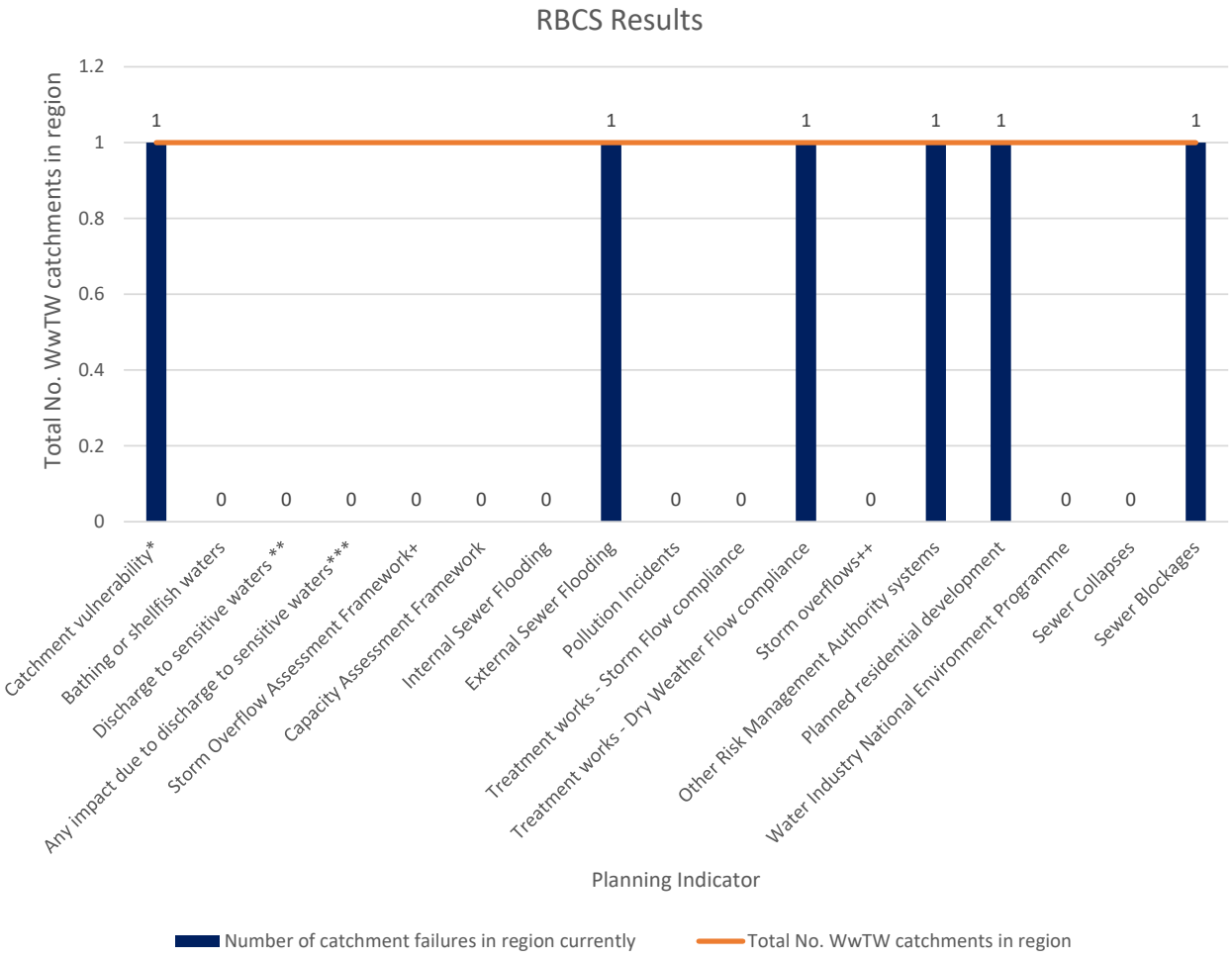
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to increase to 1200 by 2050, a change of 3% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including near Tremle House, Pencader with 37 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

In Tyweli there is only one catchment. In the case of an extreme storm event there wil be flooding. This catchment has a high projected population growth rate leading to a risk of compliance issues at the WwTW in dry weather. There is also a reported risk of surface water flooding raised by NRW.



*To sewer flooding due to extreme wet weather events.
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***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

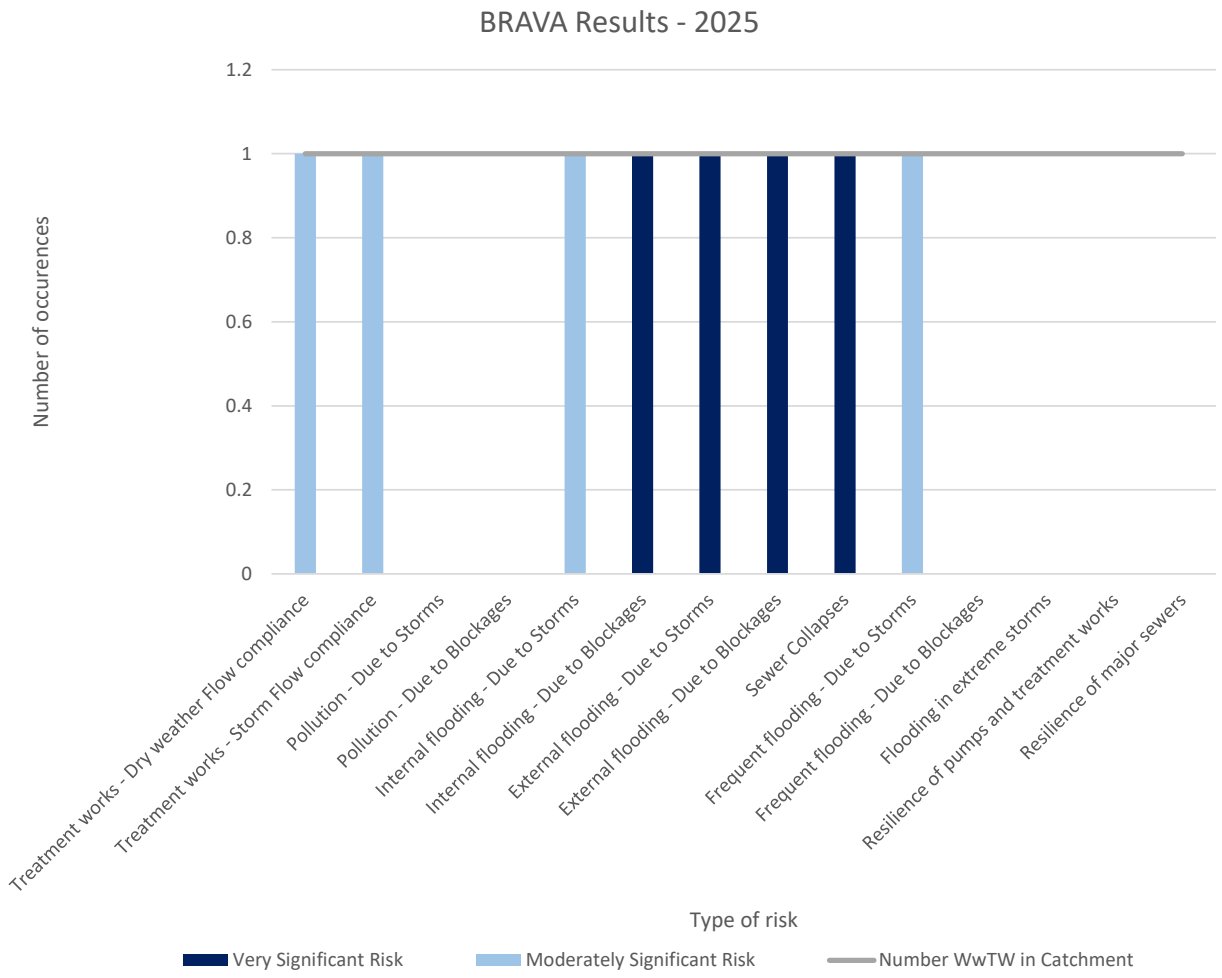

Figure 4 - BRAVA 2025 Summary

In 2025 the risk of pollution due to an extreme storm is the biggest concern. Followed by compliance issues at the WwTW in both storm and dry conditions.

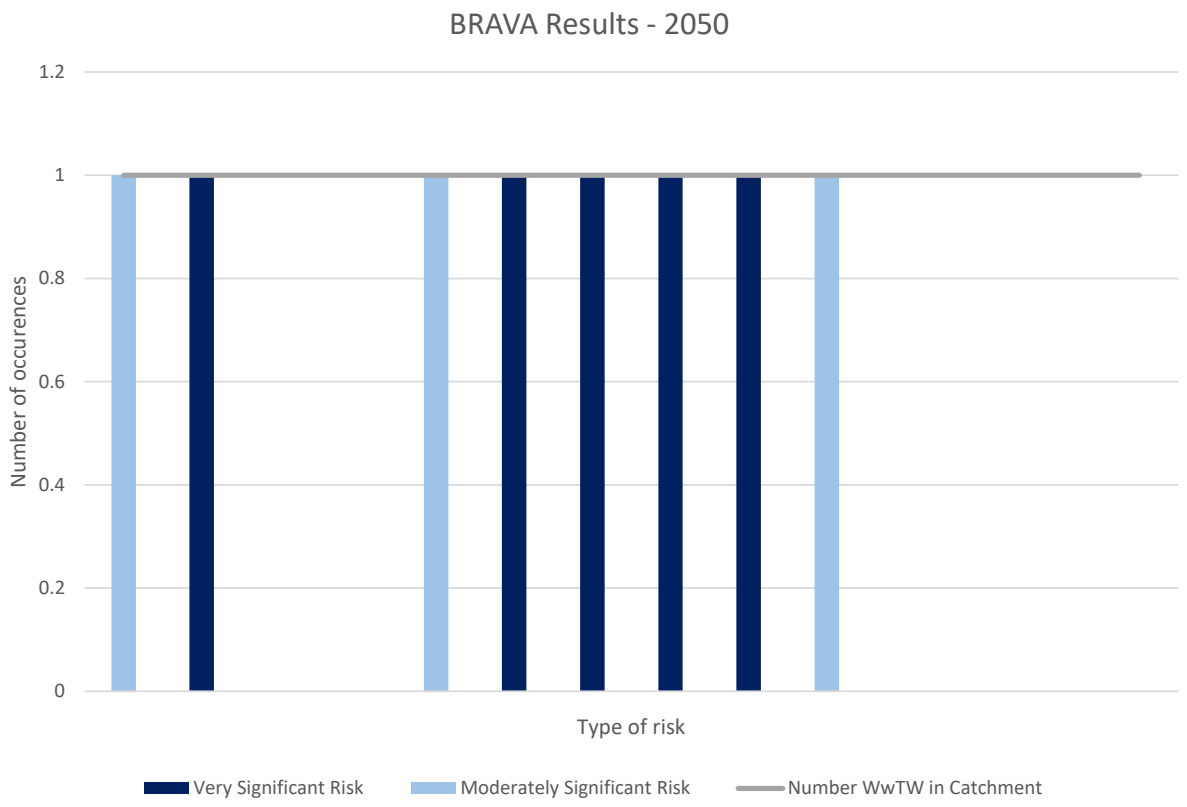

Figure 5 - BRAVA 2050 Summary

In 2050 the biggest concerns relate to flooding and blockages due to extreme storms. There is less of a risk on pollution compared to 2025. However, the compliance issues at the WwTW still persist with more risk placed on the works due to and increase in flow arriving at the works from population growth.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

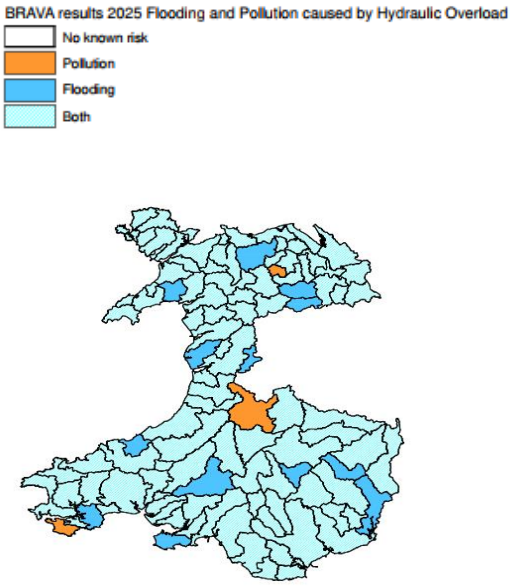

Figure 6 - Associated Strategic Planning Areas priority (2025)

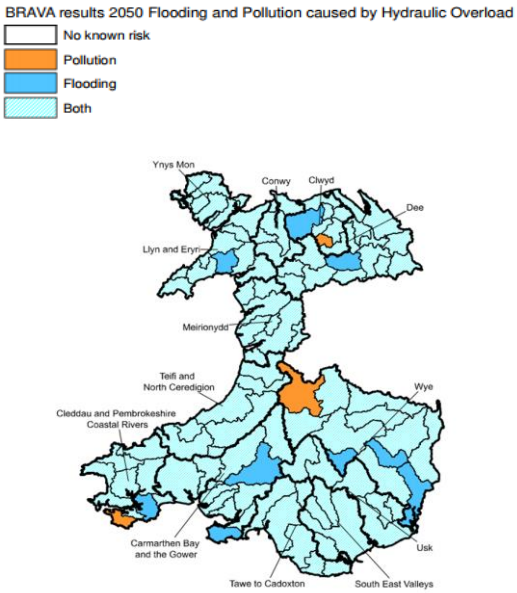

Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Tyweli - headwaters to confluence with Teifi has a water quality priority status for 2050 of 2 which indicates targeted investment to mitigate and focus during AMP10.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

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Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Tyweli - headwaters to confluence with Teifi	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

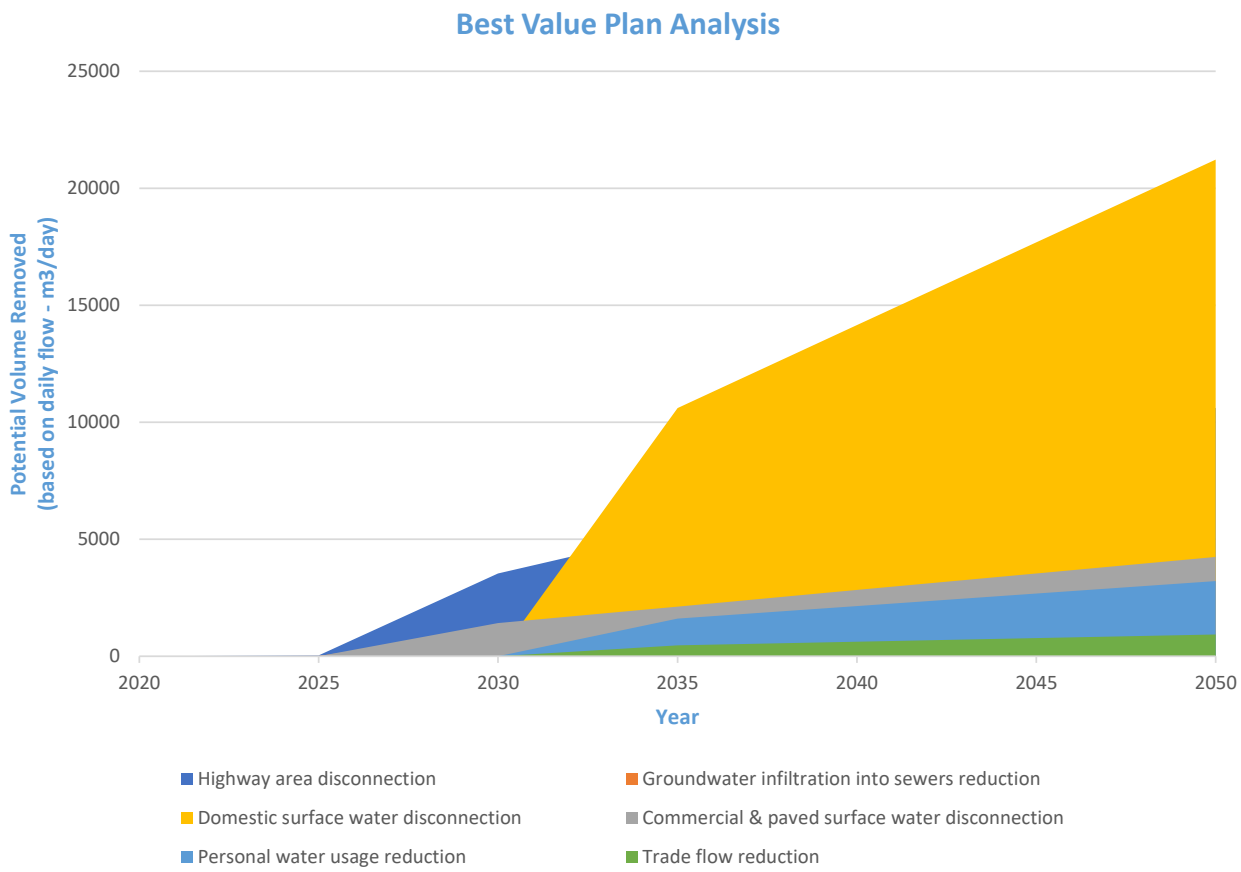
Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.



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The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£0.00	£0.00
40 spills in a Typical Year	£0.00	£0.00	£0.00
20 spills in a Typical Year	£0.00	£0.00	£0.00
10 spills in a Typical Year	£2,000,000.00	£2,000,000.00	£2,000,000.00
0 spills in a Typical Year	£7,000,000.00	£7,000,000.00	£7,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	2.00	2.00	2.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£0	£0	£0
External escapes in gardens	£0	£0	£0
Escapes in highways	£2,000,000	£2,000,000	£2,000,000
No flooding	-	£0	£0
Total	£2,000,000.00	£2,000,000	£2,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

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If you want to work with us to develop joint projects to reduce the risk of flooding and protect the environment, please get in touch.

We will continue to work with Welsh Government, Regulators and Local Authorities about the pace, scale and affordability of improvements to be made.

We will be consulting on the preferred approach to planning and once its concluded the next stage is to develop the pipeline of options to meet the pace scale and affordability discussed with Welsh Government and our regulators.

Table 6 - Summary of schemes per WwTW within the Tactical Planning catchment first cycle prior to HRA/ SEA

L4 Catchments	No. Schemes
PENCADER STW	0

DWMP Tactial Planning Catchment Summary

Ystwyth - conf with Cwmnewydion to tidal limit

1.0 Introduction

This Drainage and Wastewater Management Plan (DWMP) sets out how Dŵr Cymru Welsh Water (DCWW) will manage and improve its assets to maintain a resilient and robust wastewater drainage system. The plan aims to manage flooding and pollution from our wastewater assets in the future, for our customers and our environment by working collaboratively with stakeholders, regulators and local authorities to provide a complete partnership in tackling current and future problems.

1.1 Catchment Information

The Ystwyth - conf with Cwmnewydion to tidal limit planning catchment lies within the Teifi and North Ceredigion river basin catchment, (see Figure 1 below), it consists of 4 wastewater catchments (see Figure 2 below). There is a combined population of 1696, this is set to increase to 1787 by 2050, a change of 5%. There is a total sewer length of 18km, with a foul sewer length of 16km, a surface water length of 1km and a combined sewer length of 0km. There are 4 Wastewater Treatment Works (WwTW), 6 Sewerage Pumping Stations (SPSs), and 2 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Morlais catchment borders the eastern coastline just south of Aberystwyth. Stretching all the way inland towards Cwmystwyth getting gradually more steep. The catchment includes the River Ystwyth which confluences into the River Cwmnewydion at the coast of Aberystwyth.

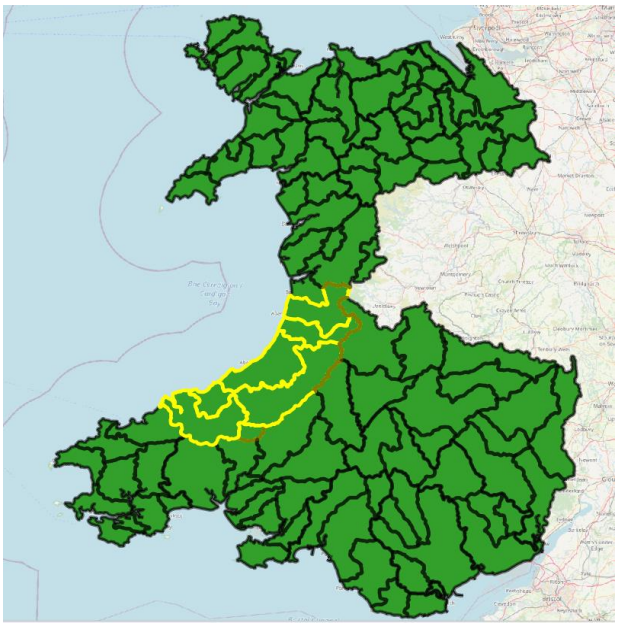


Figure 1 - River basin location detailing the associated tactial planning catchments

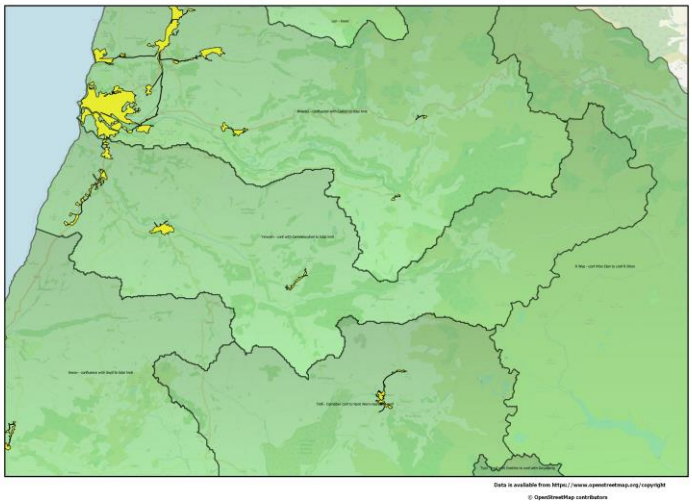


Figure 2- Tactical planning catchment

2.0 Stakeholder Engagement

The DWMP aims to enable DCWW to work collaboratively with stakeholders, regulators and local authorities to tackle current and future challenges. DCWW has identified stakeholder objectives that alighn with the aims of the DWMP and goals of other management plans. Table 1 details the main opportunities we have identified but this is not intended to be exhaustive. Note that these stakeholders have their own planning processes and plans which do not necessarily align with those of DCWW.

Scheme Information
Stakeholder enagement meetings area scheduled to commence in 2022. These meetings will be held between DCWW and the respective parties, such as NRW, EA, Councils and ENGO's. Further information of the outcome and points of focus towards short and long term strategy planning will be provided in the next cycle of the DWMP assessment.

Table 1 - Current and future investigation schemes

3.0 Risk

We have assessed our likely performance from now to 2050 against the objectives that we set in our most recent business plan. The results of this assessment are presented in the following sections.

To understand future performance, we need to estimate how much population will change by, the degree to which climate change will impact Wales and areas of England that border our company, and how further surface water connected to the sewer network might increase the amount and rate at which rainfall drains into our sewers.

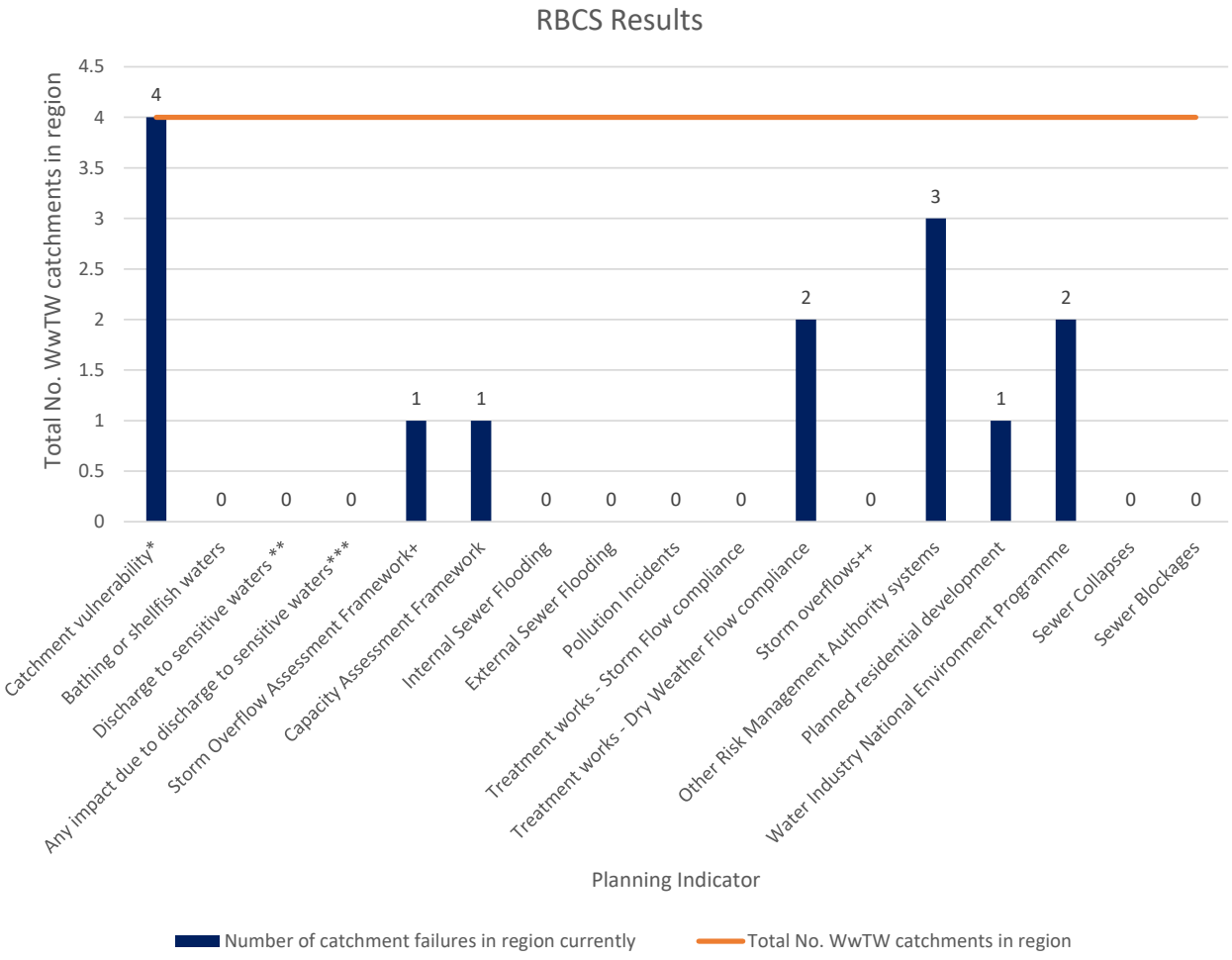
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

Climate change is predicted to increase the intensity of storms by around 15% in this region. In a typical year, winters are likely to be warmer and wetter, and summers generally drier. More intense rainfall will happen more frequently. The population in the Teifi and North Ceredigion region is set to increase to 1800 by 2050, a change of 5% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Land at Southgate, Aberystwyth with 189 units and Crugiau, Aberystwyth with 118 units.

3.1 Risk Based Catchment Screening

The Risk Based Catchment Screening (RBCS) is the initial screening process to determine if a more detailed risk assessment is required. The assessment screens catchments against planning indicators which have been stipulated in the national guidance for DWMPs. A catchment will pass through to a more detailed risk assessment if it fails against one or more of these indicators, the results are shown in Figure 3.

In the event of an extreme storm 4 out of 4 catchments in Ystwyth are predicted to flood. In the majority of the catchments, NRW are reporting risks of surface water flooding. Also, it is reported that half of the WwTWs in this catchment will have compliance issues in dry weather conditions.



*To sewer flooding due to extreme wet weather events.
**Sensitve waters are considered as Bathing Water and Shellfish Water.
**Catagorised as a "planned" scheduled action within the Natural Resources Wales Action Database or considered as "Remedy" on Natural England Designated Sites system.
***Catagorised as a "identified" scheduled action within the Natural Resources Wales Action Database or considered as "Threat" on Natural England Designated Sites system.
+Frequency investigation triggered.
++Overflow risks not covered by other indicators,

Figure 3 - Risk Based Catchment Screening results

3.2 Baseline Risk And Vulnerability Assessment (BRAVA)

Following on from the RBCS, the Baseline Risk and Vulnerability Assessment (BRAVA) highlights current and future risk. The risk scores are driven by company targets which were set in our last business plan. These targets were subdivided according to population or sewer length, depending on the measure, to derive a target for each river basin catchment.

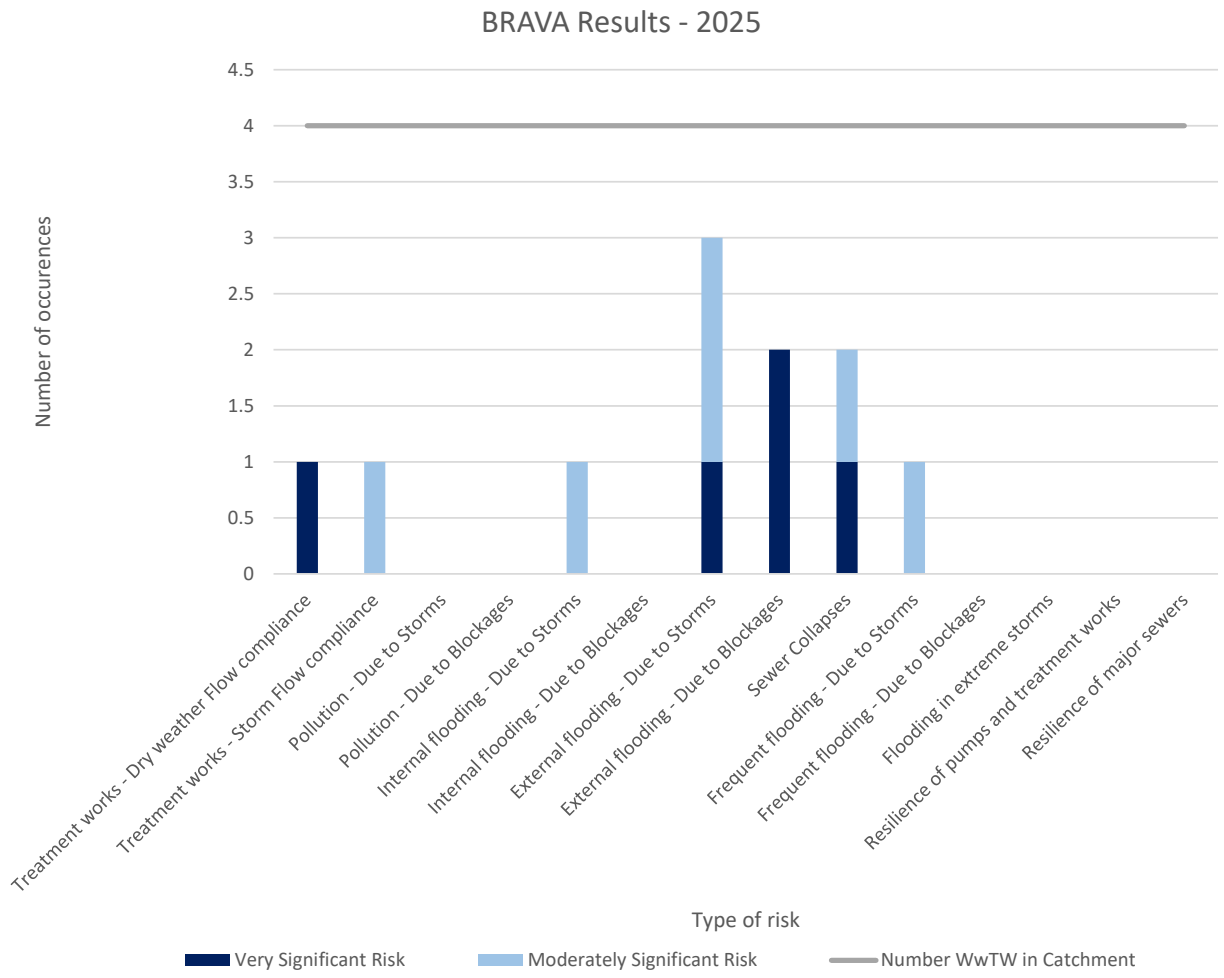


Figure 4 - BRAVA 2025 Summary

In 2025 there are no large outstanding risks in this catchment. However there is a possibility of compliance issues at the WwTW caused by both wet weather and dry weather conditions. In addition to this, the risk of pollution and blockages are also possible.

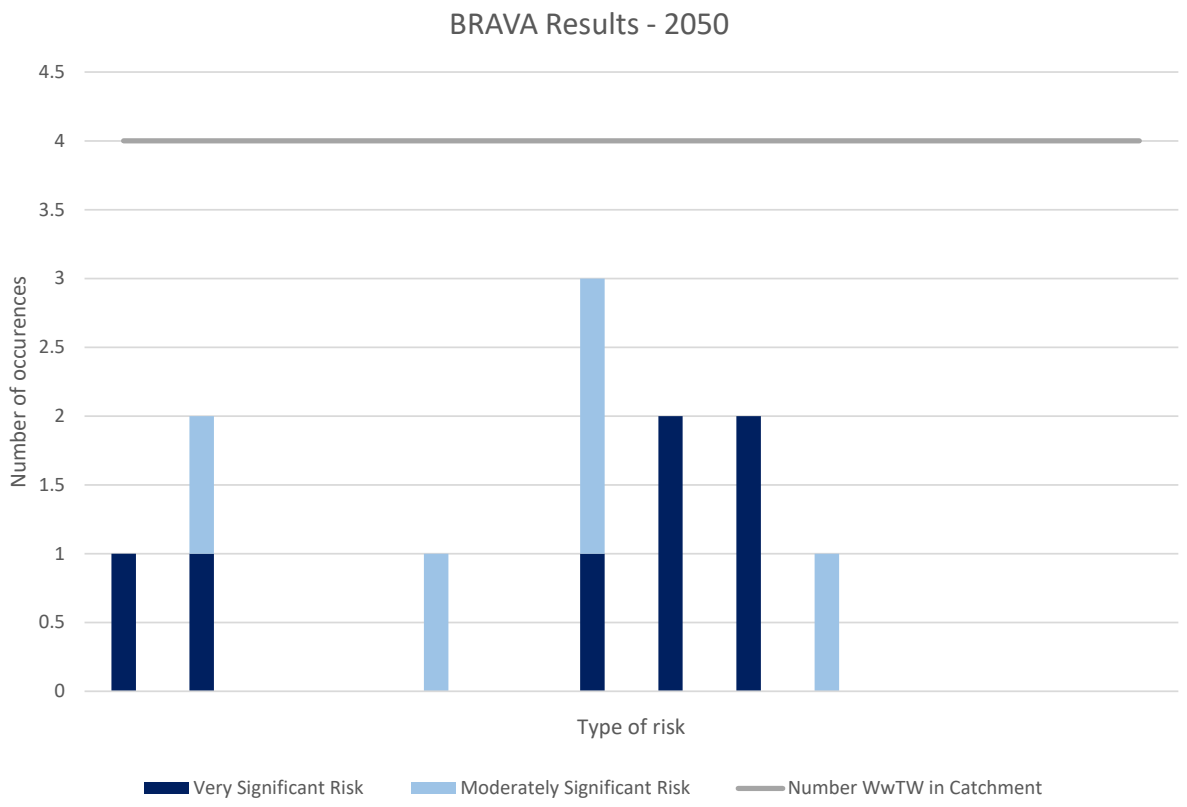


Figure 5 - BRAVA 2050 Summary

In 2050 there is an increased risk with compliance issues at the WwTW during major storm events and also in dry weather conditions. This is may be due to increased amounts of rainfall due to climate change combined with an increase in population. There is also increased risk of sewers collapsing in this catchment.

Figures 6 and 7 indicate the current and predicted risk of flooding, pollution, and both flooding and pollution caused by lack of capacity (termed 'hydraulic overload') across our networks. These maps illustrate where the issues occur and can be used to target where we want to work with the community and stakeholders to resolve issues. By working together, we can combine knowledge and resources to deliver the best outcomes for local communities and the environment. We want to include your feedback in our decision-making process.

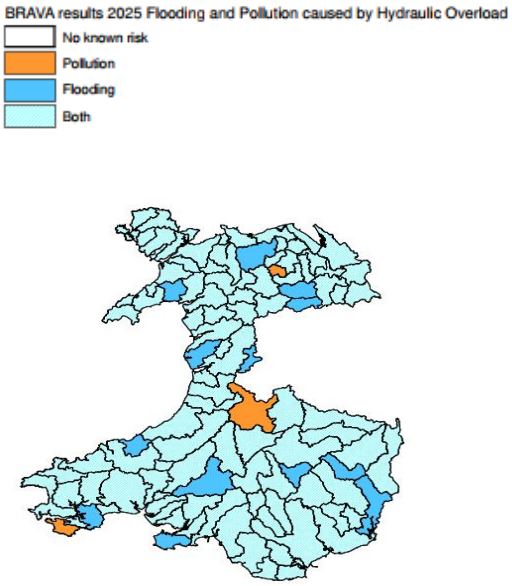


Figure 6 - Associated Strategic Planning Areas priority (2025)

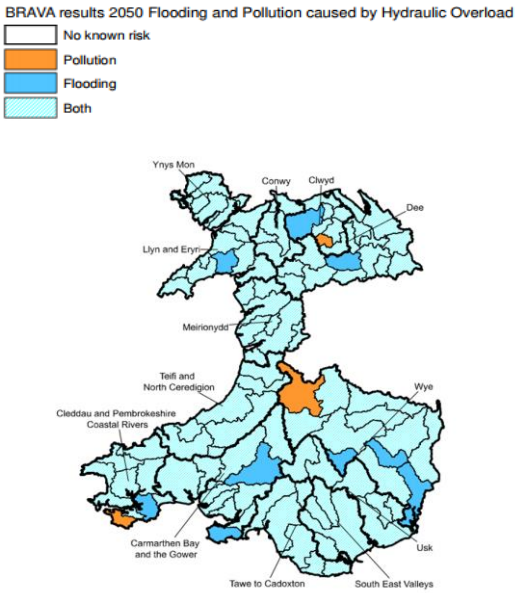


Figure 7 - Associated Strategic Planning Areas

3.3 Water Quality

Water quality is the classification of the quality of watercourses or water bodies in accordance to its physical, biological and chemical properties. Water quality is an important factor of environmental monitoring, ensuring that not only the water body is safe but the surrounding habitat and ecosystem is also.

Water quality status is categorised from 1 to 4, with 4 being the worst case. The priority status is based on the significance towards the risk factors triggering water quality. Ystwyth - conf with Cwmnewydion to tidal limit has a water quality priority status for 2050 of 1 which indicates targeted investment to mitigate and focus during AMP11.

4.0 Supply Demand

Supply-demand is an assessment of the capacity of our treatment works. It approximately assesses whether all the treatment works in a region can collectively cope with current and future flows in dry and wet weather. There are two parts to the assessment: dry weather flow (DWF) and a wet weather capacity assessment.

For the DWF part of the assessment, the suitability of the dry weather consents is tested against forecast future growth and changes in water consumption. Results for three scenarios are provided: the 0% headroom scenario assesses the region's capability for treating the predicted changes in DWF in the future with no allowance for error, with no spare treatment works capacity. The other scenarios indicate resilience - i.e. could we cope if we had flows 10% or 20% higher than estimated?

The wet weather assessment takes storm consent values where available as an indication of treatment works capacity and estimates the amount of incoming flow the treatment works is able to treat across a year. Again, three scenarios are shown, with differing treatment "targets" - i.e. if we wanted to ensure that 70% of the wet weather flows in a catchment were treated, could the treatment works cope? Changes in rainfall due to climate change and changing dry weather flows within the region mean that the percentage of flow treated across a year can change in the future.

Table 2 shows the supply-demand assessment for this region. Where a region may not have adequate capacity under a given scenario, it is flagged blue for further investigation. There may be local incapacity issues at individual works within the region.

L3 Area	Headroom	2025	2030	2035	2040	2045	2050
Ystwyth - conf with Cwmnewydion to tidal limit	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
	80%						
	90%						

Table 2 - Supply Demand Balance

5.0 Options

Over time the pressures on our sewerage network change due to influences such as catchment growth, creep of rainwater into the network, or influences such as climate change impacting rainfall patterns. To ensure the plan is robust over the 30-year planning horizon and to account for the uniqueness of each catchment we have tested various types of schemes, and combination of schemes, to ensure a robust 'best value' plan is delivered.

The types of schemes tested are detailed in Table 3 and can be categorised into either improving network resilience to rainfall or improving network headroom in dry weather flow conditions.

Improving Resilience		
10% Reduction in area draining to the combined sewers	Represents removal of runoff from large commercial buildings.	Short term
25% Reduction reduction in area draining to the combined sewers	Represents removal of area runoff from non-residential paved areas where there is only one stakeholder (e.g. Local Authority or Highways Agency).	Medium term
50% Reduction reduction in area draining to the combined sewers	Represents removal of runoff from any connected area including residential properties. There are likely to be multiple stakeholders to engage with.	Long term
Improving Headroom		
Reducing infiltration	Reducing infiltration into sewers by 50%, which could be achieved by relining or replacing the public sewers .	Medium term
Reducing water use	Represents a reduction in water use per person to around 100l per person per day by 2050 by application of water efficiency measures	Medium term
Reducing trade flow	Reduce trade flows by around 25% by application of water efficiency measures.	Long term

Table 3 - Risk mitigation details

We have undertaken an analysis of all our wastewater catchments to determine the benefit in terms of potential volume of water removed from our systems for each scheme type to determine a Journey Plan, (see Figure 8 below), which provides the direction of the best scheme types to undertake in this catchment for the most benefit against predicted future risk from growth, creep and climate change.

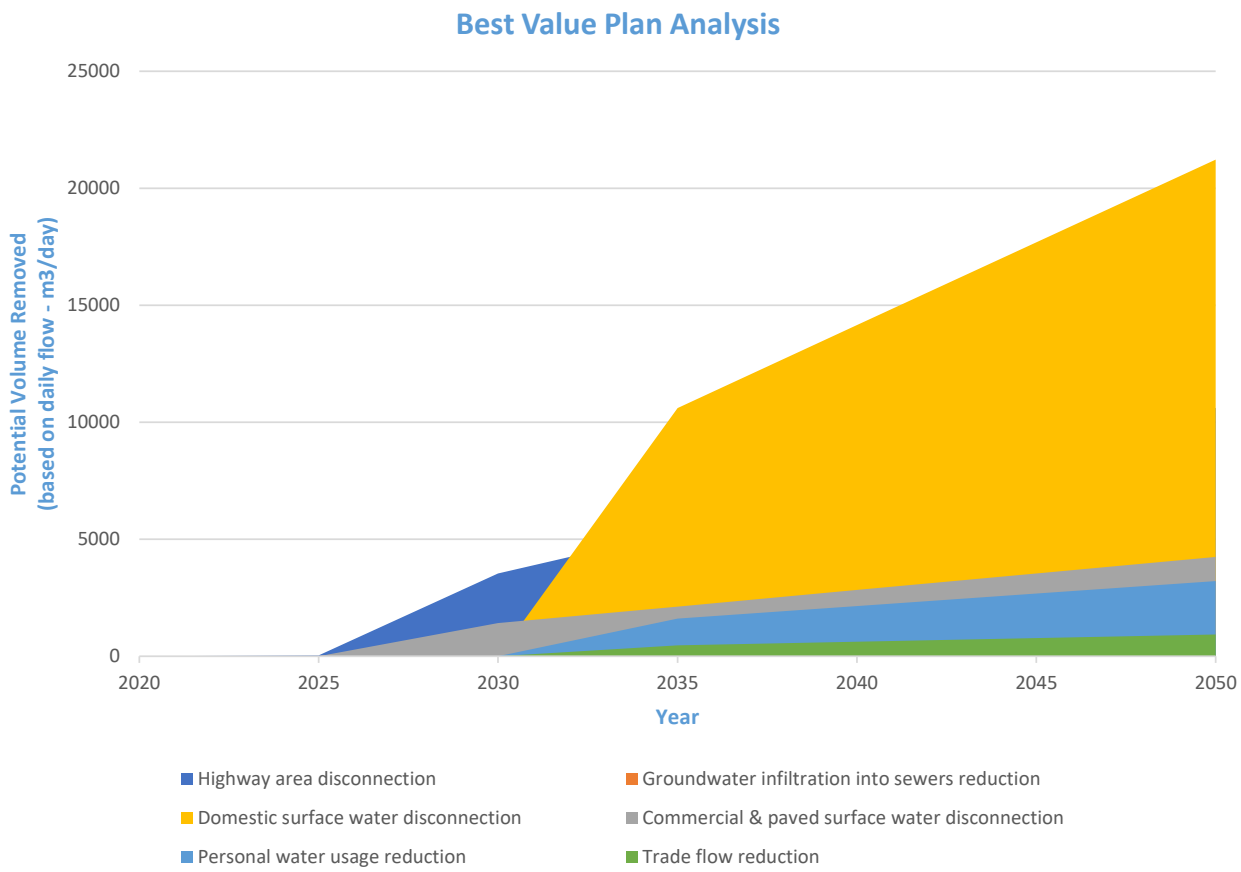


Figure 8 - Best Value Plan Analysis

Approaches to managing risk

We have undertaken analysis to determine the likely costs to mitigate future predicted pollution and flooding. We assess combined sewer overflows based on the number of times they are predicted to spill in a 'typical year'. Table 4 illustrates the cost of potential measures to mitigate risk to varying standards. The assessment calculates the impact of rainfall and drainage contributions to the network relative to todays costs.

Mitigating the risk posed by flooding has been assessed in terms of probability of occurrence, we use the size of a storm event that has the probability of occurring once every 30 years. Table 5 illustrates the cost of potential mitigation measures to mitigate varying flood risk types.

The choice of scenarios for storm overflow mitigation in Table 4 is a separate cost and would be required in addition to the choice of scenarios for flooding protection in Table 5. The chosen scenarios for Storm overflows and flooding are to be added together.

Choice of Scenario	Current Scenario (£)	2030 Scenario (£)	2050 Scenario (£)
Maintain Existing Performance*	-	£10,000,000.00	£15,000,000.00
40 spills in a Typical Year	£3,000,000.00	£3,000,000.00	£3,000,000.00
20 spills in a Typical Year	£5,000,000.00	£5,000,000.00	£5,000,000.00
10 spills in a Typical Year	£6,000,000.00	£6,000,000.00	£6,000,000.00
0 spills in a Typical Year	£11,000,000.00	£11,000,000.00	£11,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	37.00	41.00	45.00

* Maintain is a considered scenario where we will continue to maintain the current level of service within the region and improve the network and address known and emerging risk.

Table 4 - Summary of Combined Sewer Overflow option investments

Choice of Scenario	Current Scenario (£)	2050 Scenario (£)	2050 Resilience Scenario (£) 1 in 50 yr (Storm Dennis)
Internal escapes	£0	£0	£0
External escapes in gardens	£0	£0	£0
Escapes in highways	£1,000,000	£2,000,000	£2,000,000
No flooding	-	£1,000,000	£4,000,000
Total	£1,000,000.00	£3,000,000	£6,000,000

Table 5 - Summary of Flooding option investments

Table 4 and 5 are strategic cost indications to illustrate the level of investment needed to provide protection against drainage and network failure, pollution events and flooding, internal and external to properties. The solutions developed highlight the level of investment required to bring our entire network up to the level of protection required to be resilient for future risk and demands. The range of scenarios is to provide a choice for understanding and discussion of future direction.

We are beginning to break down the investment indicated in Table 3 and 4 by creating practical schemes ready for delivery. These schemes are designed as 100% traditional, 100% sustainable or green and 100% mixture of the two. These packages have then been analysed in terms of their long term benefit, and environmental and social cost to society, and one has been chosen for inclusion as our preferred best value option. The areas where we have started our delivery programme aims to provide protection, to our worst served customers and rivers designated as Special Areas of

For more information on the methodology developed to carry out the assessments see the DWMP plan main report.

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L4 Catchments	No. Schemes
LLANILAR STW	0
LLANAFAN SWK	0
LLANFARIAN (ABERYSTWYTH) STW	0
RHYDYFELIN (ABERYSTWYTH)	0