River Basin Catchment Summary

Carmarthen Bay and the Gower

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

Carmarthen Bay and the Gower (see Figure 1 below) consists of 87 wastewater catchments with a total population of 173117. There is a total sewer length of 1230km, where 659km is associated to the foul system, 107km is associated to the surface water system and 496km is associated to the combined system. There are 87 Wastewater Treatment Works (WwTW), 284 Sewerage Pumping Stations (SPSs), and 217 Combined Storm Overflows (CSOs) across this river basin catchment level.

The Carmarthen Bay and the Gower catchment extends from Carmarthen Bay to the Llyn Brianne Reservoir to the north and includes the western end of the Brecon Beacons National Park and we estimate it has a population equivalent of approximately 263,088.

The main rivers of the catchment drain to Carmarthen Bay and includes the main rivers Cothi, Tywi, Taff and Llwchr. The most significant urban areas are Llanelli, Gowerton, Carmarthen and Ammanford.

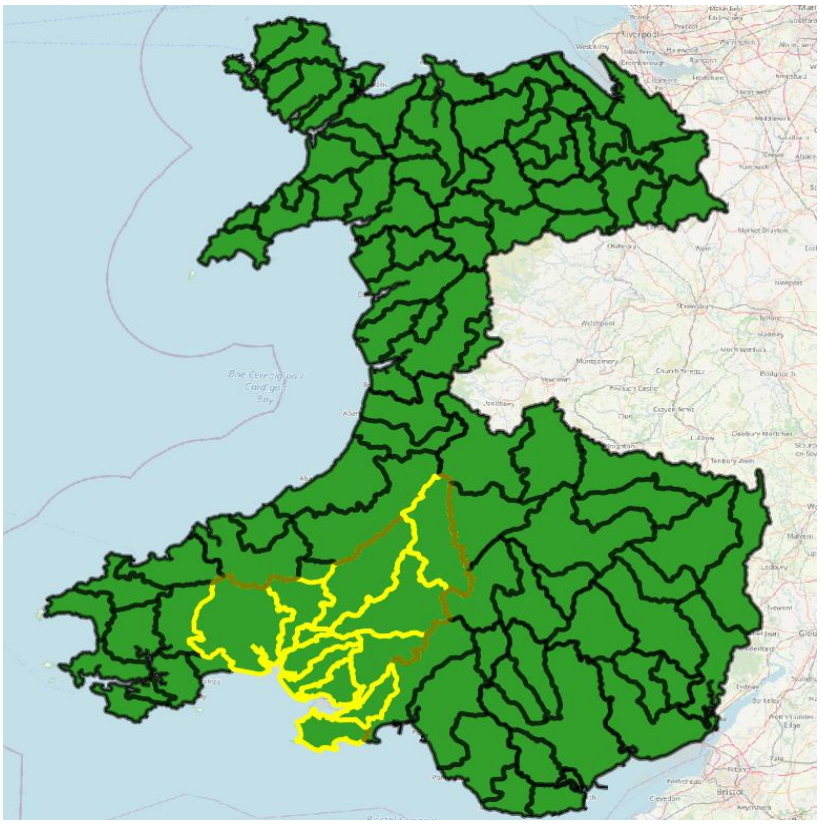


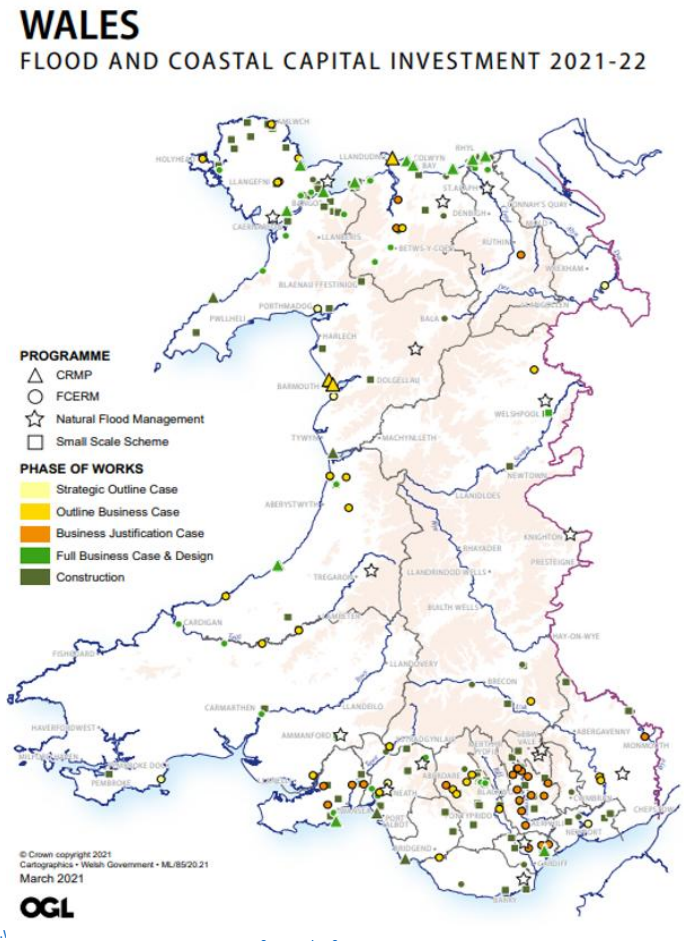
Figure 1 - River basin location detailing the associated tactial planning catchments

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/south-west-wales-area-statement/introduction-to-south-west-area-statement/?lang=en	Natural Resources Wales Environment Agency Local partnerships
Flood Risk Management Plans (FRMP)	The Carmarthen Bay and the Gower 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 properties north side of the Gower at Penclawdd and Crofty, the report states flooding also impacted approximately 70 caravans in Camarthan Bay.	Welsh Government Water companies Coastal Groups (local authority led) Natural Resources Wales Environment Agency Lead local flood authorities
Shoreline Management Plans (SMP)	Carmarthen Bay and the Gower is covered by SMP 20 - Lavernock Point to St Ann's 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/681008/2016-updated-carmarthen_bay_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.

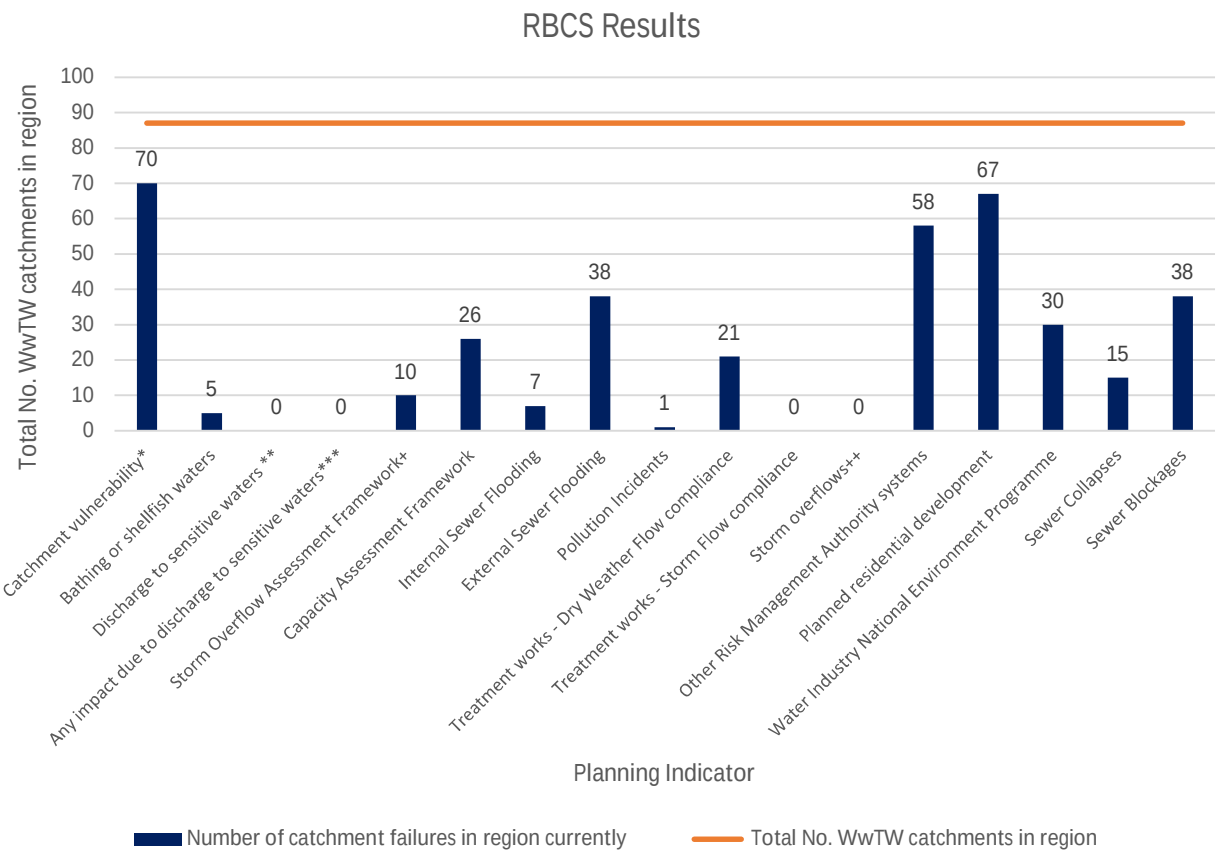
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

The population in the Carmarthen Bay and the Gower region is set to decrease to 168500 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 1,100 units in West Carmarthen and eight strategic development areas with a total of 6,090 units.
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 Carmarthen Bay and the Gower catchment the biggest concerns indicated by the RBCS are catchment vulnerability and storm flow compliance at Wastewater Treatment works.



* 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.

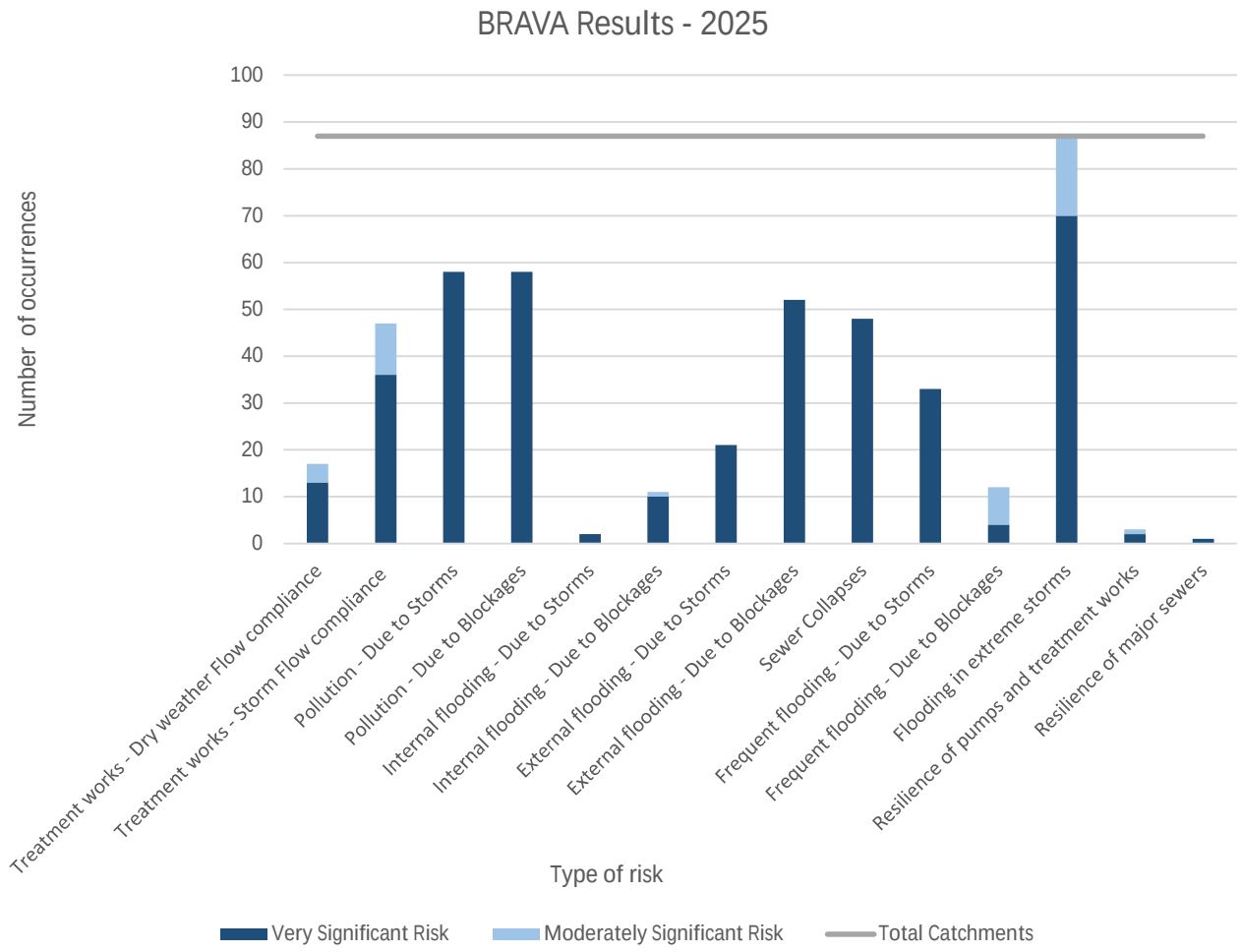


Figure 4 - BRAVA 2025 Summary

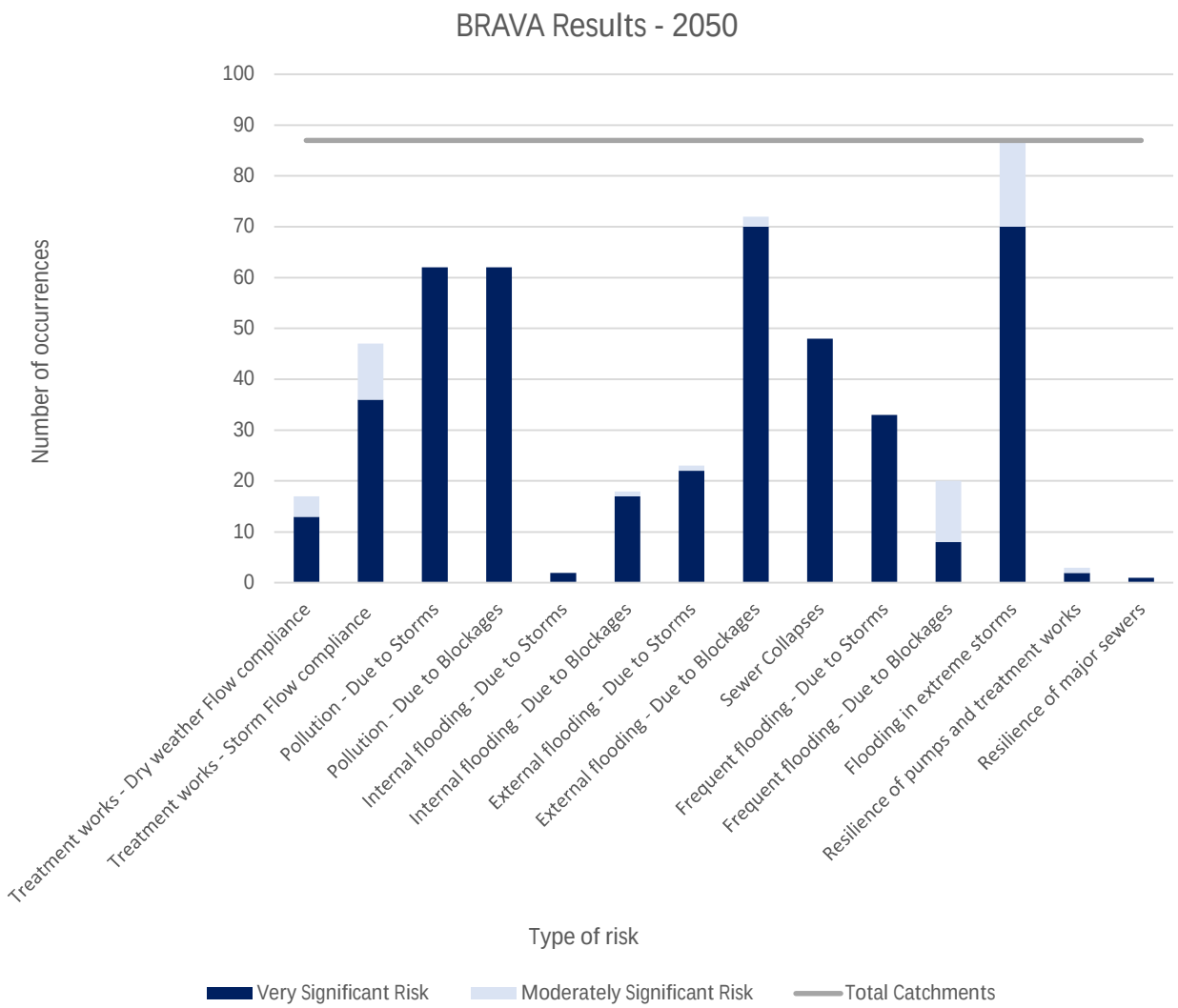


Figure 5 - BRAVA 2050 Summary

BRAVA shows that in both 2025 and 2050 risks due to flooding in extreme events are the biggest concern, and in 2050 there is also an external flooding risk due to blockages in the Carmarthen Bay and Gower.

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.

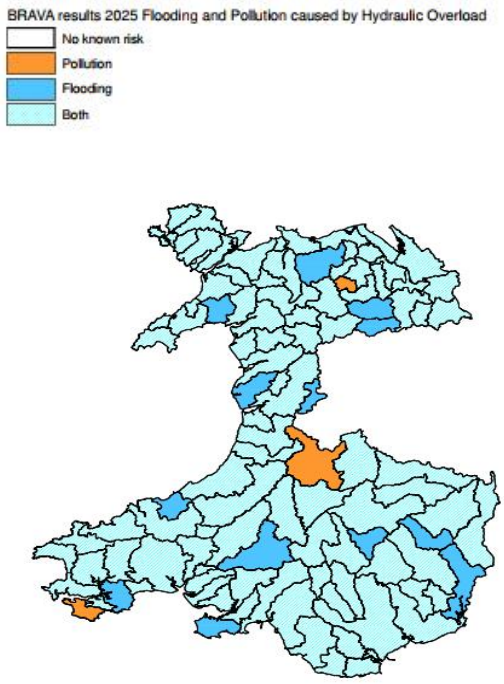


Figure 6 - Associated Strategic Planning Areas priority (2025)

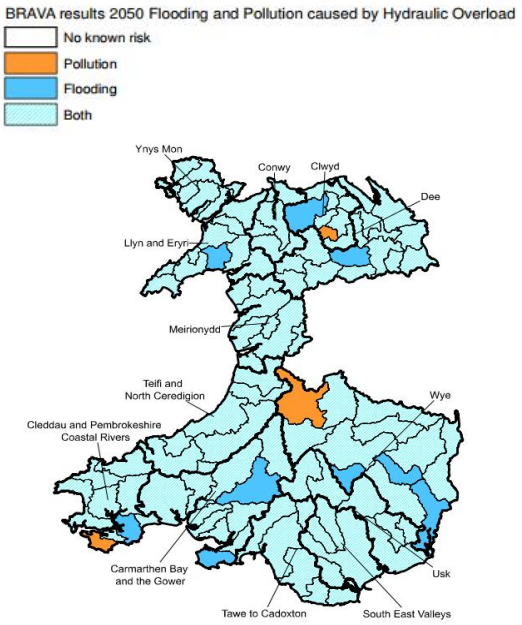


Figure 7 - Associated Strategic Planning Area priority (2050)

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
Carmarthen Bay and the Gower						

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.

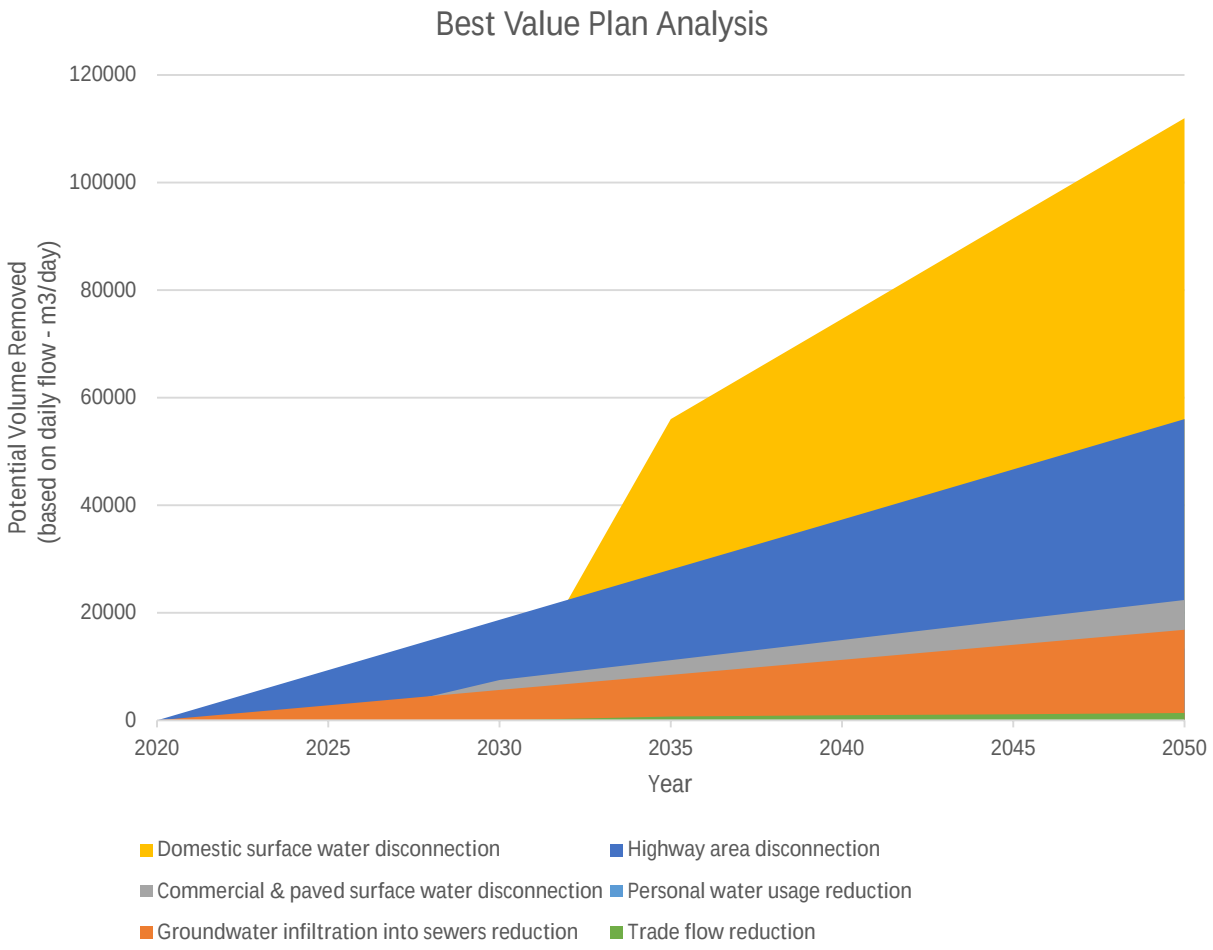


Figure 8 - Best Value Plan Analysis

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*	-	£159,000,000	£223,800,000
40 spills in a Typical Year	£89,000,000	£93,000,000	£105,000,000
20 spills in a Typical Year	£151,000,000	£160,000,000	£178,000,000
10 spills in a Typical Year	£234,000,000	£256,000,000	£283,000,000
0 spills in a Typical Year	£546,000,000	£570,000,000	£614,000,000
Equivalent No. Principality Stadiums Full of Water in 10 spills scenario	2.61	3.09	3.30

* 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	£18,000,000	£22,000,000	£22,000,000
External escapes in gardens	£16,000,000	£22,000,000	£19,000,000
Escapes in highways	£142,000,000	£178,000,000	£201,000,000
No future flooding	-	£28,000,000	£76,000,000
Total	£176,000,000	£250,000,000	£318,000,000

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

Burry Pill - headwaters 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 Burry Pill - headwaters to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 8 wastewater catchments (see Figure 2 below). There is a combined population of 12029, this is set to decrease to 10545 by 2050, a change of -12%. There is a total sewer length of 96km, with a foul sewer length of 85km, a surface water length of 3km and a combined sewer length of 4km. There are 8 Wastewater Treatment Works (WwTW), 38 Sewerage Pumping Stations (SPSs), and 11 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Burry Pill - headwaters to tidal limit is situated in the south of Wales, covering most of the area of the Gower Peninsula. It stretches from Rhossili Bay in the west past Bishopston in the east. This catchment is relatively flat with much of the area grassland, most notably the common of Cefn Bryn. There are numerous villages through the catchment including Reynoldston, Llanrhidian and Southgate. Also within the catchment is Swansea airport. There are a number of small rivers throughout the catchment including Burry Pill, Ilston Pill and Nicholson Brook.

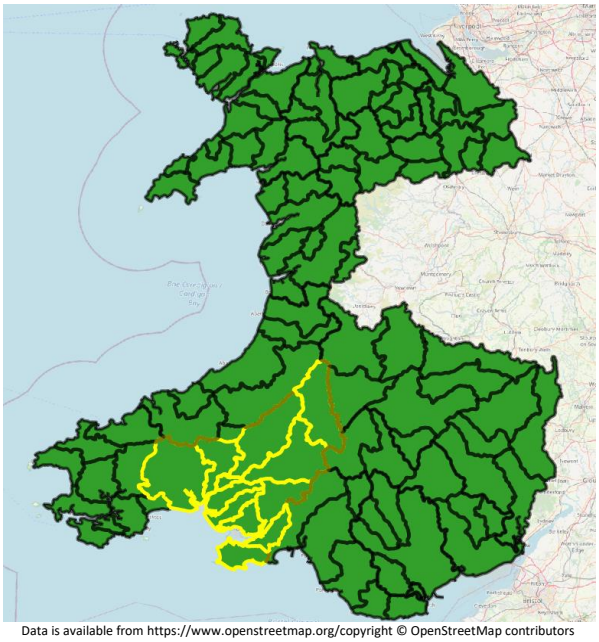


Figure 1 - River basin location detailing the associated tactial planning catchments

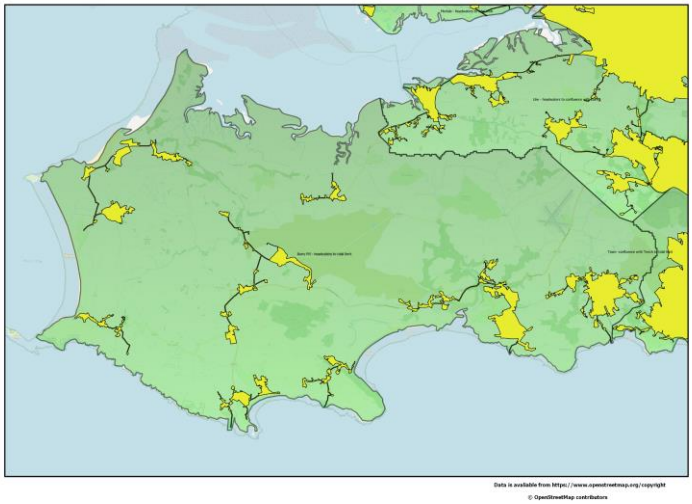


Figure 2- Tactical planning catchment

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.

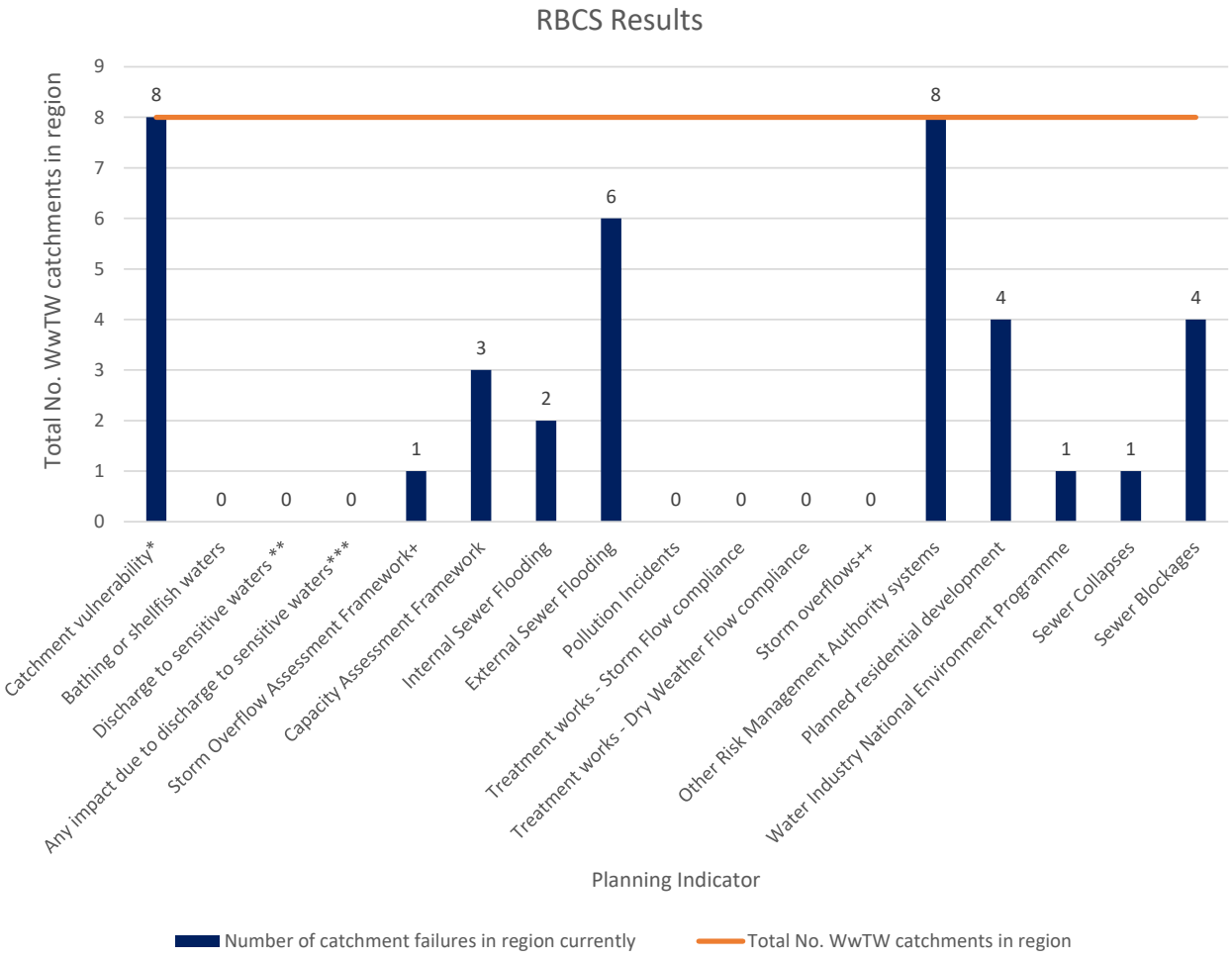
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 10500 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 Land adjoining Pennard Drive, Pennard with 60 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 8 out of the 8 L4 catchments within this L3 are likely to be vulnerable to sewer flooding due to an extreme storm event and are also likely to have flood risks that fall under the scope of other risk management authorities. External sewer flooding was also flagged as a risk within the catchment.



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**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.

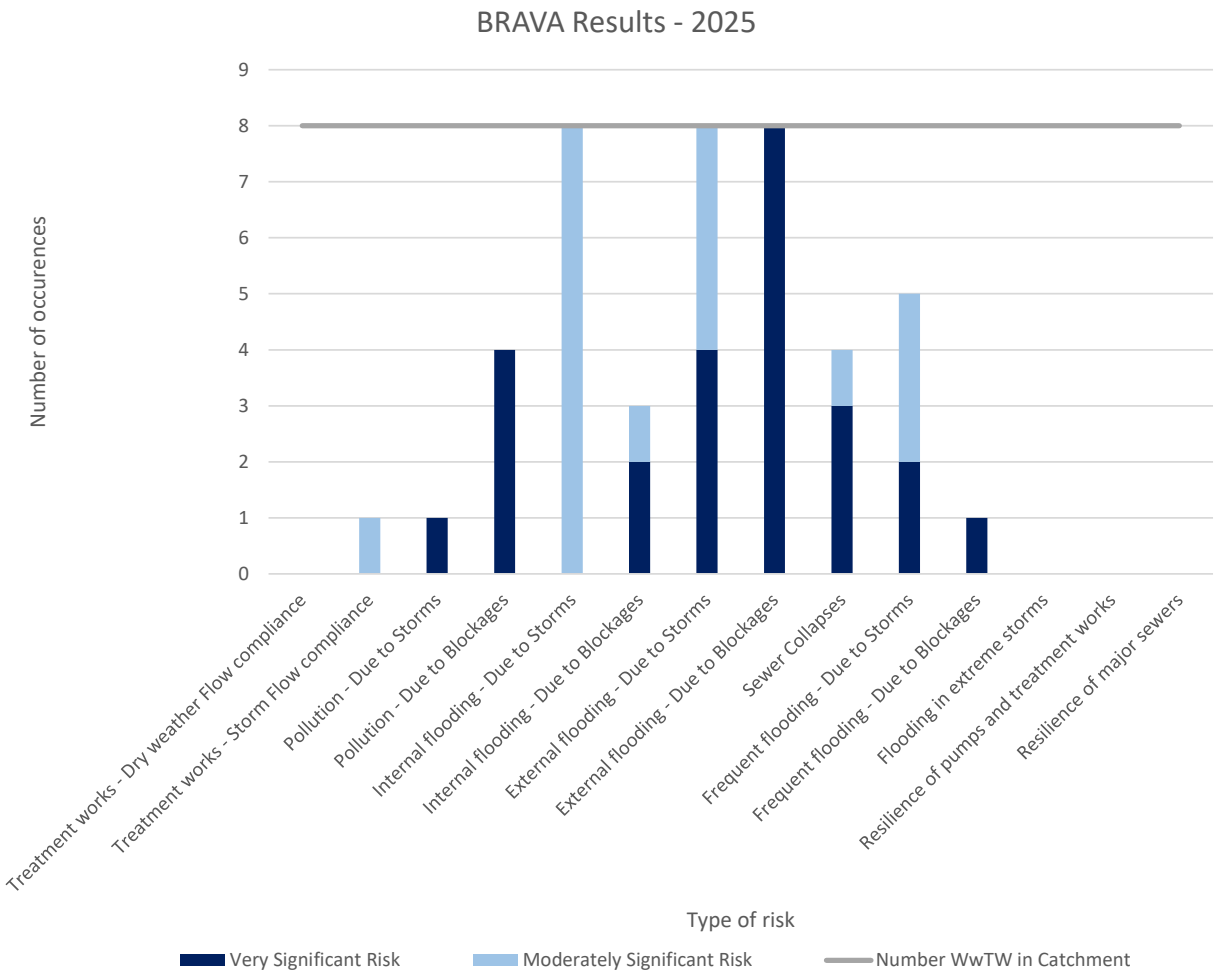


Figure 4 - BRAVA 2025 Summary

In 2025 it is predicted that overall risk within the catchment will come from 4 different risk types and be relatively low. The different risk types are internal flooding due to storms, treatment work compliance due to storms and pollution due to both storms and blockages.

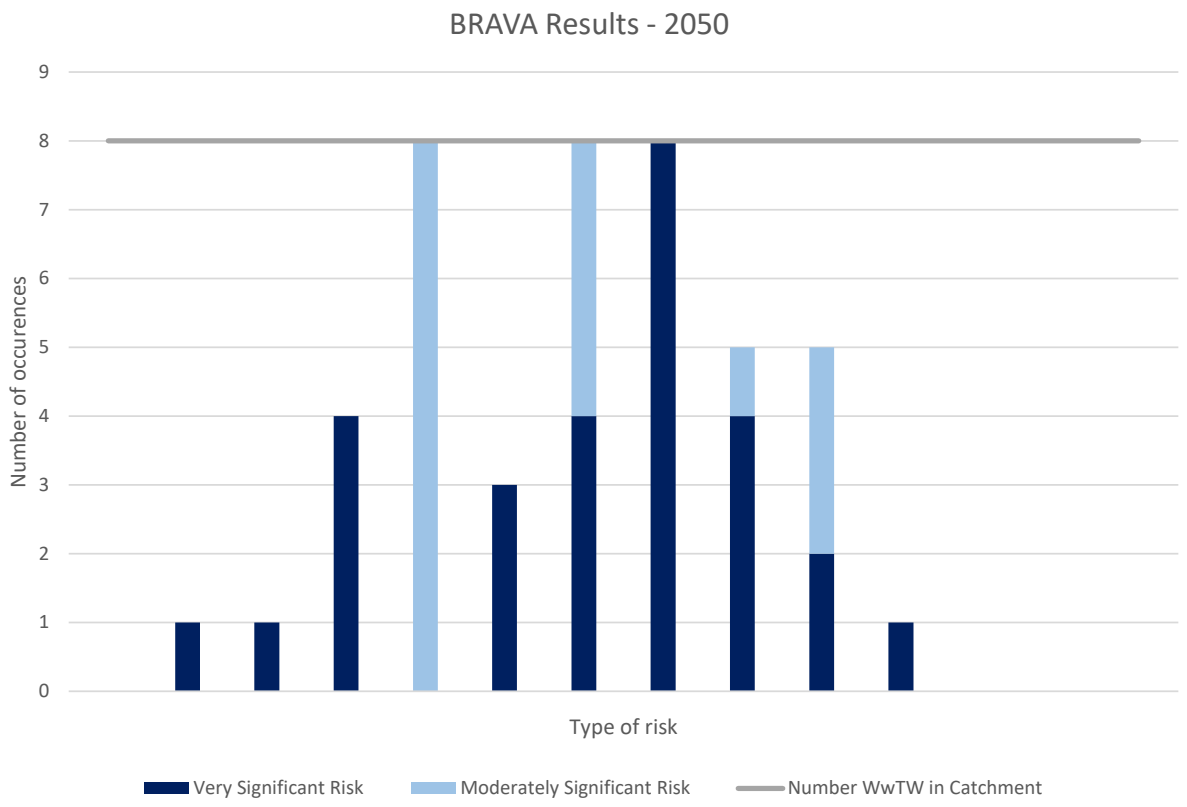


Figure 5 - BRAVA 2050 Summary

In 2050 it is predicted that sewer collapse will emerge as the most significant risk within the catchment, followed by pollution due to storms.

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.

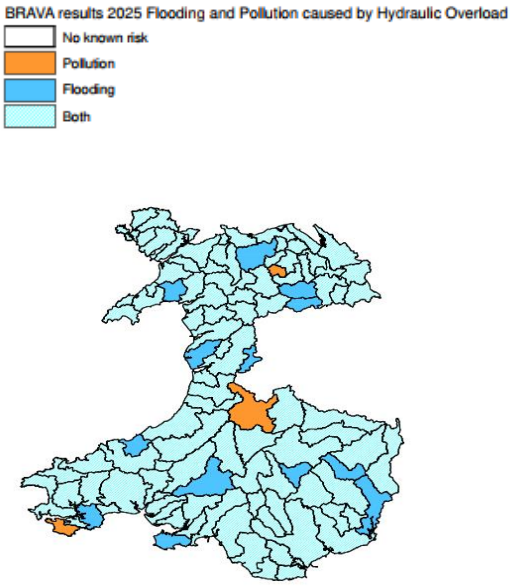


Figure 6 - Associated Strategic Planning Areas priority (2025)

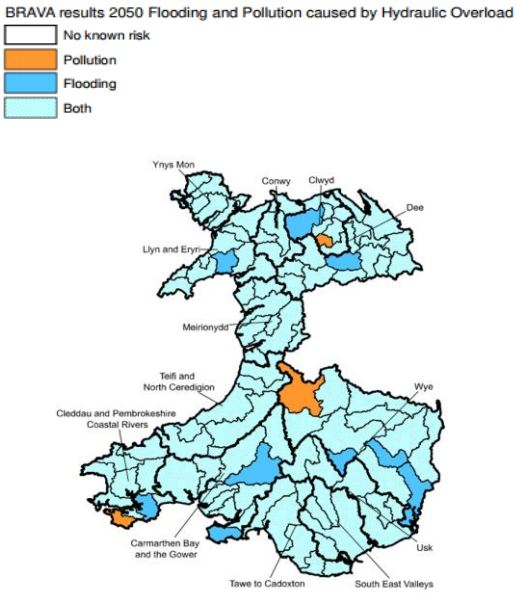


Figure 7 - Associated Strategic Planning Areas

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. Burry Pill - headwaters 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
Burry Pill - headwaters 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.

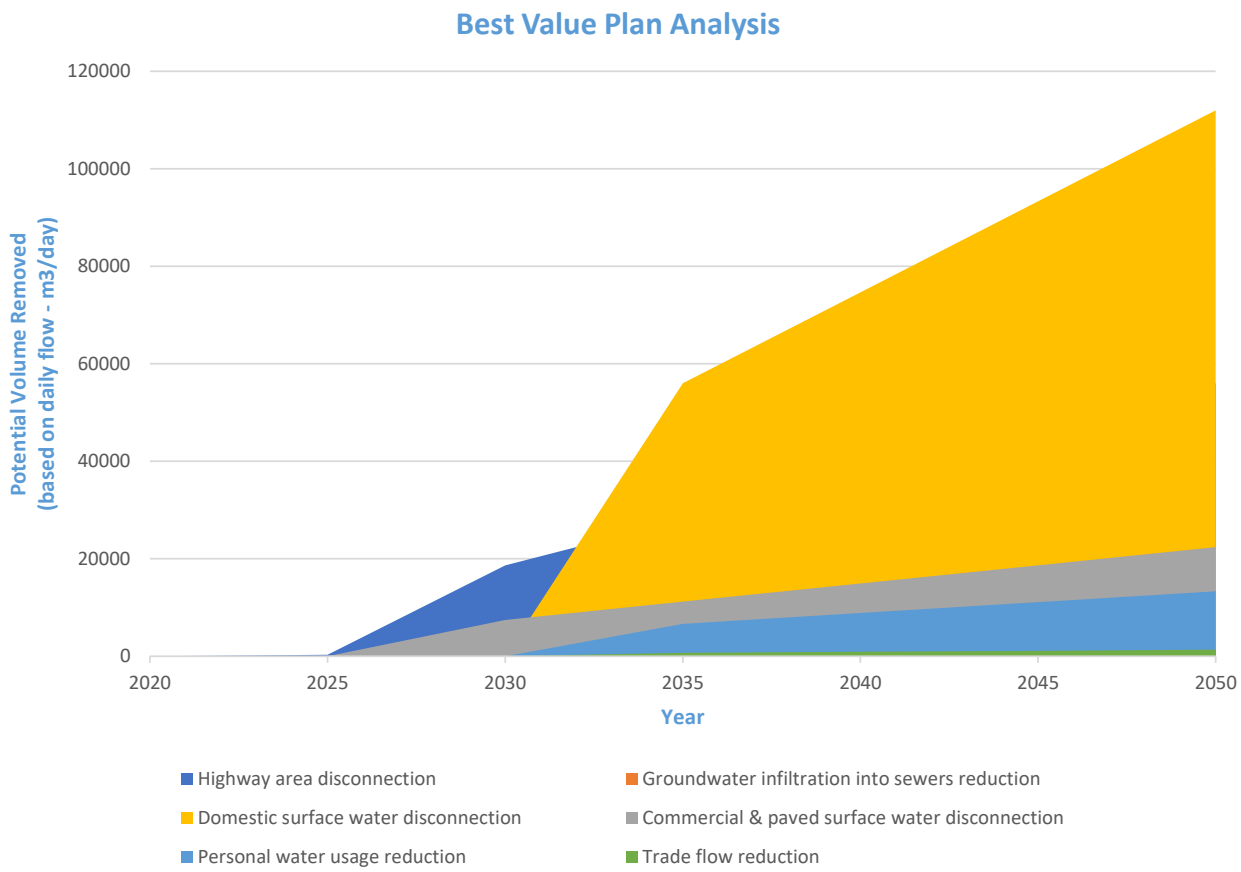


Figure 8 - Best Value Plan Analysis

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*	-	£9,000,000.00	£12,000,000.00
40 spills in a Typical Year	£2,000,000.00	£2,000,000.00	£2,000,000.00
20 spills in a Typical Year	£4,000,000.00	£4,000,000.00	£4,000,000.00
10 spills in a Typical Year	£9,000,000.00	£11,000,000.00	£11,000,000.00
0 spills in a Typical Year	£17,000,000.00	£19,000,000.00	£17,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	14.00	22.00	20.00

* 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	£4,000,000	£4,000,000	£4,000,000
Escapes in highways	£10,000,000	£12,000,000	£15,000,000
No flooding	-	£0	£0
Total	£15,000,000.00	£17,000,000	£20,000,000

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
REYNOLDSTON (GOWER) STW	0
LLANRHIDIAN STW	0
OXWICH	0
RHOSSILI	0
SOUTHGATE (THE GOWER) HAEL LANE	0
LLANMADOC	0
OVERTON (GOWER PENINSULAR)	0
BISHOPSTON	0

DWMP Tactial Planning Catchment Summary

Cothi - headwaters to confluence with Tywi

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 Cothi - headwaters to confluence with Tywi planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 11 wastewater catchments (see Figure 2 below). There is a combined population of 1672, this is set to increase to 1681 by 2050, a change of 1%. There is a total sewer length of 25km, with a foul sewer length of 25km, a surface water length of 0km and a combined sewer length of 0km. There are 11 Wastewater Treatment Works (WwTW), 8 Sewerage Pumping Stations (SPSs), and 13 Combined Storm Overflows (CSOs) across this tactical planning unit.

The L3 catchment of Cothi - headwaters to confluence with Tywi is a steep catchment situated to the west of the Brecon Beacons National Park. It stretches from Cordon Hill in Mid Wales in the north, down towards Nantgaredig in the south. The majority of the catchment is steep and forested, including a large section of the Brechfa forest. There are few settlements within the catchment, with the most notable being Llansawel, Llanfynydd and Brechfa. The source of the river Cothi is found in the far north of the catchment and the river runs throughout the catchment where it joins the river Tywi in the south of the catchment .

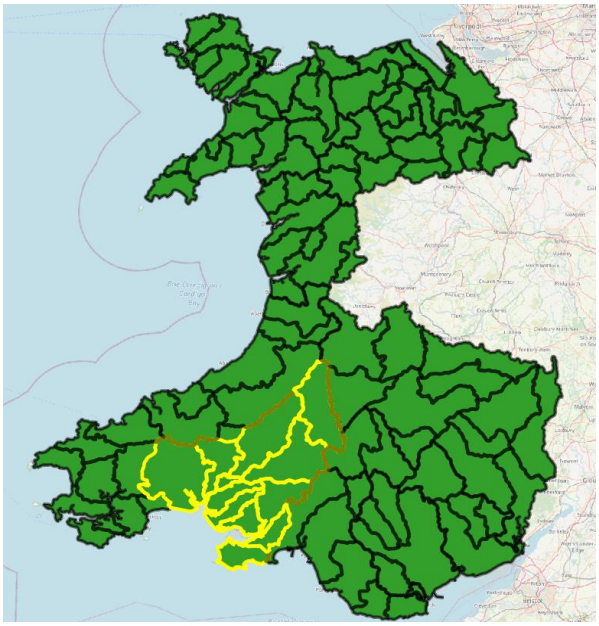


Figure 1 - River basin location detailing the associated tactial planning catchments

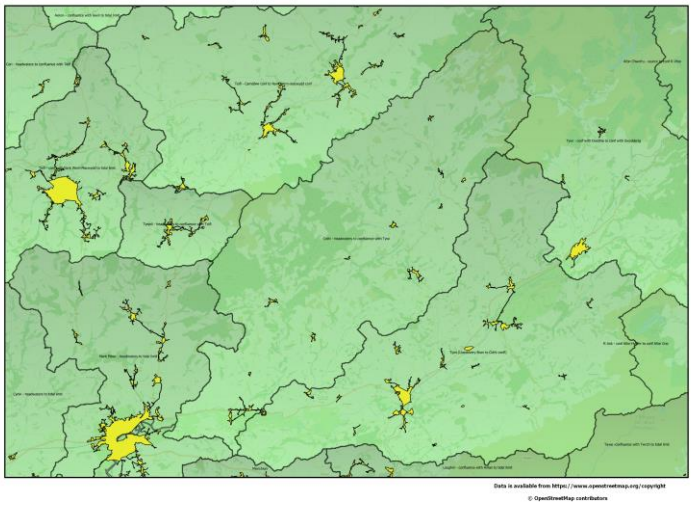


Figure 2- Tactical planning catchment

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.

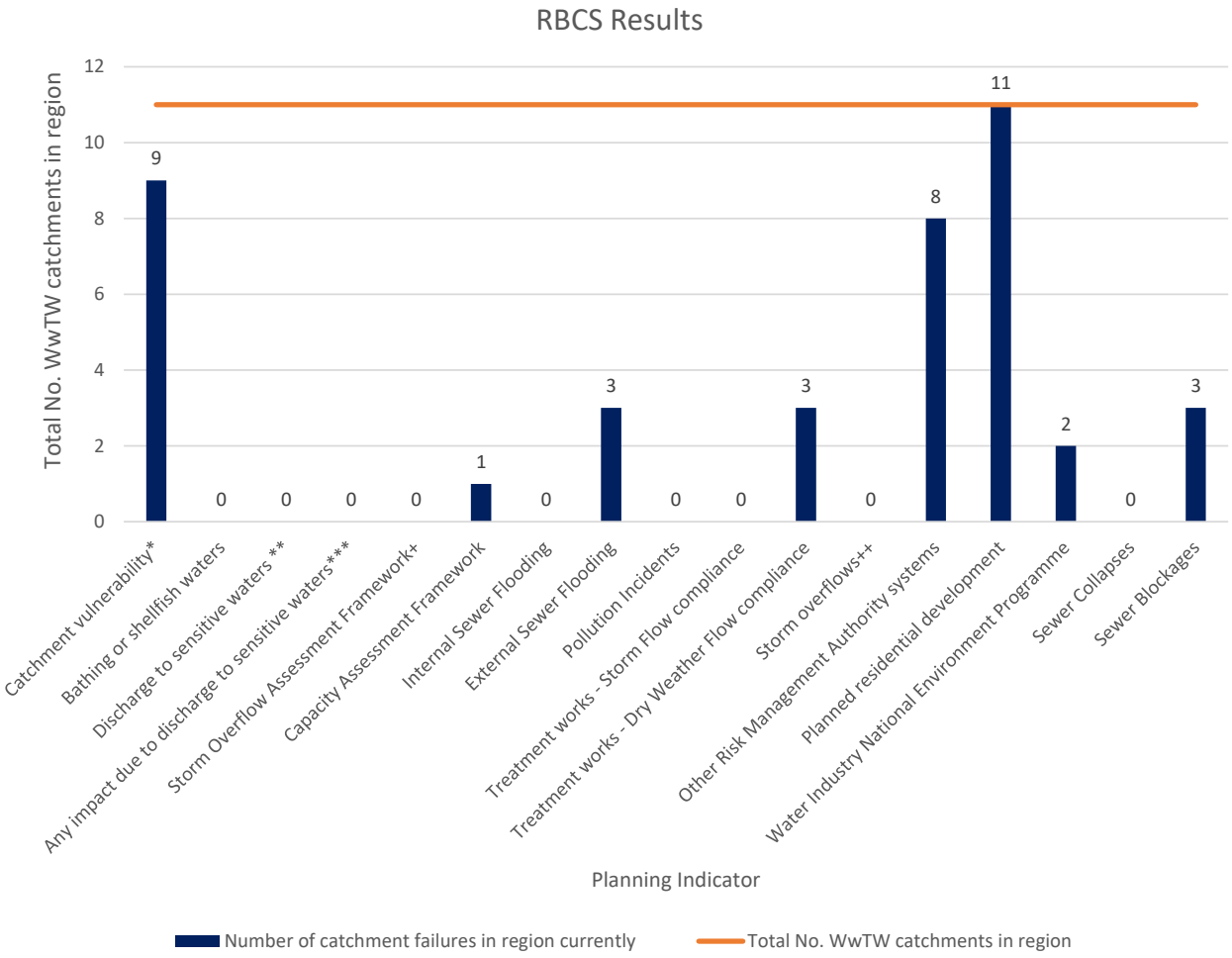
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to increase to 1700 by 2050, a change of 1% 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 former joinery, Station Road with 30 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 9 out of the 11 L4 catchments within this L3 are likely to be vulnerable to sewer flooding due to extreme storm events. Planned residential development was also flagged as a significant risk within this 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.

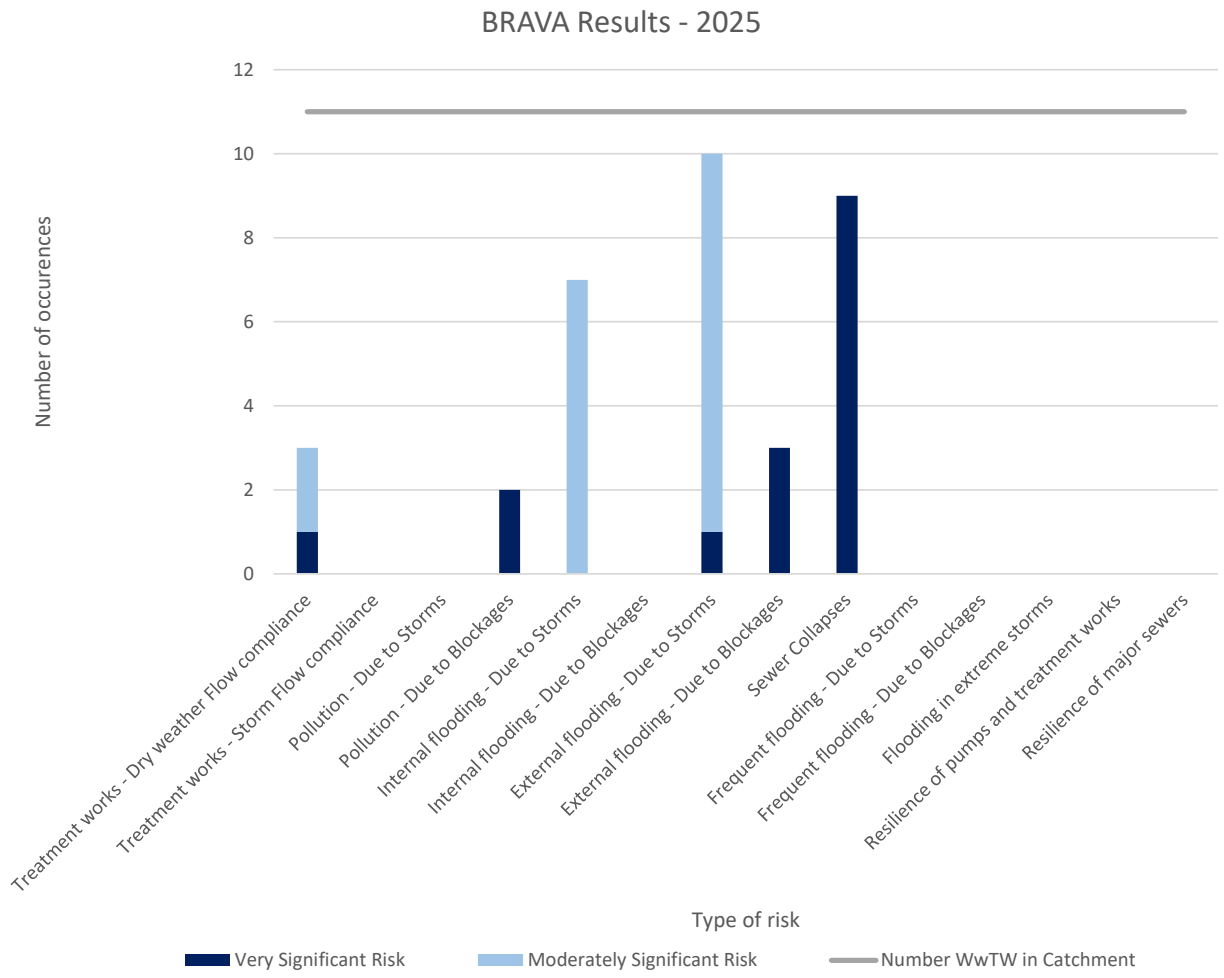


Figure 4 - BRAVA 2025 Summary

In 2025 it is predicted that 7 types of risk will be of a significant level. Of these concerns, pollution due to extreme storm events and external flooding due to extreme storm events are likely to be the risks of greatest concern.

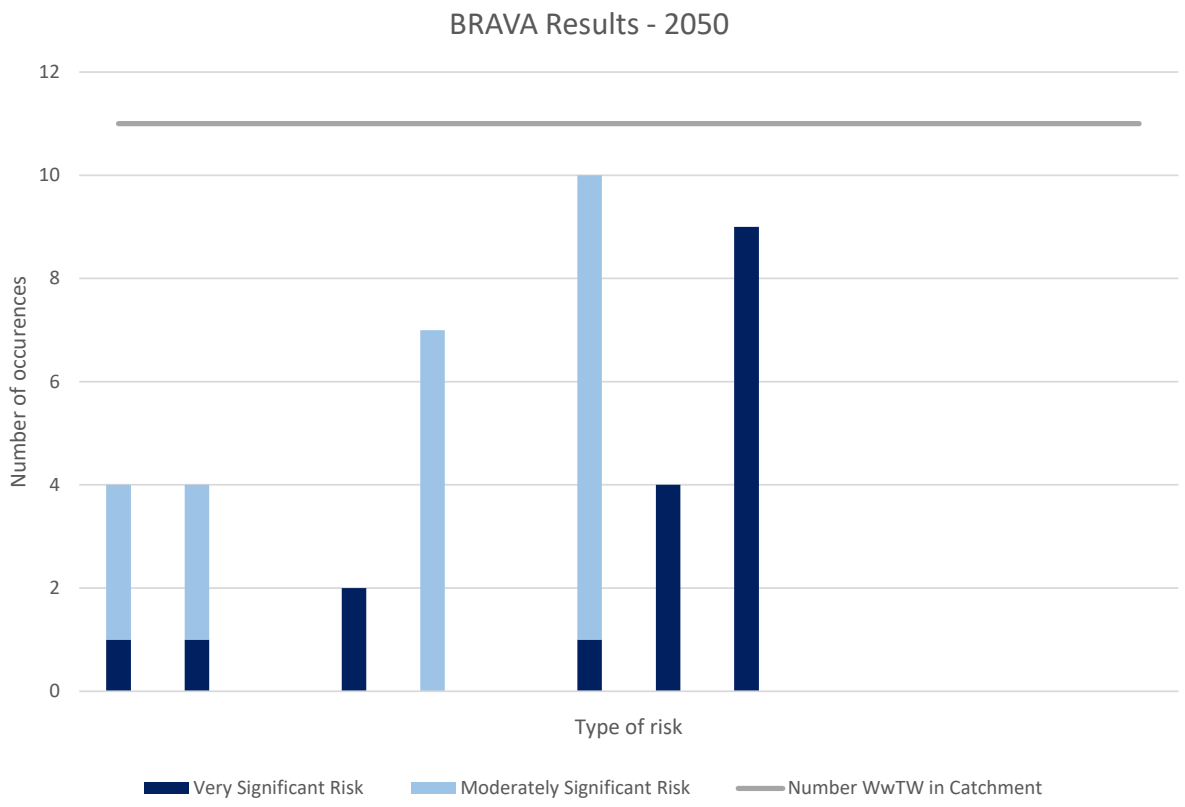


Figure 5 - BRAVA 2050 Summary

In 2050 sewer collapse is expected to emerge as the most significant risk within the catchment. Pollution and external flooding, both due to storms, are expected to also be risks along with internal flooding due to blockages.

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.

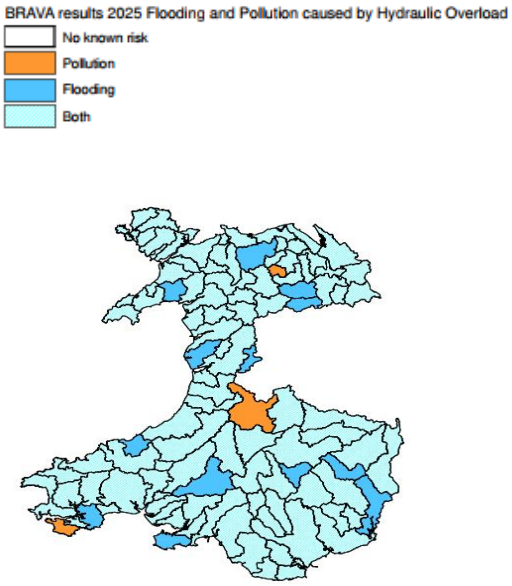


Figure 6 - Associated Strategic Planning Areas priority (2025)

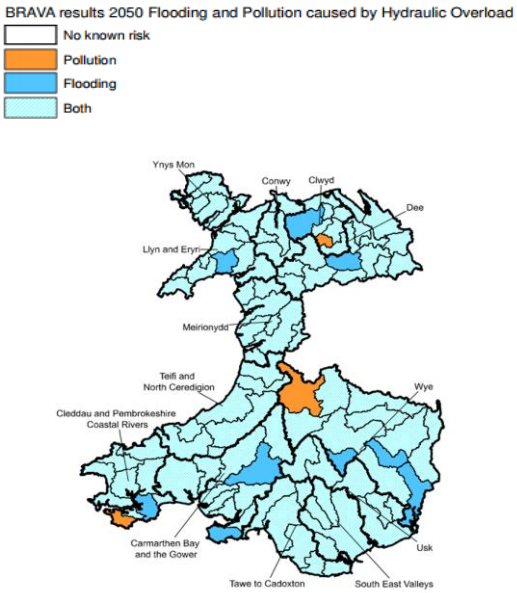


Figure 7 - Associated Strategic Planning Areas

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. Cothi - headwaters to confluence with Tywi 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
Cothi - headwaters to confluence with Tywi	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.

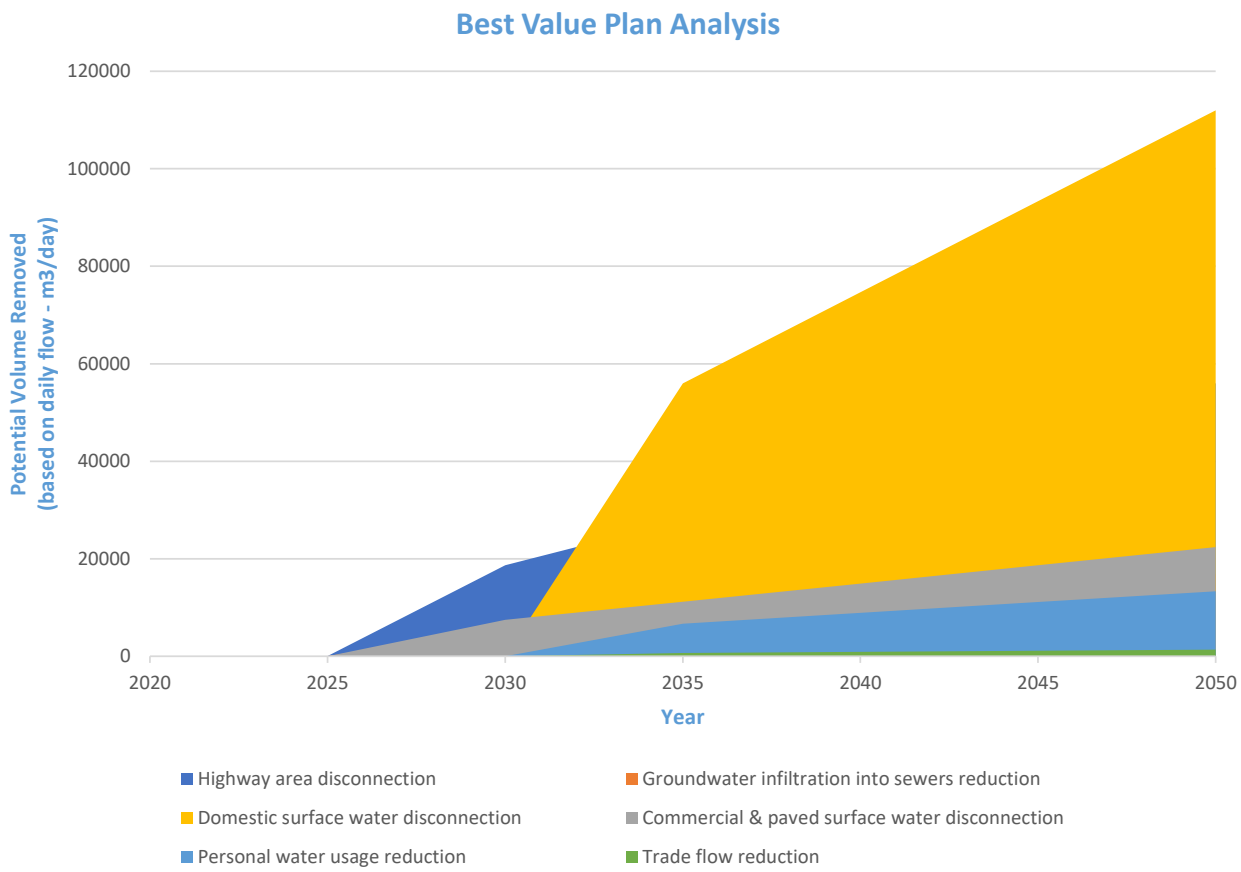


Figure 8 - Best Value Plan Analysis

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*	-	£11,000,000.00	£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	£4,000,000.00	£4,000,000.00	£4,000,000.00
10 spills in a Typical Year	£4,000,000.00	£5,000,000.00	£8,000,000.00
0 spills in a Typical Year	£15,000,000.00	£15,000,000.00	£15,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	52.00	57.00	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	£0	£0	£0
Escapes in highways	£5,000,000	£6,000,000	£7,000,000
No flooding	-	£2,000,000	£6,000,000
Total	£5,000,000.00	£8,000,000	£13,000,000

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
NANTGAREDIG STW	0
TALLEY	0
LLANFYNYDD (NR LLANDEILO)	0
BRECHFA STW	0
FFARMERS (NR LAMPETER)	0
LLANSAWEL STW	0
FELINGWMUCHAF	0
PUMSAINT	0
CRUGYBAR STW	0
ABERGORLECH STW	0
CAIO	0

DWMP Tactial Planning Catchment Summary

Cynin - headwaters 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 Cynin - headwaters to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 19 wastewater catchments (see Figure 2 below). There is a combined population of 11499, this is set to decrease to 10804 by 2050, a change of -6%. There is a total sewer length of 92km, with a foul sewer length of 79km, a surface water length of 0km and a combined sewer length of 10km. There are 19 Wastewater Treatment Works (WwTW), 30 Sewerage Pumping Stations (SPSs), and 22 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Cynin - headwaters to tidal limit stretches from the village of Llanfyrnach in the north to Laugharne and the mouth of the river Taf in the south. The northern parts of the catchment are steep and rural. There are numerous towns and villages within the catchment including St. Clears, Laugharne and Whitland. The river Taf runs throughout the catchment from source to mouth, along with a number of smaller tributaries.

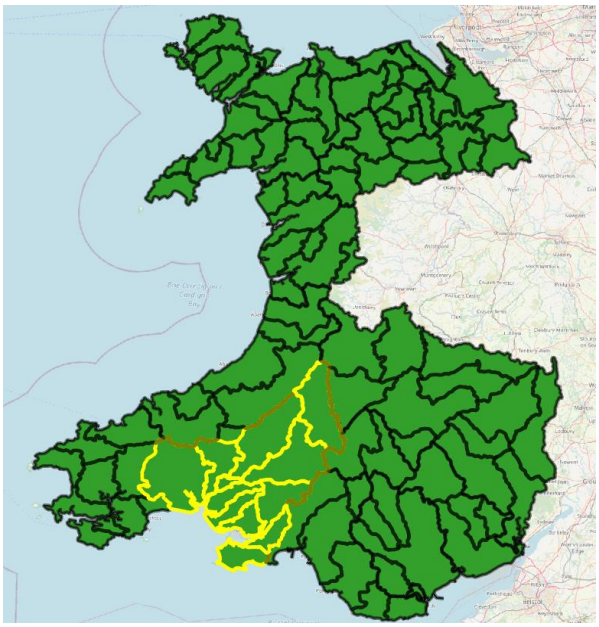


Figure 1 - River basin location detailing the associated tactial planning catchments

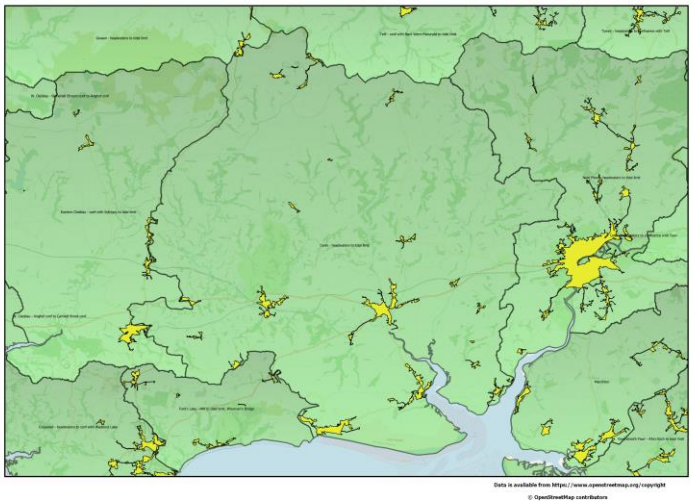


Figure 2- Tactical planning catchment

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.

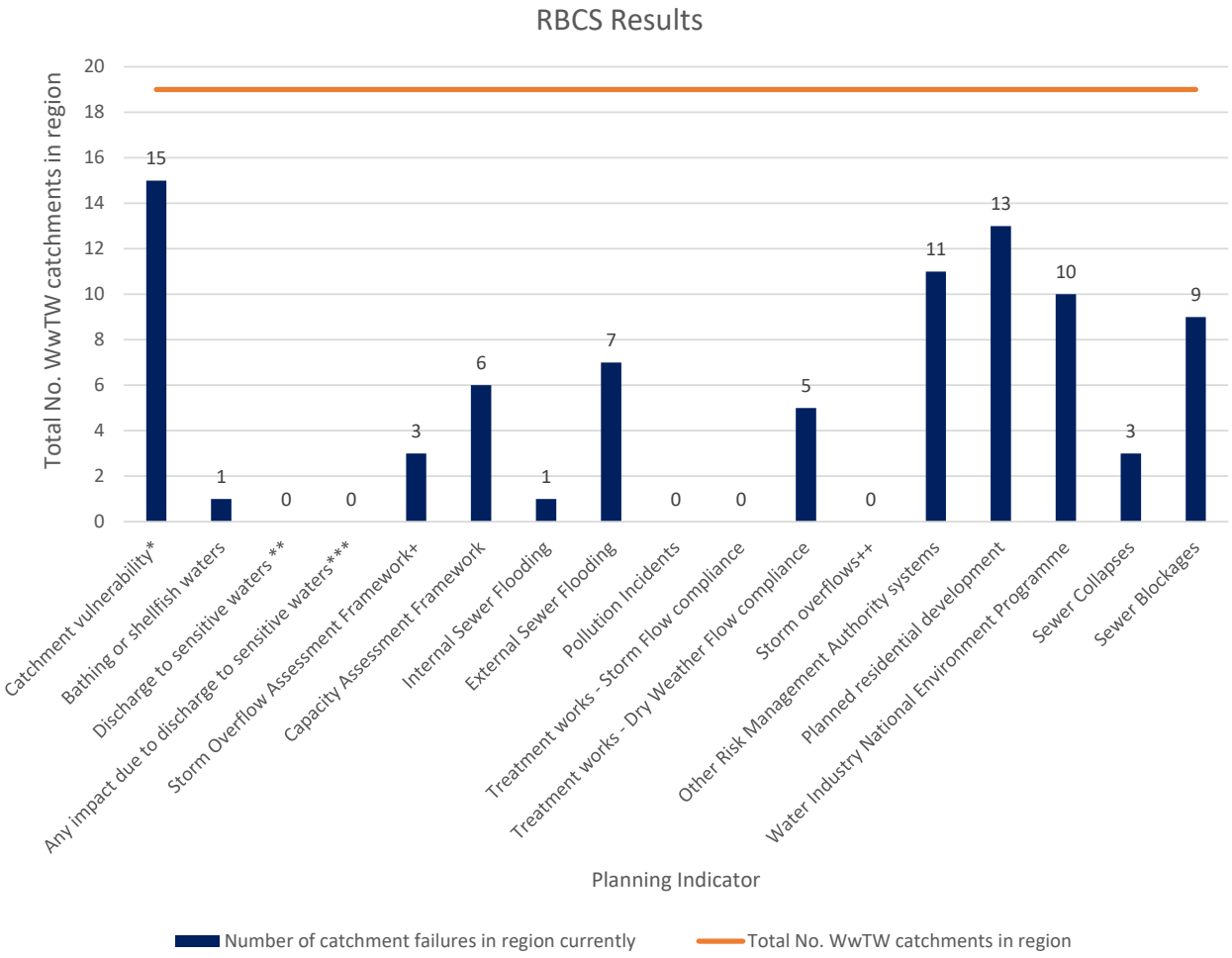
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 10800 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 next to Spring Gardens, Whitland with 64 units and Brittannia Terrace, St Clears with 50 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 15 out of the 19 L4 catchments within this L3 are likely to be at risk of sewer flooding due to extreme storm events. Planned residential development within this catchment was also flagged as an area of risk, along with flooding that falls under the scope of other risk management authorities.



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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.

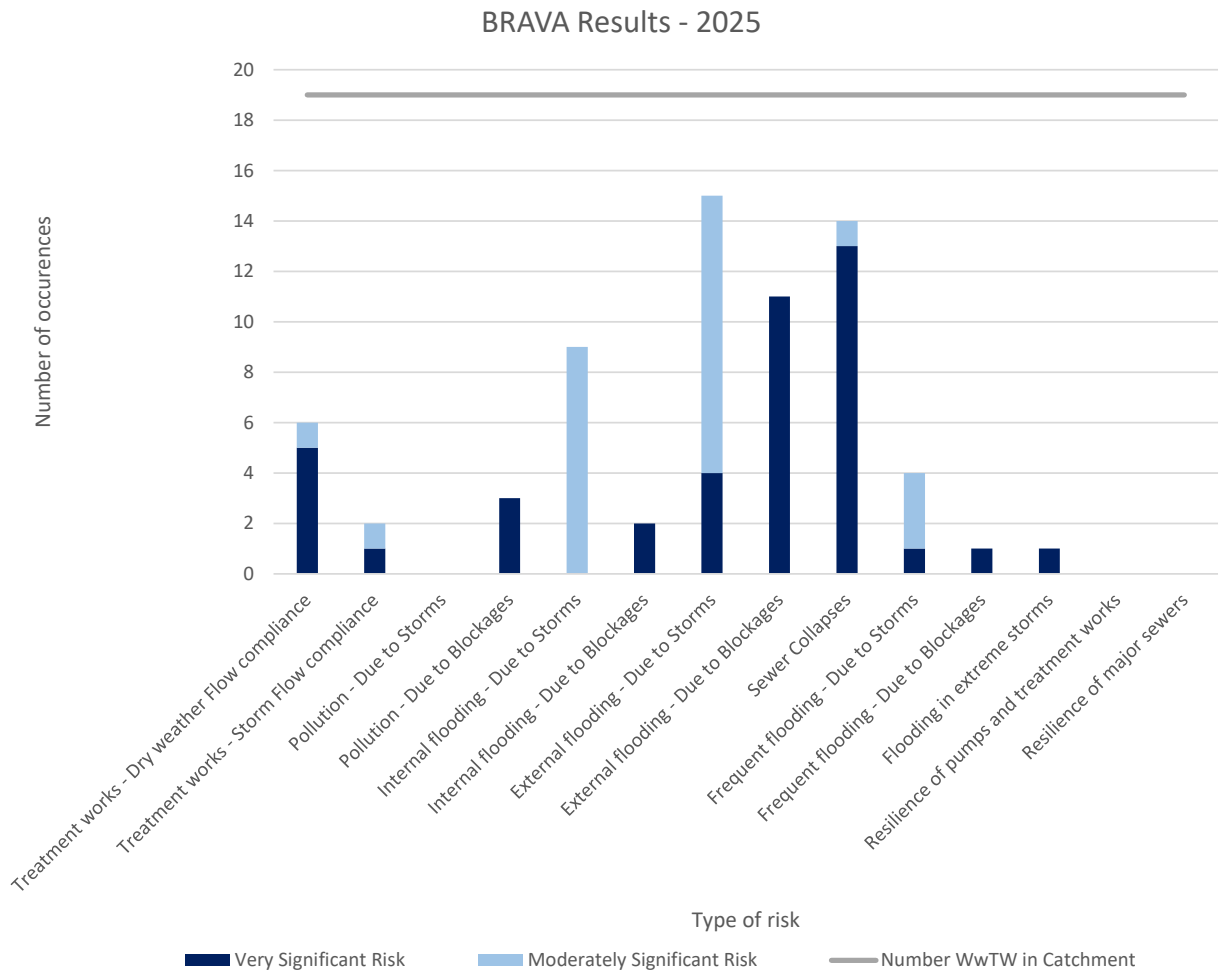


Figure 4 - BRAVA 2025 Summary

In 2025 it is predicted that the overall risk will be relatively small within the catchment. It is expected that there will be a risk from 7 different sources, with treatment work compliance during storms being the most significant of these.

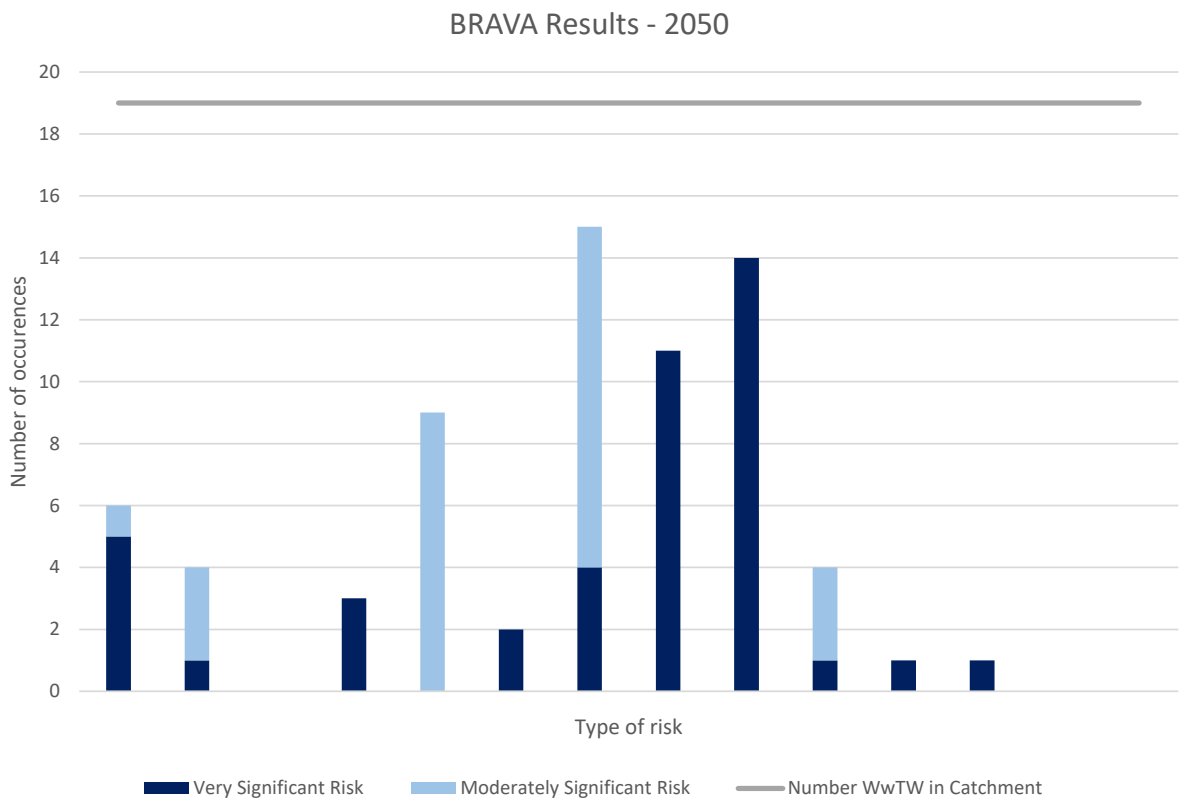


Figure 5 - BRAVA 2050 Summary

In 2050 it is expected that internal flooding due to blockages will be the most significant contributor to overall risk. It is expected that overall risk 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.

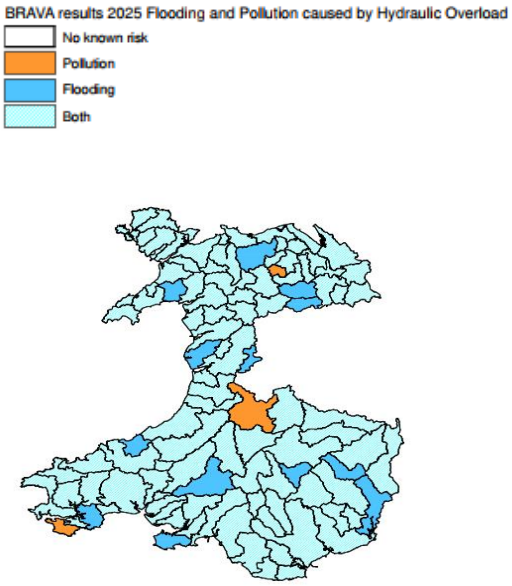


Figure 6 - Associated Strategic Planning Areas priority (2025)

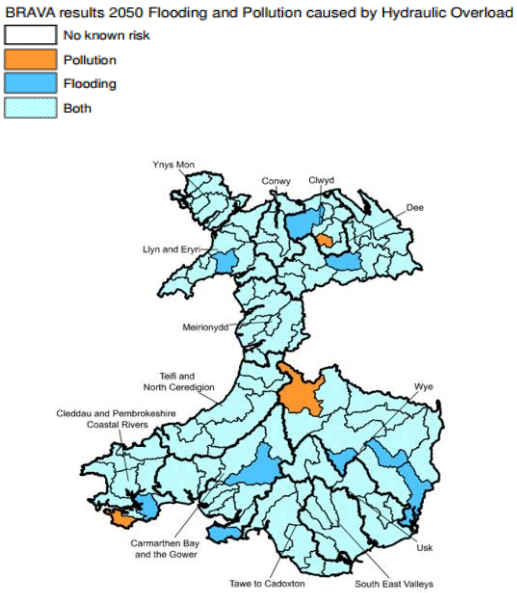


Figure 7 - Associated Strategic Planning Areas

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. Cynin - headwaters to tidal limit 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?

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
Cynin - headwaters 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.

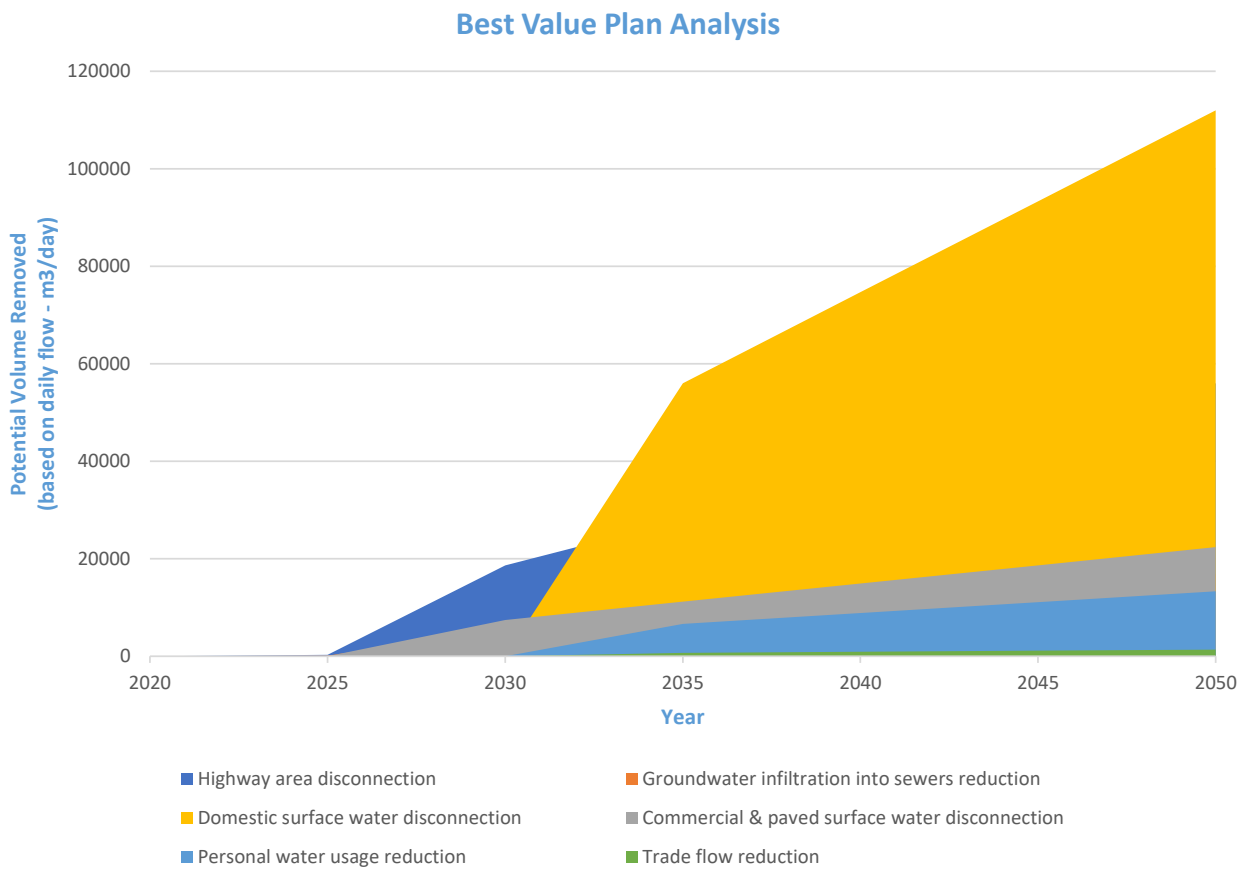


Figure 8 - Best Value Plan Analysis

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*	-	£27,000,000.00	£41,000,000.00
40 spills in a Typical Year	£11,000,000.00	£14,000,000.00	£16,000,000.00
20 spills in a Typical Year	£17,000,000.00	£19,000,000.00	£24,000,000.00
10 spills in a Typical Year	£24,000,000.00	£28,000,000.00	£34,000,000.00
0 spills in a Typical Year	£58,000,000.00	£62,000,000.00	£72,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	96.00	121.00	151.00

* 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	£3,000,000	£1,000,000
Escapes in highways	£13,000,000	£19,000,000	£16,000,000
No flooding	-	£8,000,000	£21,000,000
Total	£14,000,000.00	£30,000,000	£38,000,000

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
LLANGYNOG (ST CLEARS)	0
WHITLAND STW	0
LAUGHARNE STW	0
LLANBOIDY	0
BANCYFELIN (ST CLEARS)	0
TRELECH	0
LLANYBRI (NR LLANSTEPHAN)	0
COOMBE	0
BLAENWAUN (NNW OF ST CLEARS) HEOL SHON	0
LLANDDEWI VELFREY (E NARBERTH)	0
GLOGUE	0
LAMPETER VELFREY	0
MEIDRIM STW	0
LLANFYRNACH STW	0
LLANSTEFFAN	0
TAVERNSPITE	0
PENDINE	0
ST CLEARS STW	0

DWMP Tactial Planning Catchment Summary

Gwendraeth Fawr - Afan Goch 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 Gwendraeth Fawr - Afan Goch to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 5 wastewater catchments (see Figure 2 below). There is a combined population of 16369, this is set to increase to 20132 by 2050, a change of 23%. There is a total sewer length of 139km, with a foul sewer length of 73km, a surface water length of 5km and a combined sewer length of 58km. There are 5 Wastewater Treatment Works (WwTW), 30 Sewerage Pumping Stations (SPSs), and 27 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Gwendraeth Fawr - Afan Goch to tidal limit stretches from Pembrey forest in the southwest to the village of Gorslas in the northeast. There are numerous settlements all throughout the catchment including Trimsaran, Pontyberem and Cwmmar. Gwendraeth Fawr runs throughout the catchment into the Bristol Channel.

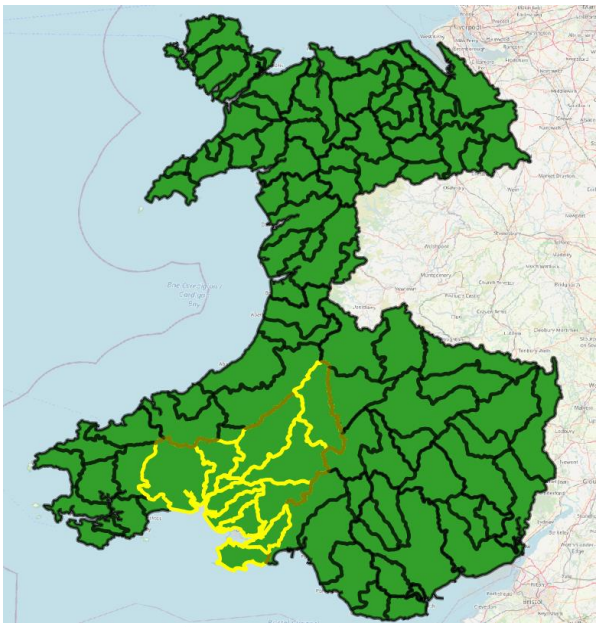


Figure 1 - River basin location detailing the associated tactial planning catchments

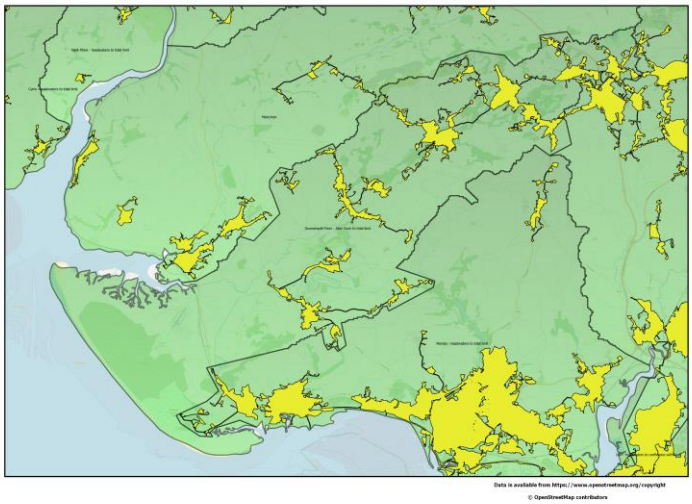


Figure 2- Tactical planning catchment

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.

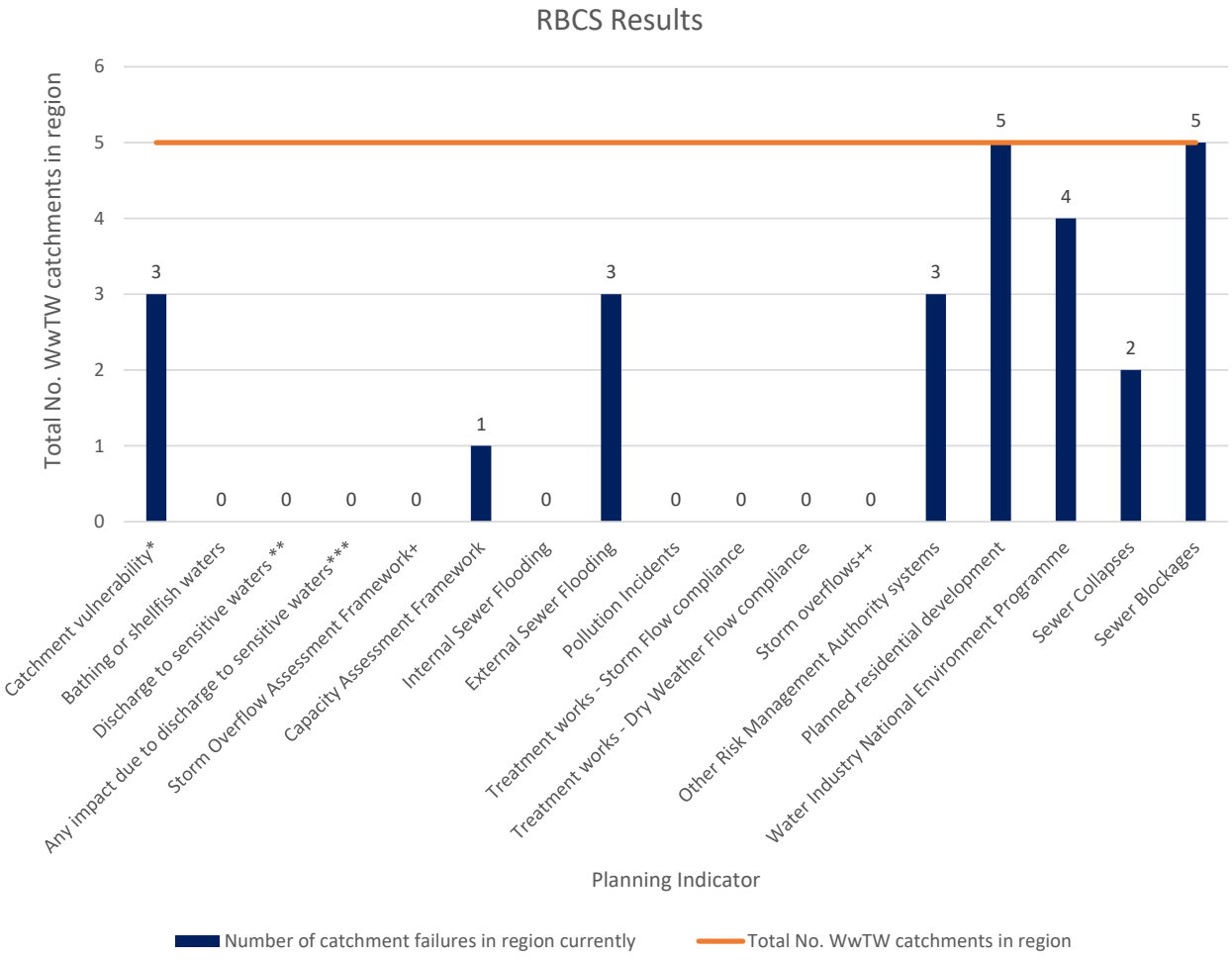
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to increase to 20100 by 2050, a change of 23% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Ffos Las with 233 units and Heol Llanelli with 100 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 RBS 3 of the 5 L4 catchments within this L3 are vulnerable to sewer flooding due to extreme storm events. Planned residential developments and sewer blockages were also flagged as areas of potential risk within this 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.

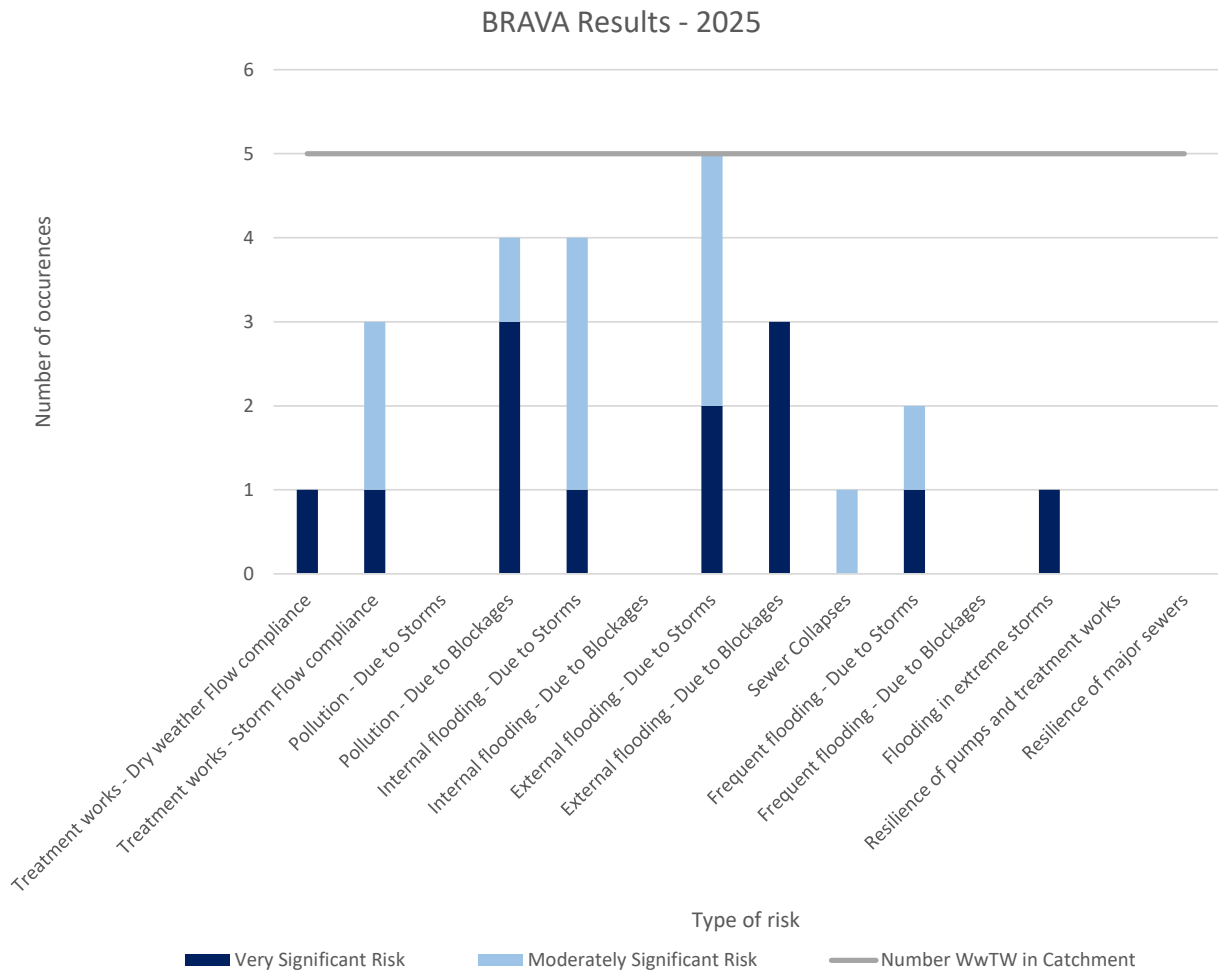


Figure 4 - BRAVA 2025 Summary

In 2025 it is expected that internal flooding will be the most significant risk within this catchment, both due to storm events and blockages. It is expected that 8 types of risk in total will contribute to overall risk within the catchment.

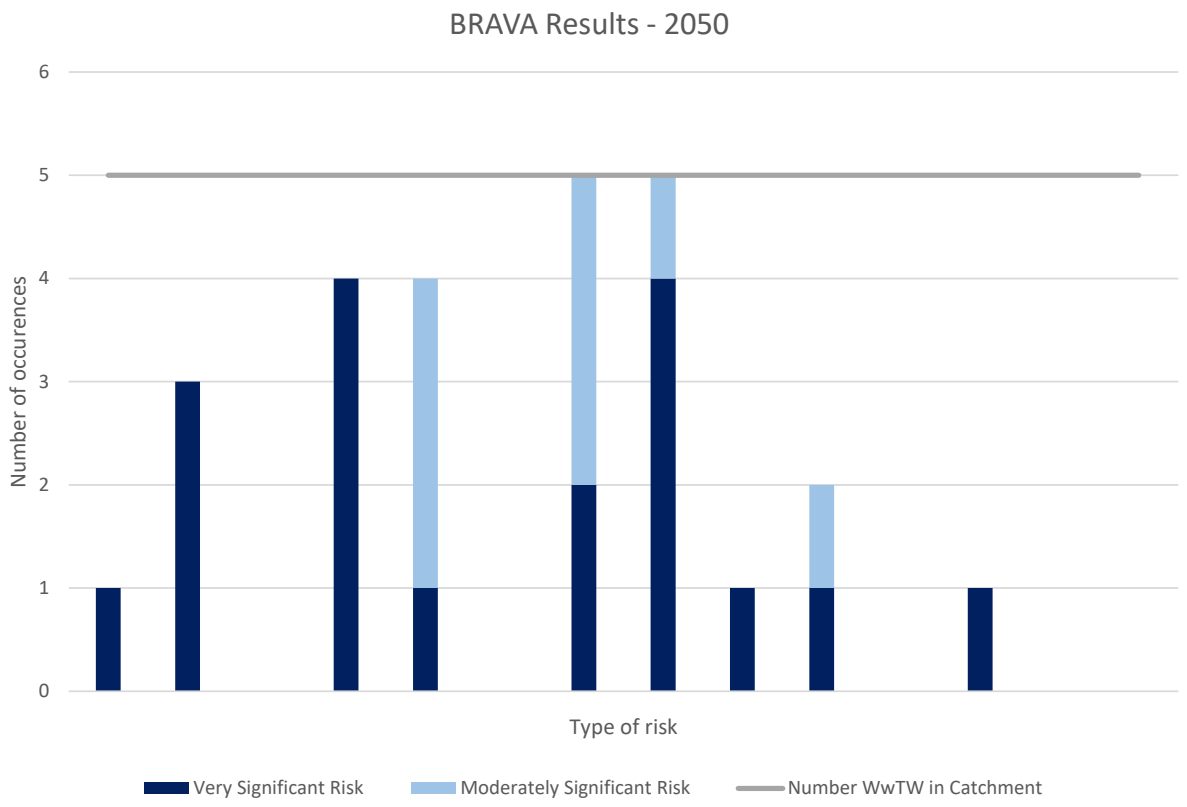


Figure 5 - BRAVA 2050 Summary

In 2050 it is expected that internal flooding due to blockages will remain a significant risk within the catchment. Sewer collapse, treament work compliance due to storms and pollution due to storms are expected to also be significat 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.

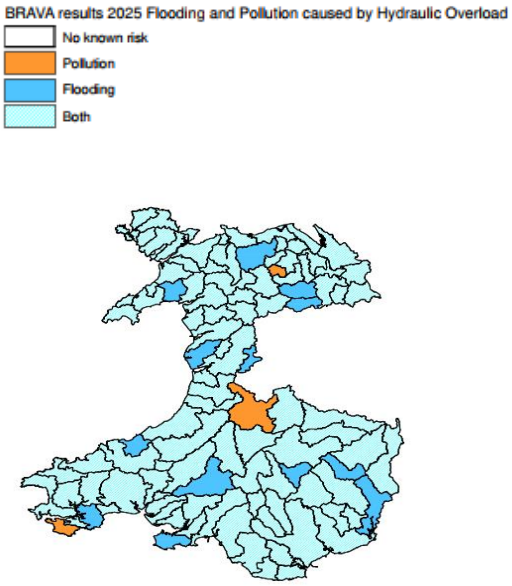


Figure 6 - Associated Strategic Planning Areas priority (2025)

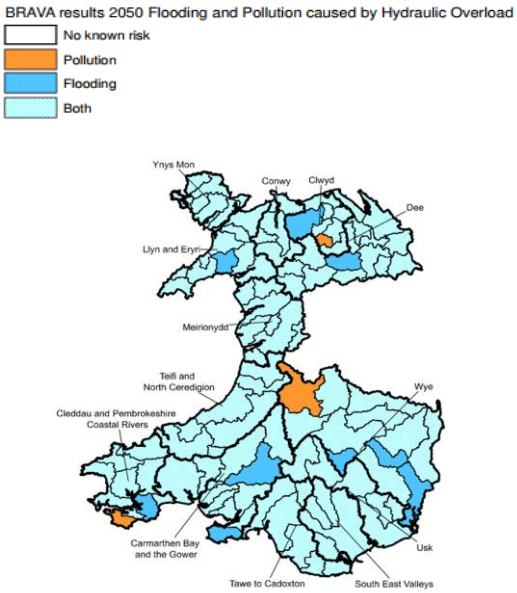


Figure 7 - Associated Strategic Planning Areas

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. Gwendraeth Fawr - Afan Goch 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
Gwendraeth Fawr - Afan Goch 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.

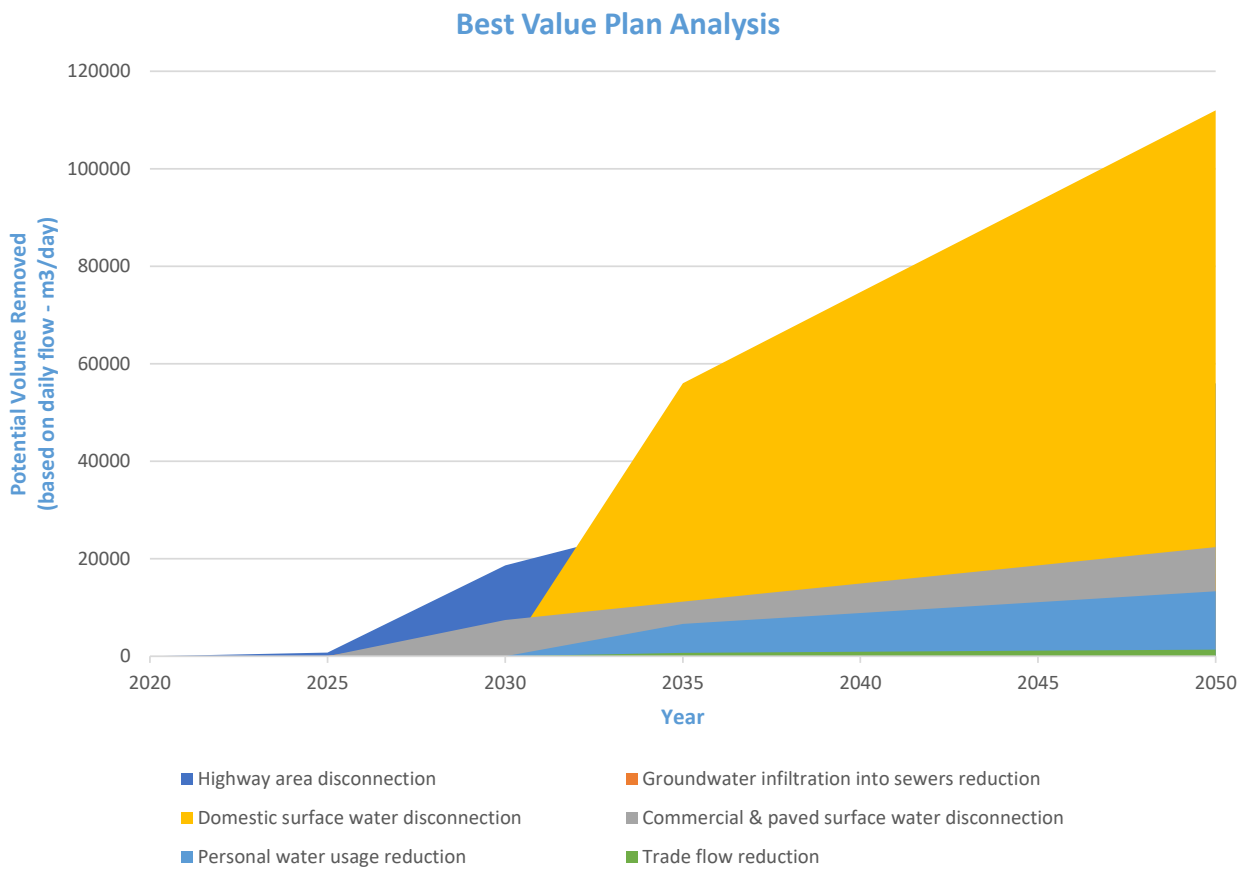


Figure 8 - Best Value Plan Analysis

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*	-	£16,000,000.00	£22,000,000.00
40 spills in a Typical Year	£9,000,000.00	£9,000,000.00	£9,000,000.00
20 spills in a Typical Year	£27,000,000.00	£28,000,000.00	£28,000,000.00
10 spills in a Typical Year	£43,000,000.00	£45,000,000.00	£46,000,000.00
0 spills in a Typical Year	£89,000,000.00	£92,000,000.00	£96,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	140.00	146.00	154.00

* 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	£15,000,000	£18,000,000	£21,000,000
No flooding	-	£1,000,000	£2,000,000
Total	£16,000,000.00	£20,000,000	£24,000,000

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
PONTYBEREM	0
CARWAY STW	0
TRIMSARAN	0
PONTYATES	0
FOUR ROADS STW	0

DWMP Tactial Planning Catchment Summary

Lliw - headwaters to confluence with Llan

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 Lliw - headwaters to confluence with Llan planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 2 wastewater catchments (see Figure 2 below). There is a combined population of 284, this is set to decrease to 243 by 2050, a change of -14%. There is a total sewer length of 375km, with a foul sewer length of 182km, a surface water length of 81km and a combined sewer length of 98km. There are 2 Wastewater Treatment Works (WwTW), 0 Sewerage Pumping Stations (SPSs), and 0 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Lliw catchment is locate between the east of Swansea. At the southern end of the catchment is the city of Gowerton near the estuary of the River Loughor. The catchment stretches north into the valleys and the Lliw Reservoir.

In this catchment there are multiple rivers that confluence into the River Loughor. These include the River Llan and Lliw. The River Clyne is also located at the south of this catchment and drains into Swansea Bay.

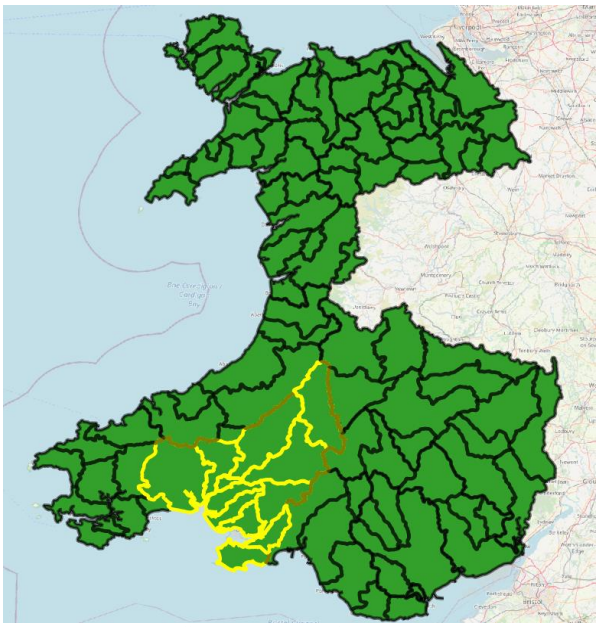


Figure 1 - River basin location detailing the associated tactial planning catchments

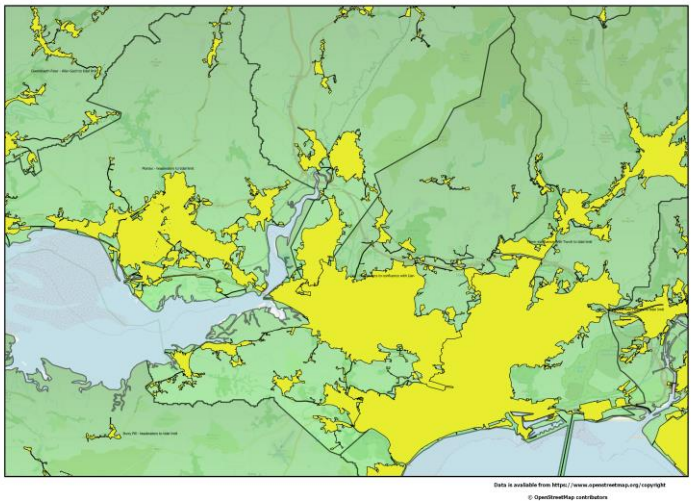


Figure 2- Tactical planning catchment

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.

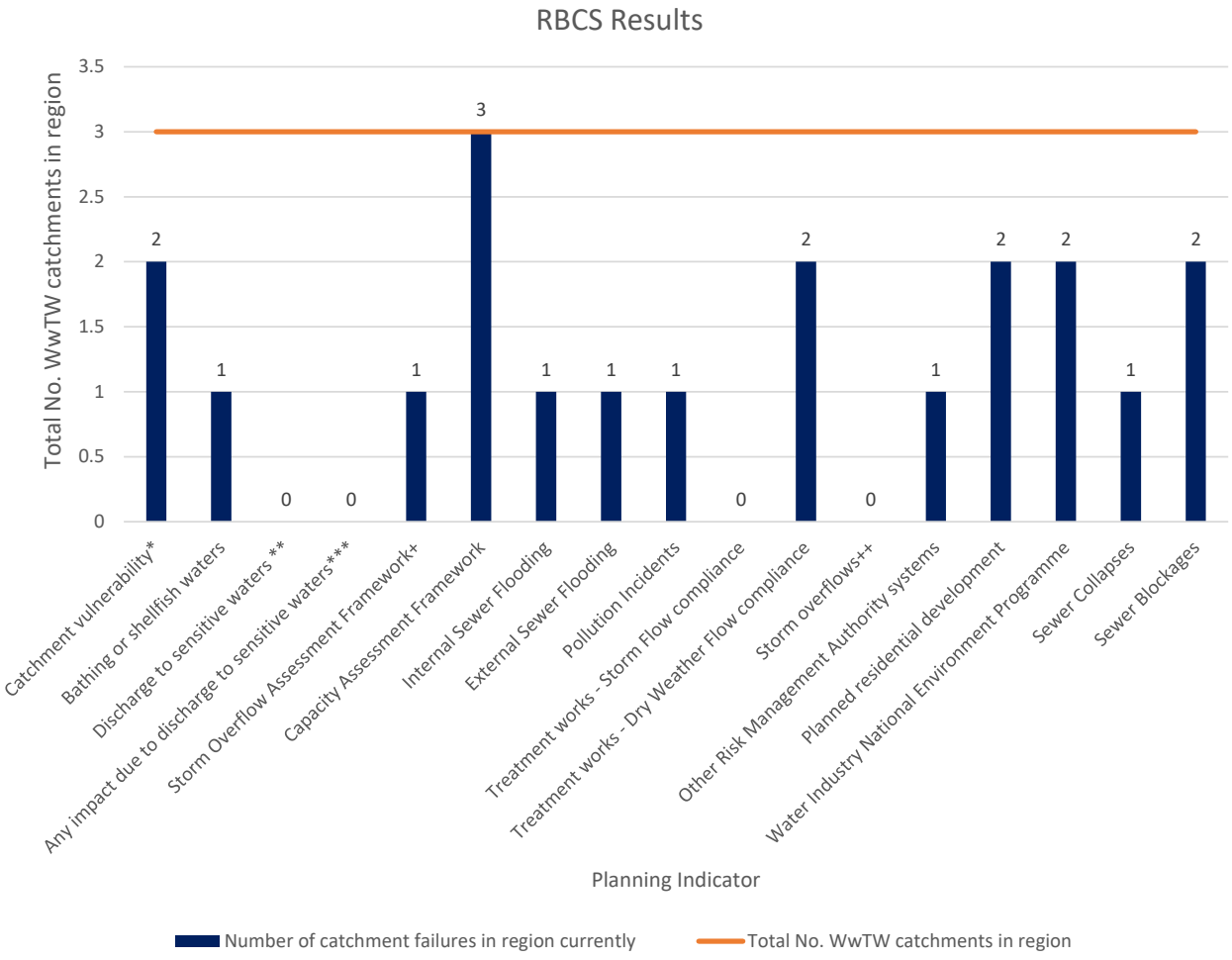
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 200 by 2050, a change of -14% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including six strategic devlopment sites with a total number of 4,575 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 2 out of 3 catchments in Lliw are predicted to flood. These catchments are at risk of impacts of future developments in the catchment leading to WwtW compliance issues and more flooding in the catchment. It is reported that there will be planned developments in these catchments and a high predicted growth rate. In the majority of the catchments NRW are reporting risks of surface water flooding.



*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.

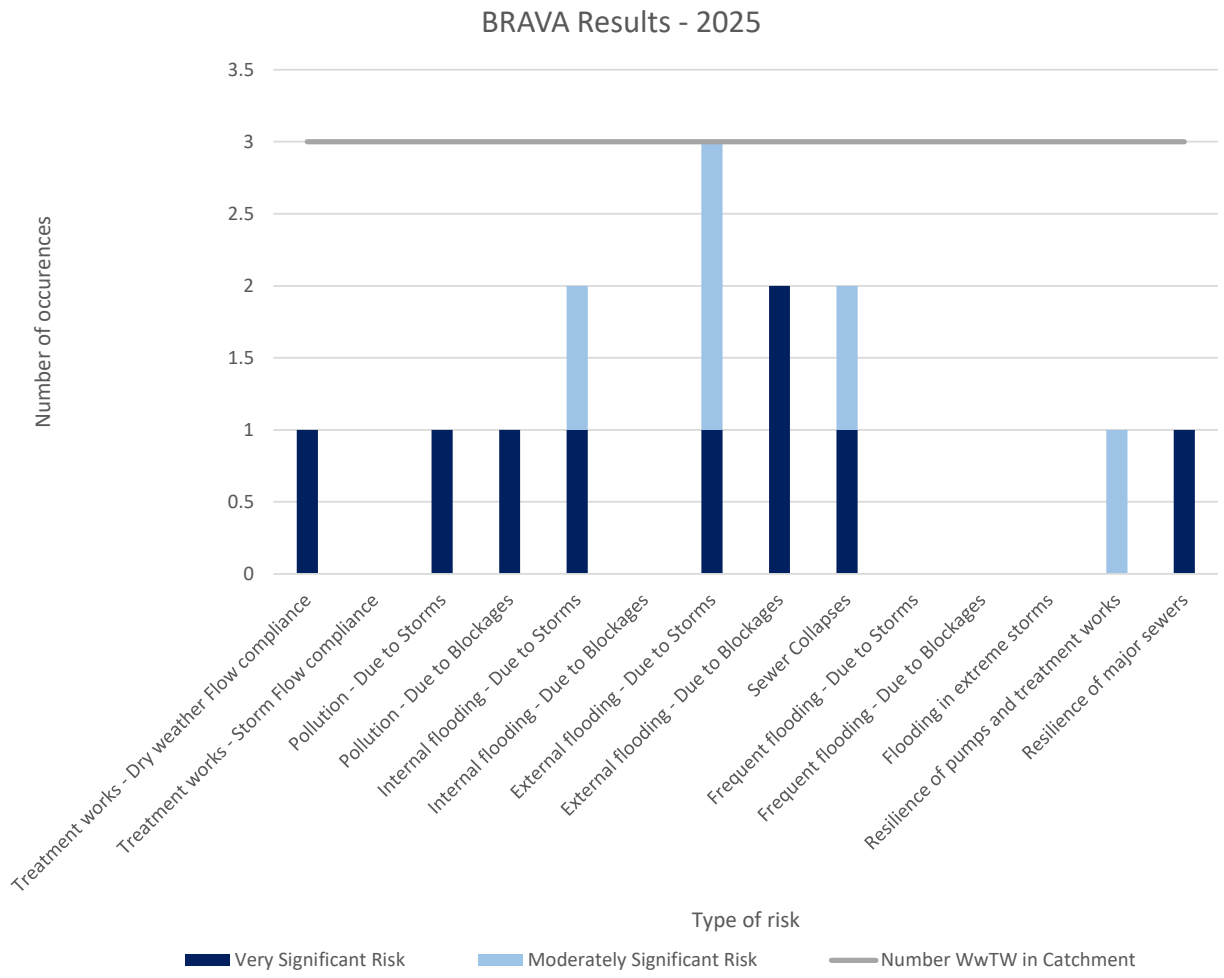


Figure 4 - BRAVA 2025 Summary

In 2025 the most significant risks are flooding and blockage during storm events, it is also predicted that there could be WwTW compliance issues occurring during these storm events.

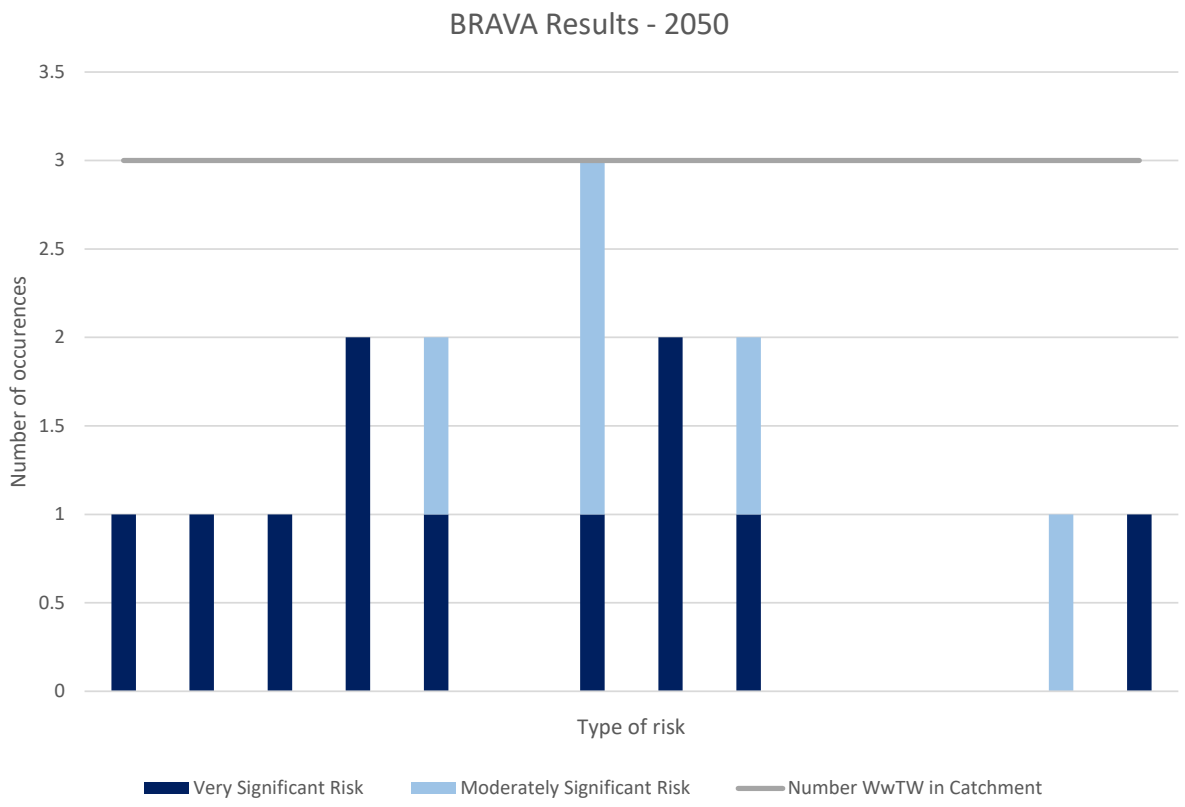


Figure 5 - BRAVA 2050 Summary

In 2050 the same issues persist as 2025. However, there will be added risks of pollution during storm events. In addition to this, the risk WwtW compliance issues in dry weather conditions increased possibly due to the growth in population.

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.

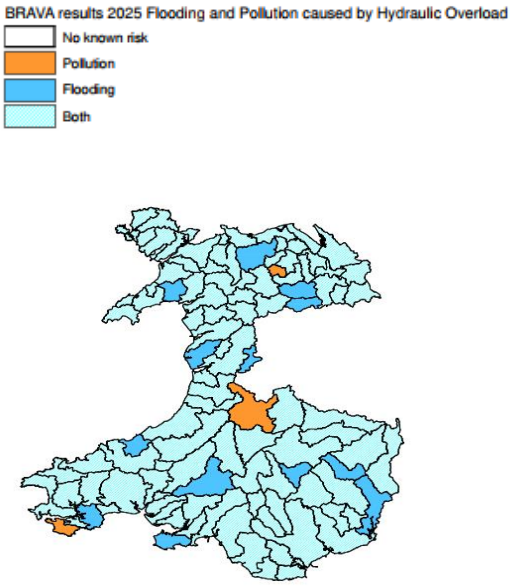


Figure 6 - Associated Strategic Planning Areas priority (2025)

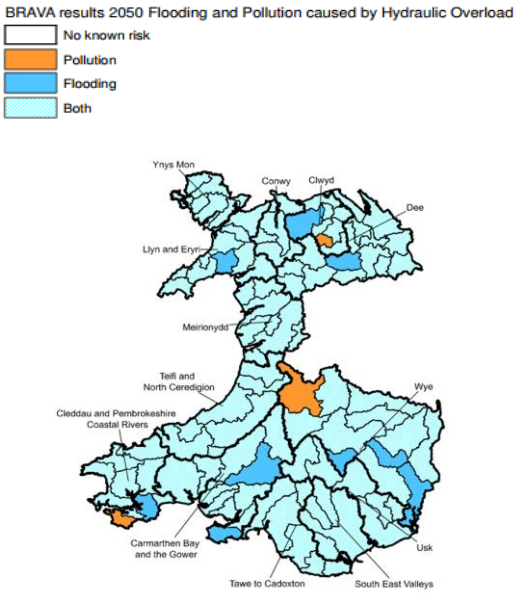


Figure 7 - Associated Strategic Planning Areas

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. Lliw - headwaters to confluence with Llan 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?

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
Lliw - headwaters to confluence with Llan	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.

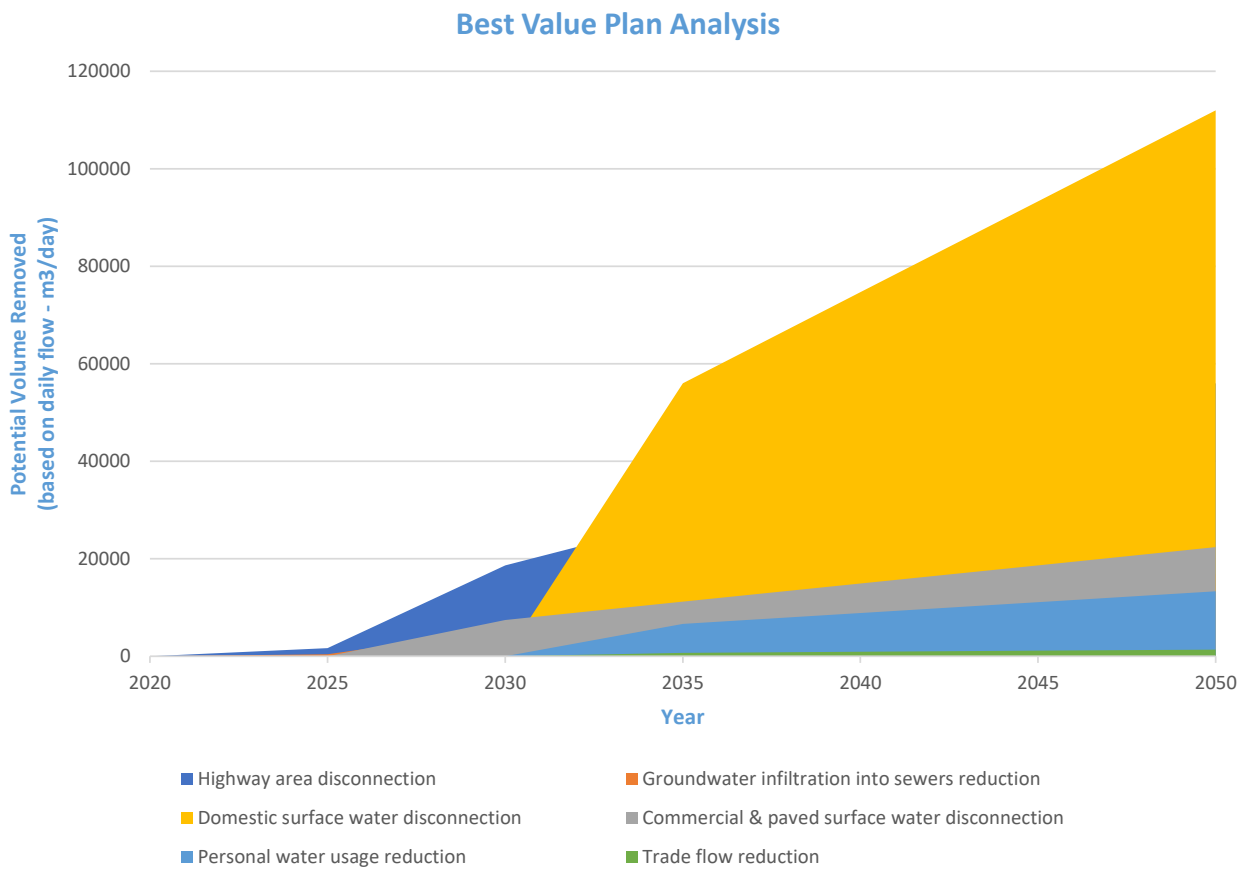


Figure 8 - Best Value Plan Analysis

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*	-	£15,000,000.00	£17,000,000.00
40 spills in a Typical Year	£0.00	£0.00	£2,000,000.00
20 spills in a Typical Year	£6,000,000.00	£6,000,000.00	£10,000,000.00
10 spills in a Typical Year	£21,000,000.00	£25,000,000.00	£32,000,000.00
0 spills in a Typical Year	£68,000,000.00	£75,000,000.00	£83,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	41.00	47.00	64.00

* 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	£6,000,000	£7,000,000	£7,000,000
External escapes in gardens	£6,000,000	£7,000,000	£6,000,000
Escapes in highways	£22,000,000	£26,000,000	£32,000,000
No flooding	-	£1,000,000	£4,000,000
Total	£34,000,000.00	£41,000,000	£49,000,000

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
GOWERTON	8
RHYD-Y-PANDY (NR CLYDACH)	0
FELINDRE	0

DWMP Tactial Planning Catchment Summary

Loughor - confluence with Aman 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 Loughor - confluence with Aman to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 9 wastewater catchments (see Figure 2 below). There is a combined population of 26373, this is set to decrease to 21463 by 2050, a change of -19%. There is a total sewer length of 160km, with a foul sewer length of 53km, a surface water length of 27km and a combined sewer length of 76km. There are 9 Wastewater Treatment Works (WwTW), 25 Sewerage Pumping Stations (SPSs), and 21 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Loughor stretches from the southwest corner of the Brecon Beacons national park down towards the towns of Loughor and Gorseinon. Much of the catchment is steep and rural. However there are a number of settlements including Ammanford and Brynaman. The river Loughor and a number of its tribuatires run throughout the catchment.

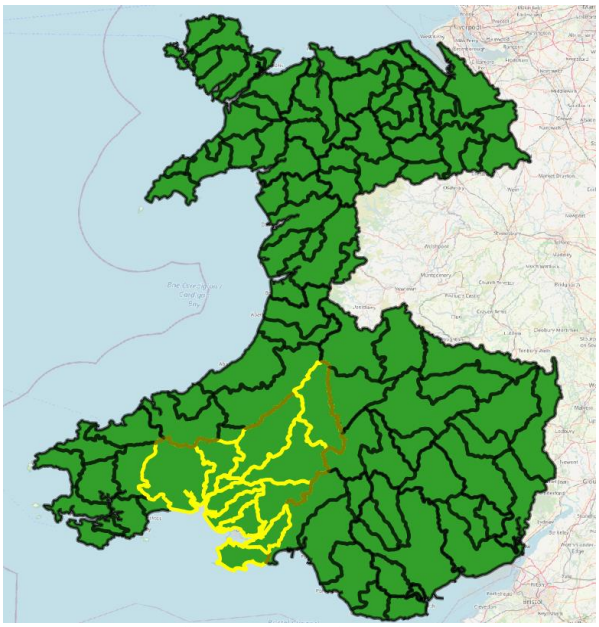


Figure 1 - River basin location detailing the associated tactial planning catchments

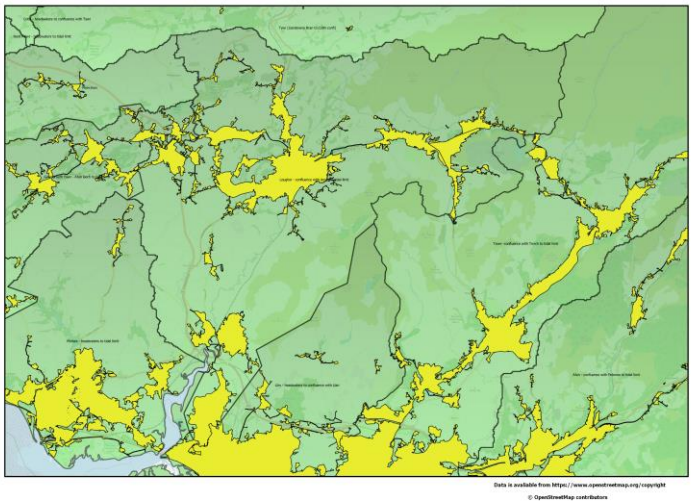


Figure 2- Tactical planning catchment

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.

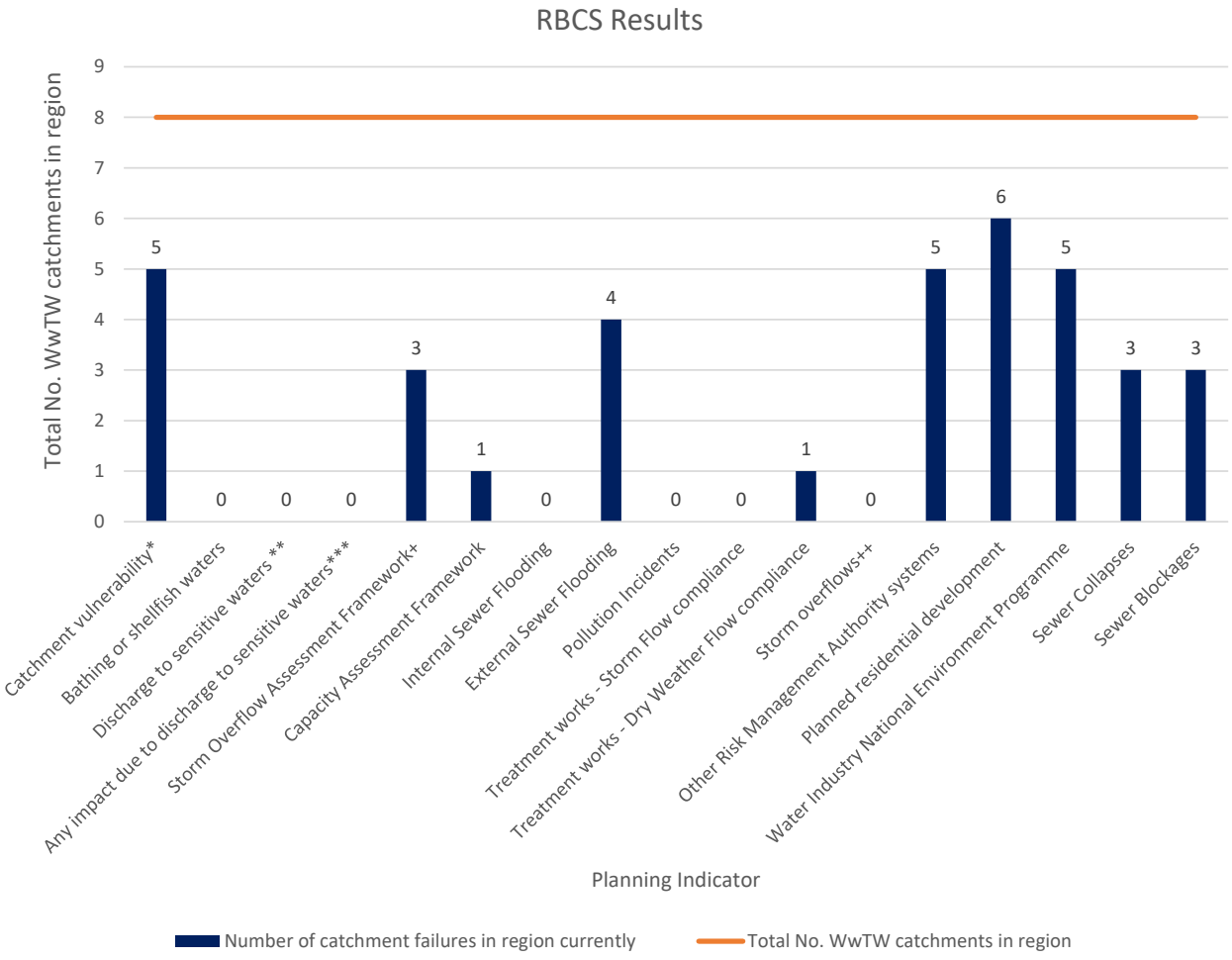
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 21500 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 a strategic site in Pontarddulais with 720 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 5 of the 8 L4 catchments within this L3 were screened as being vulnerable to sewer flooding during extreme storm events. Planned residential development, flooding issues under the purview of other risk management authorites and water industry national environment program issues were also flagged as areas of potential risk throughout the catchment.



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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.

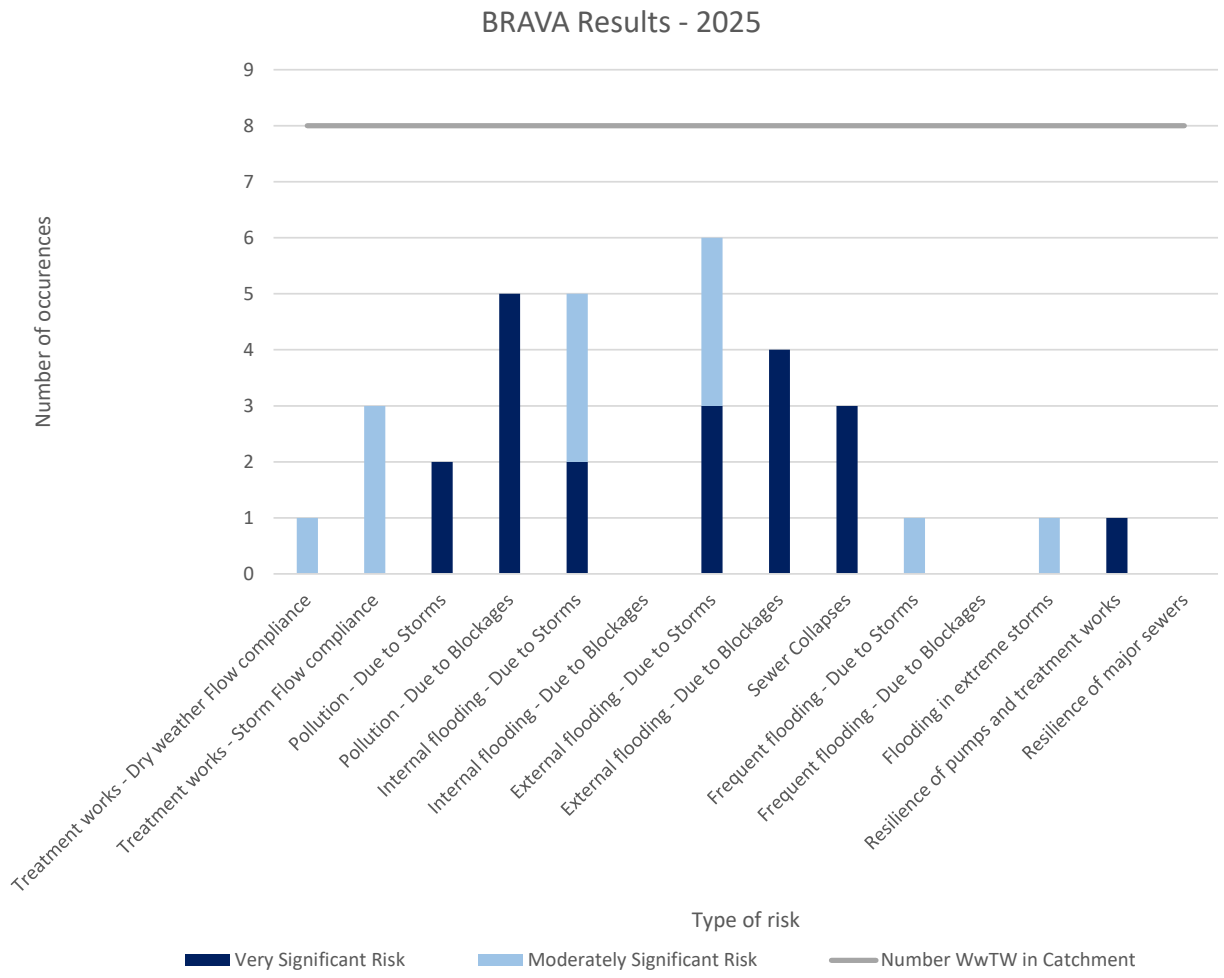

Figure 4 - BRAVA 2025 Summary

In 2025 overall risk throughout the catchment is expected to be relatively low, with internal and external flooding due to storm events expected to be the most significant.

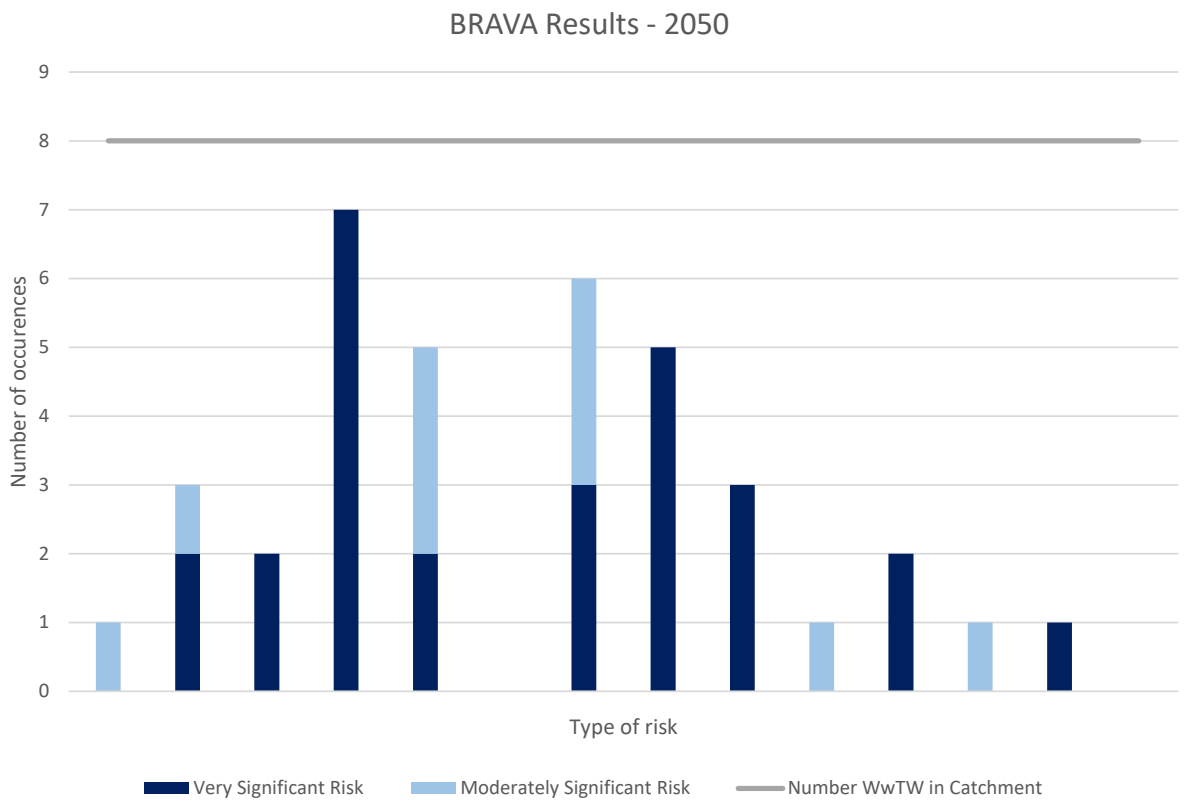

Figure 5 - BRAVA 2050 Summary

In 2050 it is expected that sewer collapse and internal flooding due to blockages will be the most significant risk 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.

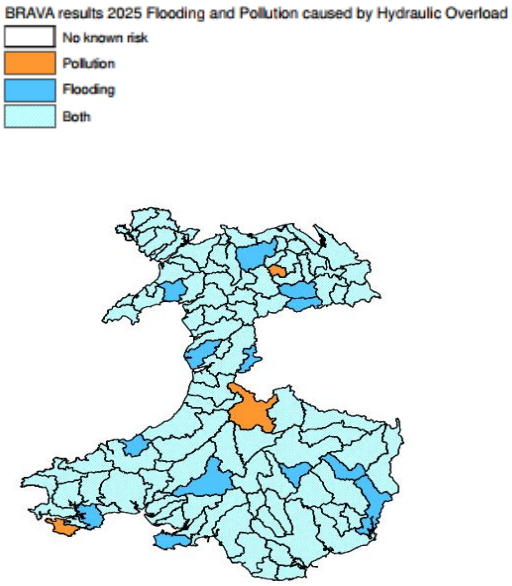

Figure 6 - Associated Strategic Planning Areas priority (2025)

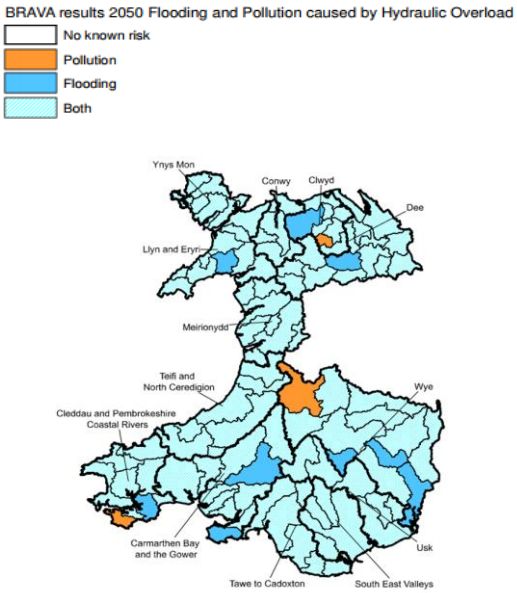

Figure 7 - Associated Strategic Planning Areas

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. Loughor - confluence with Aman to tidal limit has a water quality priority status for 2050 of 3 which indicates targeted investment to mitigate and focus during AMP9.

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
Loughor - confluence with Aman 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.

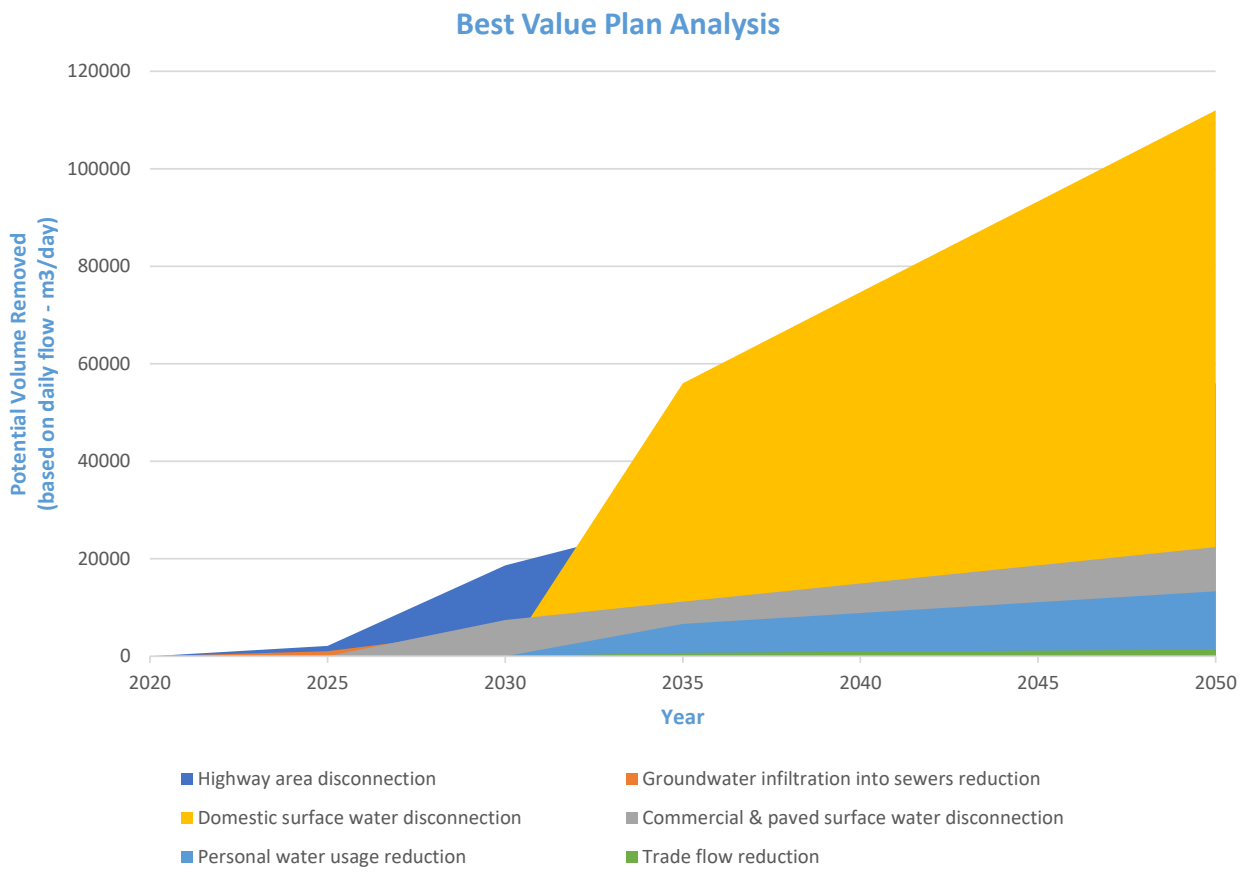

Figure 8 - Best Value Plan Analysis

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*	-	£25,000,000.00	£39,000,000.00
40 spills in a Typical Year	£17,000,000.00	£17,000,000.00	£18,000,000.00
20 spills in a Typical Year	£26,000,000.00	£26,000,000.00	£26,000,000.00
10 spills in a Typical Year	£45,000,000.00	£47,000,000.00	£49,000,000.00
0 spills in a Typical Year	£135,000,000.00	£132,000,000.00	£145,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	184.00	189.00	200.00

* 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	£2,000,000	£3,000,000	£2,000,000
External escapes in gardens	£4,000,000	£6,000,000	£6,000,000
Escapes in highways	£21,000,000	£26,000,000	£32,000,000
No flooding	-	£3,000,000	£8,000,000
Total	£27,000,000.00	£38,000,000	£48,000,000

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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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
LLANNANT	0
CROSS HANDS STW	0
CWMGWILI	0
NANTGWINEU (W OF BRYNAMMAN)	0
CARMEL & PANT-Y-LLYN	0
LLANEDI (N OF PONTARDULAIS) STW	0
CWMTAWEL (NR LAMPETER)	0
GARNSWLLT	0

DWMP Tactial Planning Catchment Summary

Meirchion

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 Meirchion planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 5 wastewater catchments (see Figure 2 below). There is a combined population of 6566, this is set to decrease to 6396 by 2050, a change of -3%. There is a total sewer length of 64km, with a foul sewer length of 46km, a surface water length of 4km and a combined sewer length of 11km. There are 5 Wastewater Treatment Works (WwTW), 20 Sewerage Pumping Stations (SPSs), and 14 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Meirchoin catchment stretches from Caeryrddin Bay at Kidwelly, North East towards the Brecon Beacons. The area is mostly country side with small villages scattered across the cathcment. The main watercourses in this catchment include; The River Lleidi, Dafen and Morlais. All confluencing into the River Loughor Estuary.

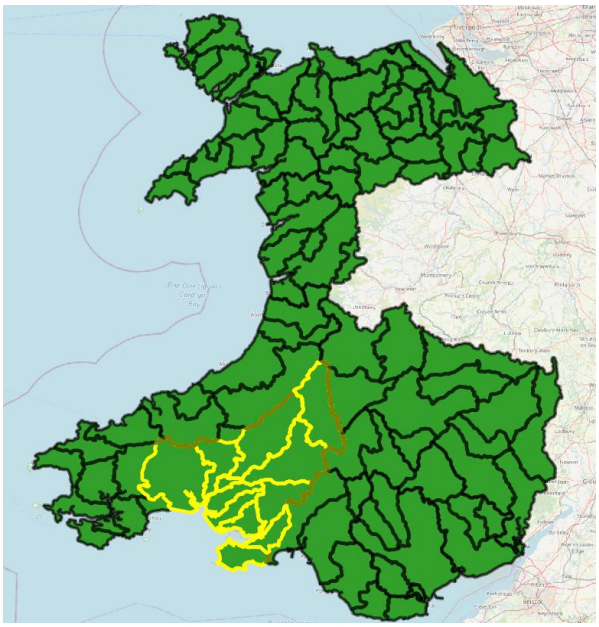


Figure 1 - River basin location detailing the associated tactial planning catchments

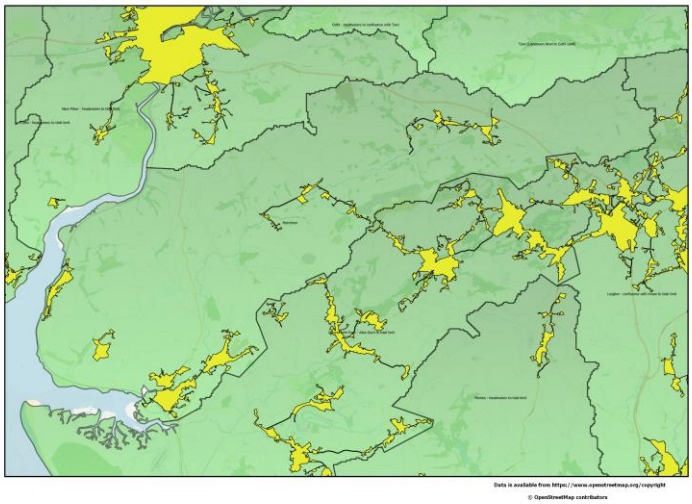


Figure 2- Tactical planning catchment

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.

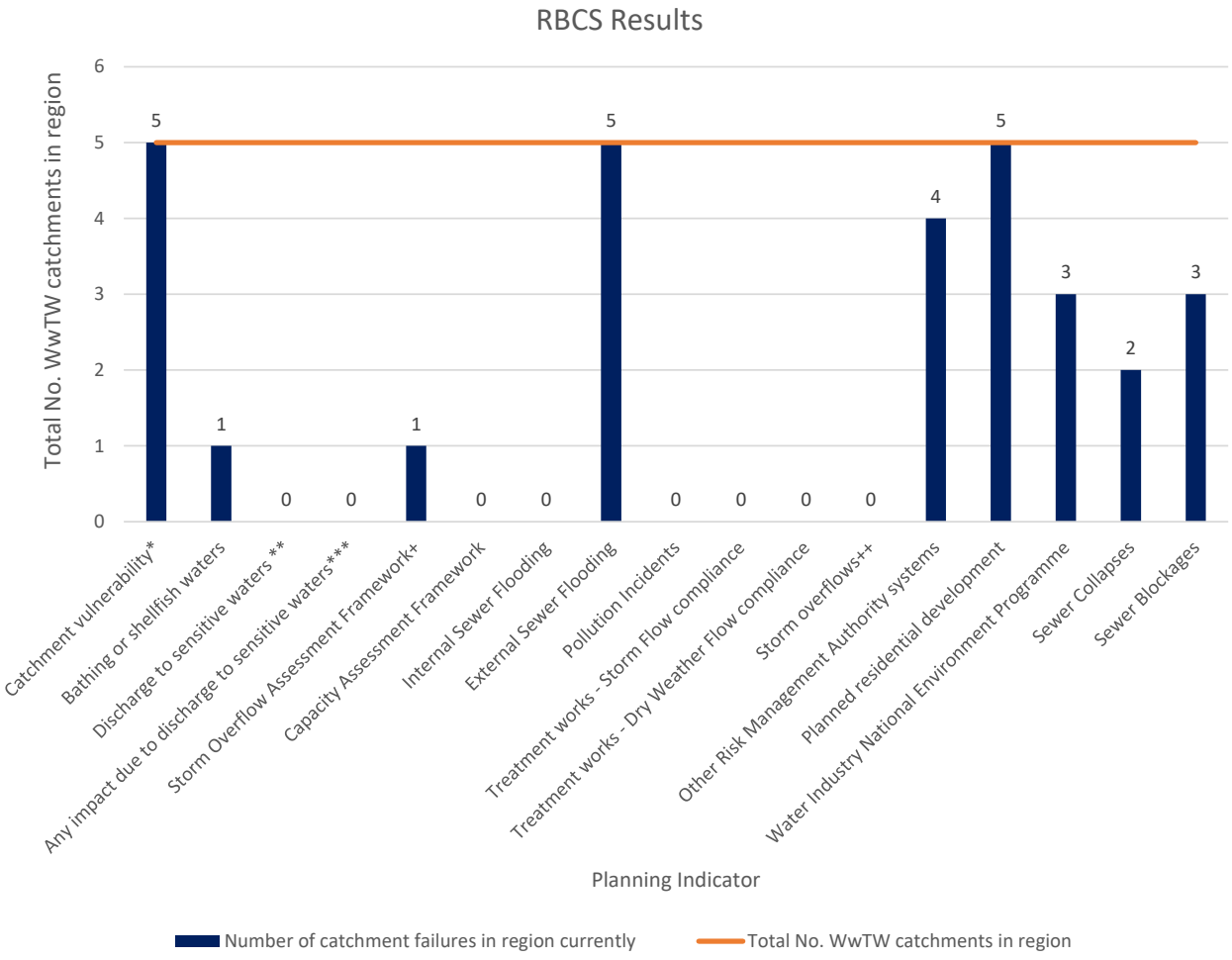
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 6400 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 Stockwell Lane, Kidwelly with 95 units and Former UK Optics Site, Kidwelly with 74 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 5 out of 5 catchments in Meirchion are predicted to flood. It is reported that there will be planned developments in all catchment and a high predicted growth rate. In the majority of the catchments NRW are reporting risks of surface water flooding and blockages.



*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.

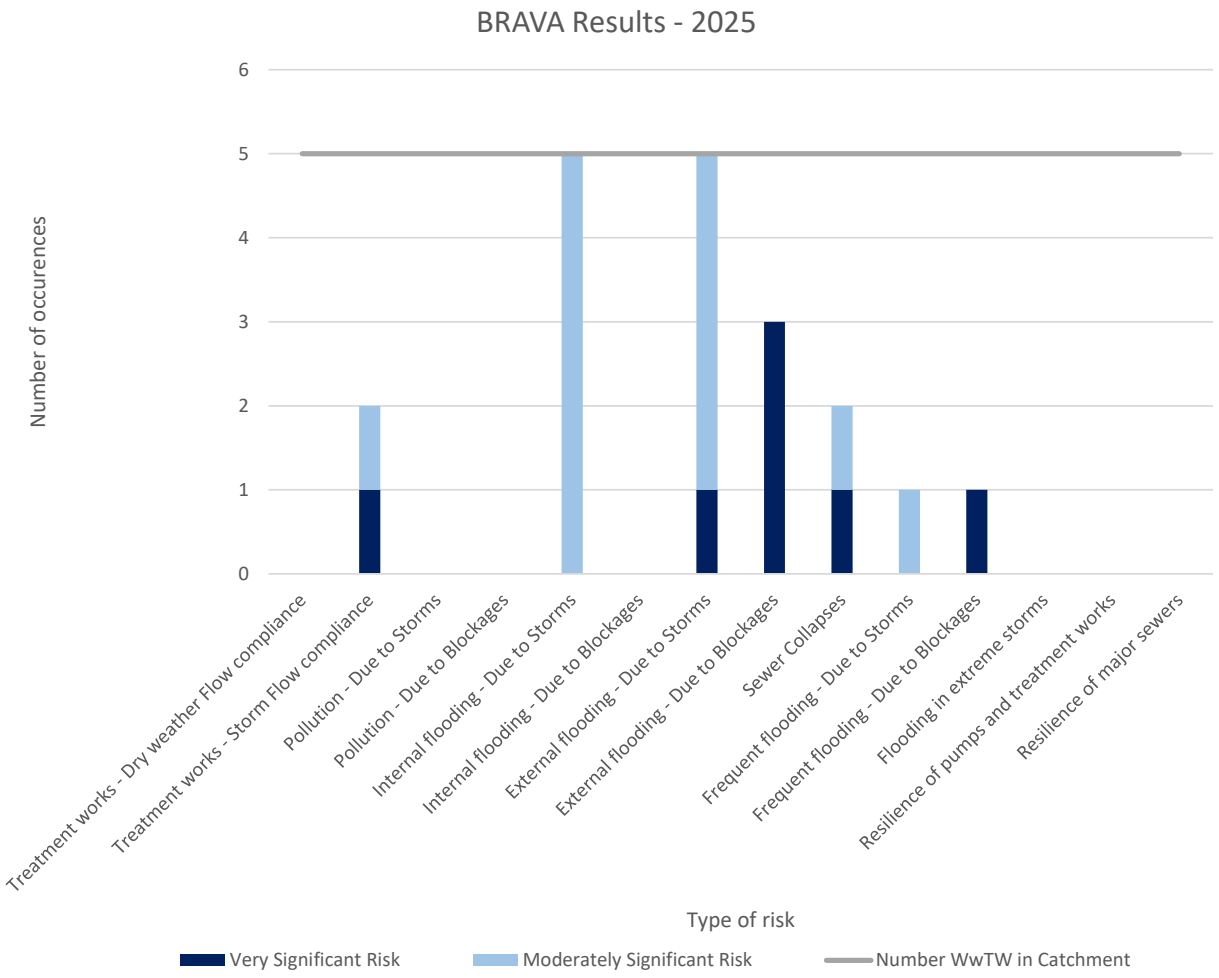


Figure 4 - BRAVA 2025 Summary

In 2025 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.

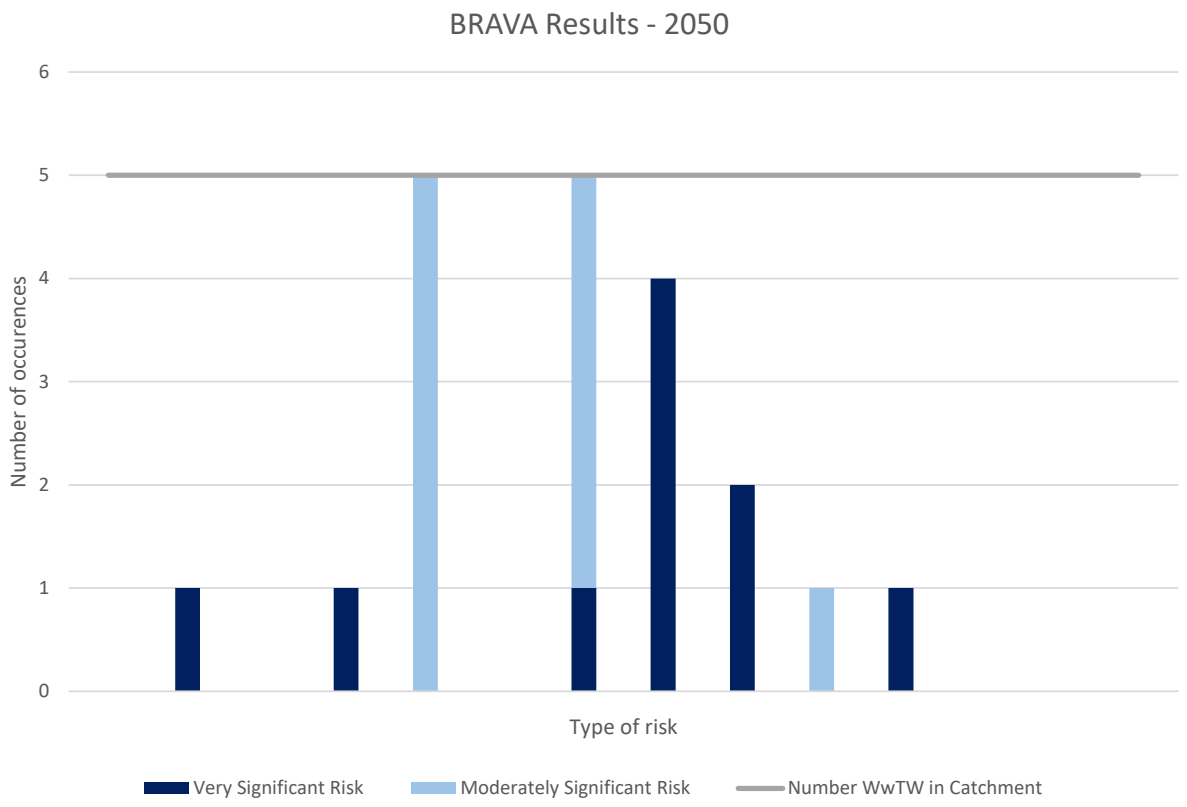


Figure 5 - BRAVA 2050 Summary

In 2050 the same issues persist as 2025. There is a decrease in the risk of internal flooding in the catchment during storm events. However, there is a an increase in blockages and external flooding.

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.

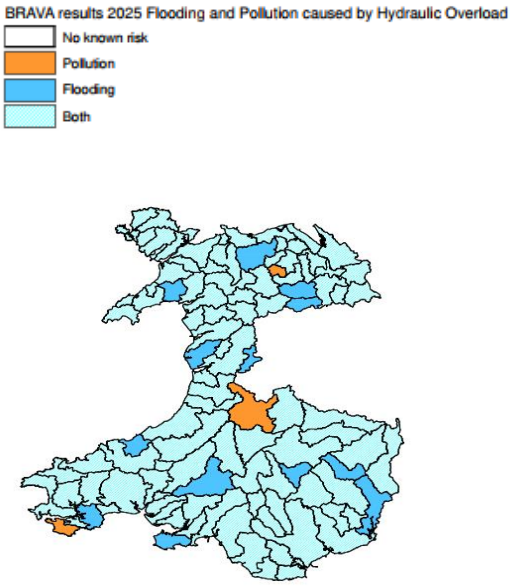


Figure 6 - Associated Strategic Planning Areas priority (2025)

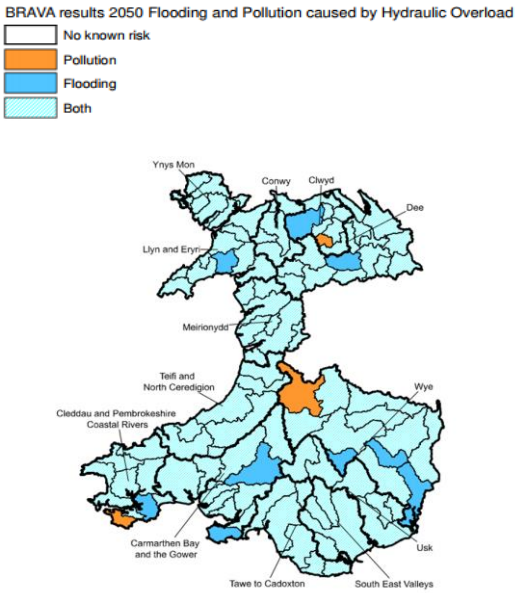


Figure 7 - Associated Strategic Planning Areas

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. Meirchion 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?

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
Meirchion	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.

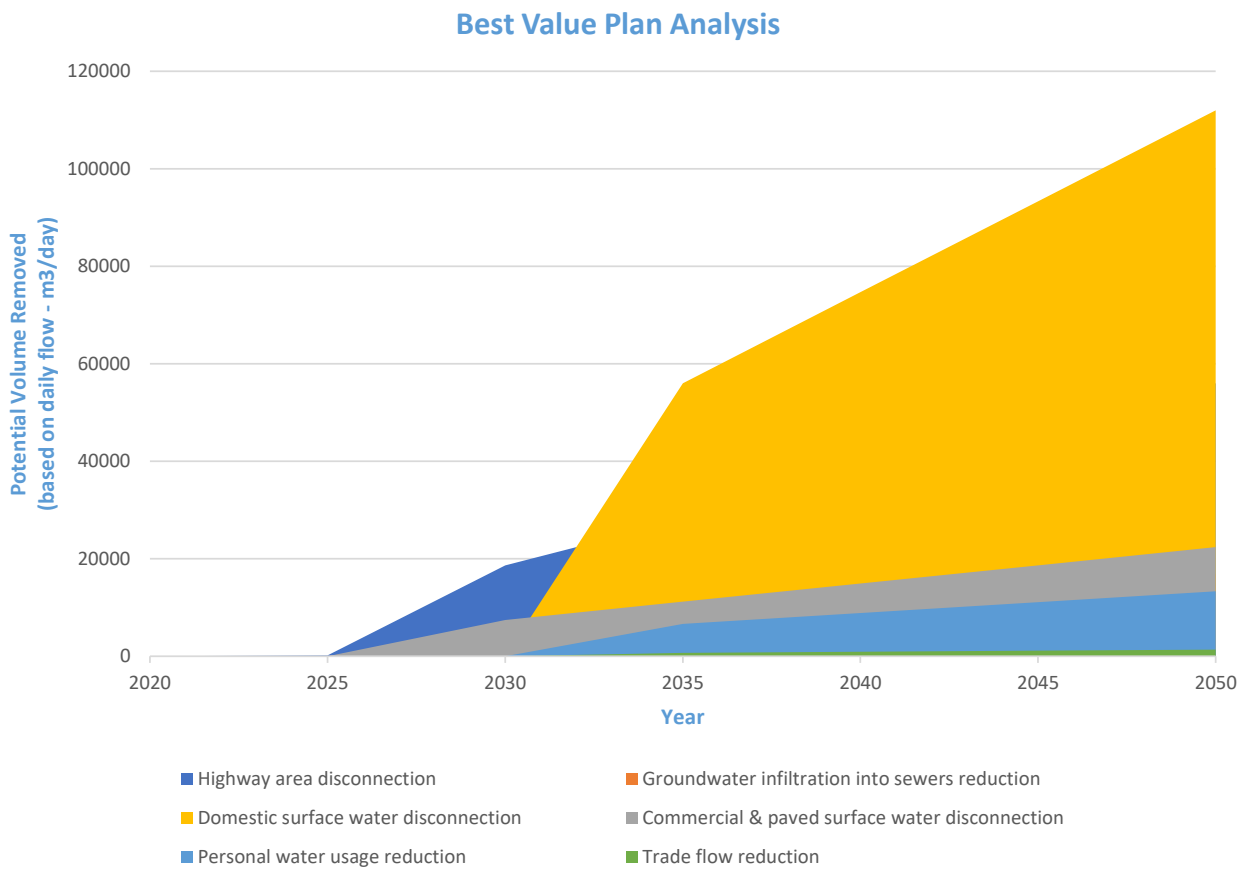


Figure 8 - Best Value Plan Analysis

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*	-	£7,000,000.00	£12,000,000.00
40 spills in a Typical Year	£2,000,000.00	£1,000,000.00	£1,000,000.00
20 spills in a Typical Year	£2,000,000.00	£2,000,000.00	£3,000,000.00
10 spills in a Typical Year	£4,000,000.00	£4,000,000.00	£5,000,000.00
0 spills in a Typical Year	£14,000,000.00	£14,000,000.00	£16,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	17.00	19.00	21.00

* 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	£8,000,000	£9,000,000
No flooding	-	£1,000,000	£2,000,000
Total	£7,000,000.00	£9,000,000	£11,000,000

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
KIDWELLY STW	0
LLANDDAROG STW	0
FERRYSIDE (NR KIDWELLY)	0
LLANSAINT	0
LLANGYNDEYRN STW	0

DWMP Tactial Planning Catchment Summary

Morlais - headwaters 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 Morlais - headwaters to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 4 wastewater catchments (see Figure 2 below). There is a combined population of 64778, this is set to increase to 66578 by 2050, a change of 3%. There is a total sewer length of 447km, with a foul sewer length of 158km, a surface water length of 43km and a combined sewer length of 239km. There are 4 Wastewater Treatment Works (WwTW), 77 Sewerage Pumping Stations (SPSs), and 53 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Morlais catchment borders the estuary of the River Loughor. The catchments stretches along the coastline from Llangennech to Pembrey. This also includes the city of Llanelli. The North of the catchment is towards the Valleys around Llannon. The main watercourses in this catchment include; The River Lleidi, Dafen and Morlais. All confluencing into the River Loughor Estuary.

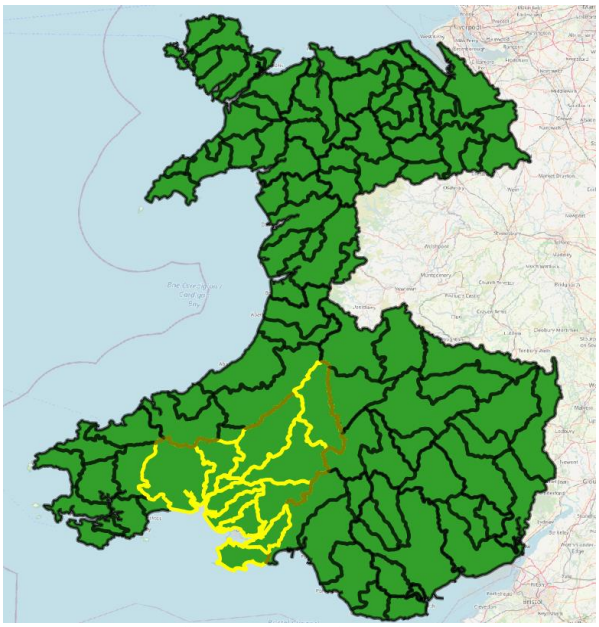


Figure 1 - River basin location detailing the associated tactial planning catchments

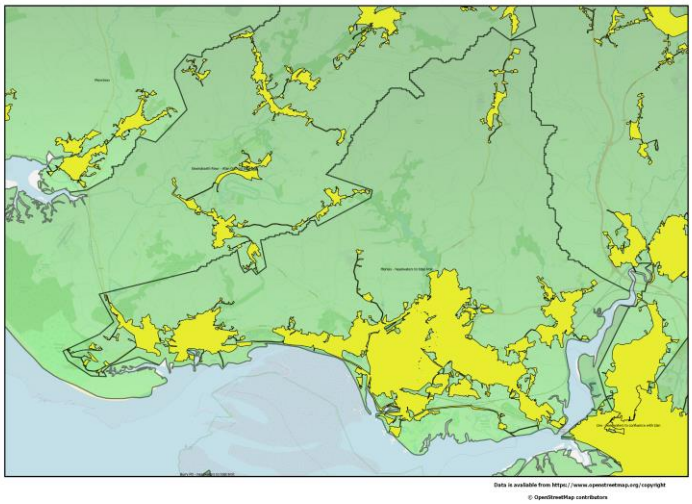


Figure 2- Tactical planning catchment

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.

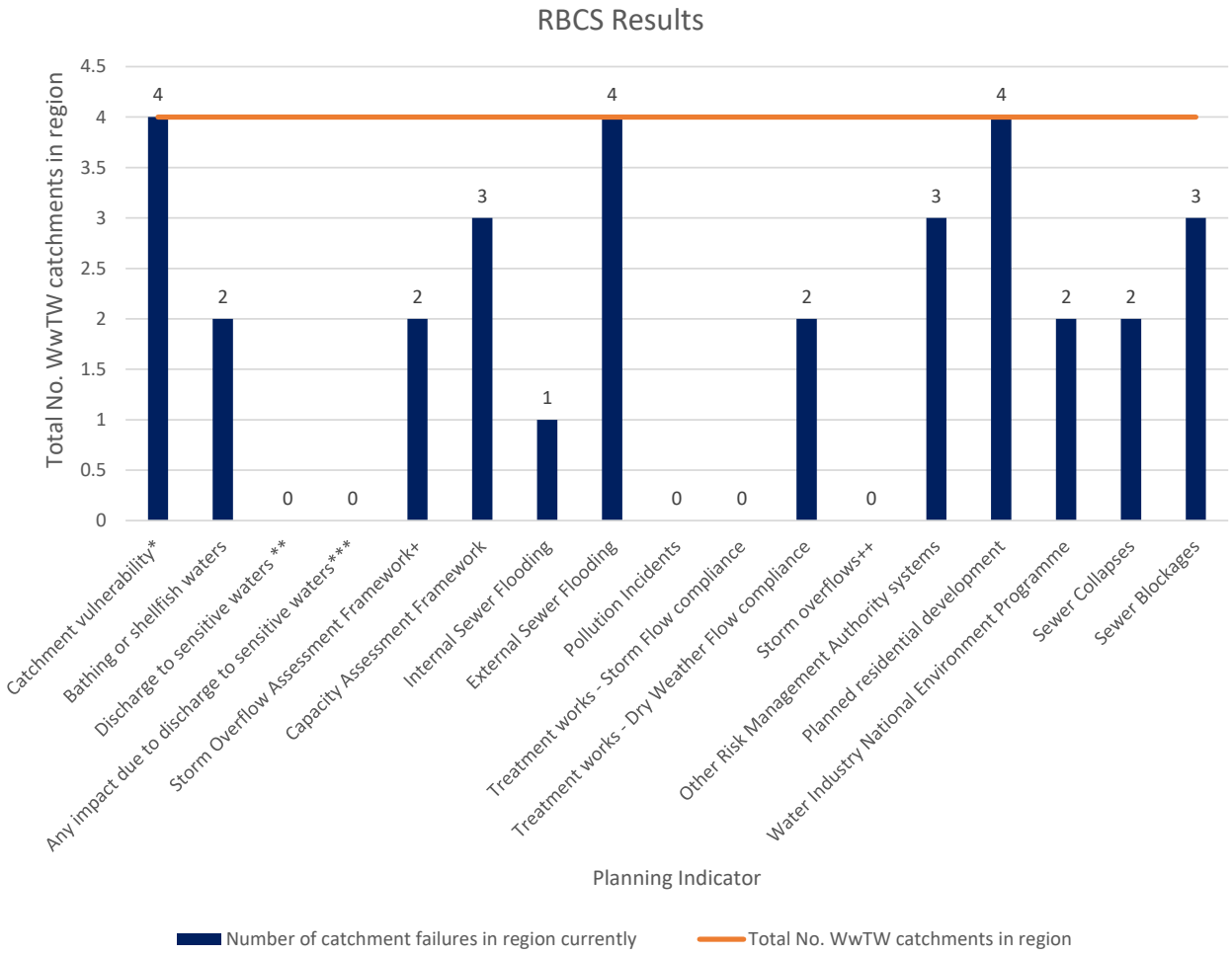
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to increase to 66600 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 the Former Stradey Park in Llanelli Coastal with 355 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 Morlais are predicted to flood. All catchments are at risk of impacts of future developments in the catchment leading to WwtW compliance issues and more flooding in the catchment. It is reported that there will be planned developments in all catchment and a high predicted growth rate. In the majority of the catchments NRW are reporting risks of surface water flooding.



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++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.

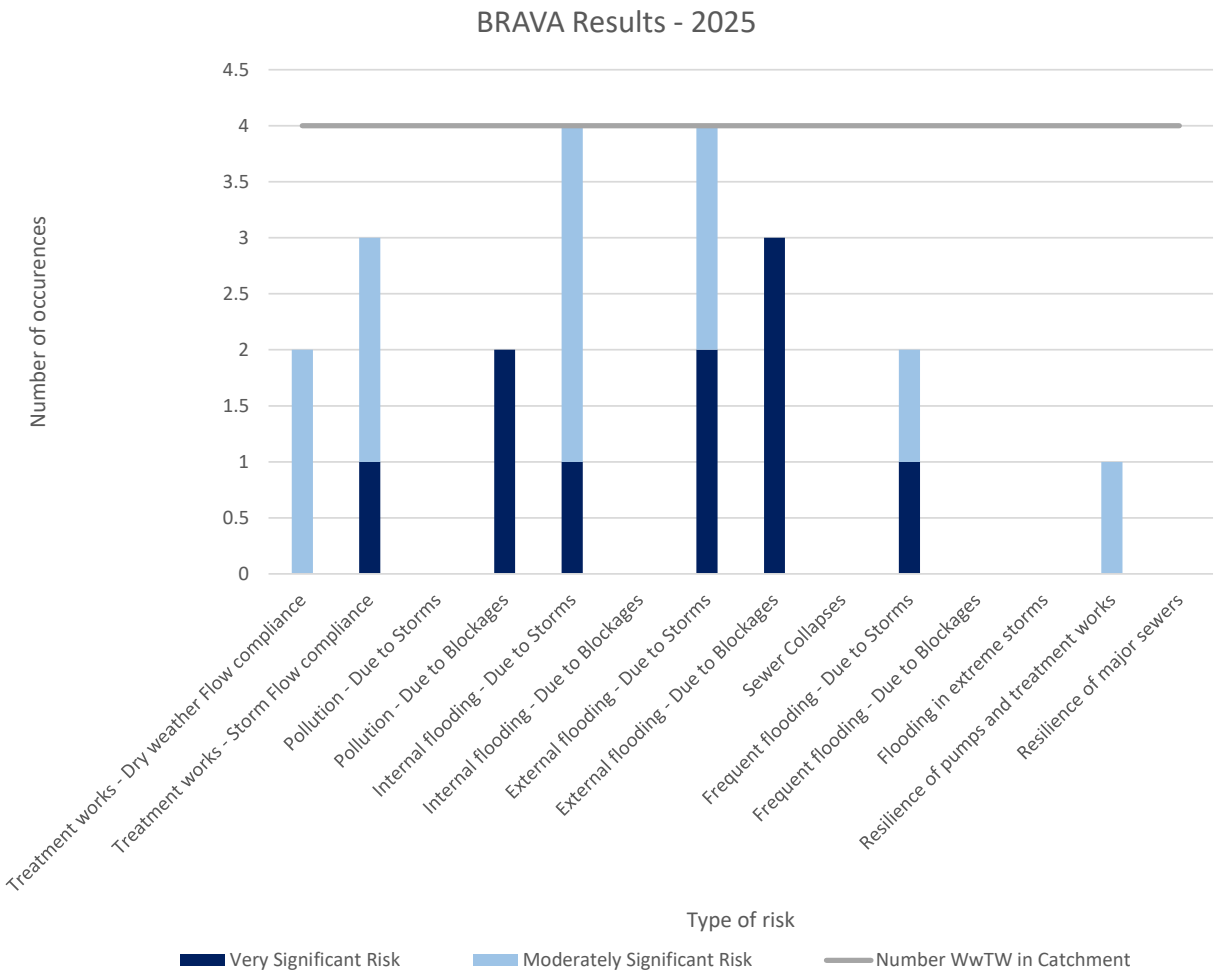


Figure 4 - BRAVA 2025 Summary

In 2025 the most significant risks are flooding and pollution caused by major storm events. Leading to blockages in the catchment and compliance issues at the WwTW

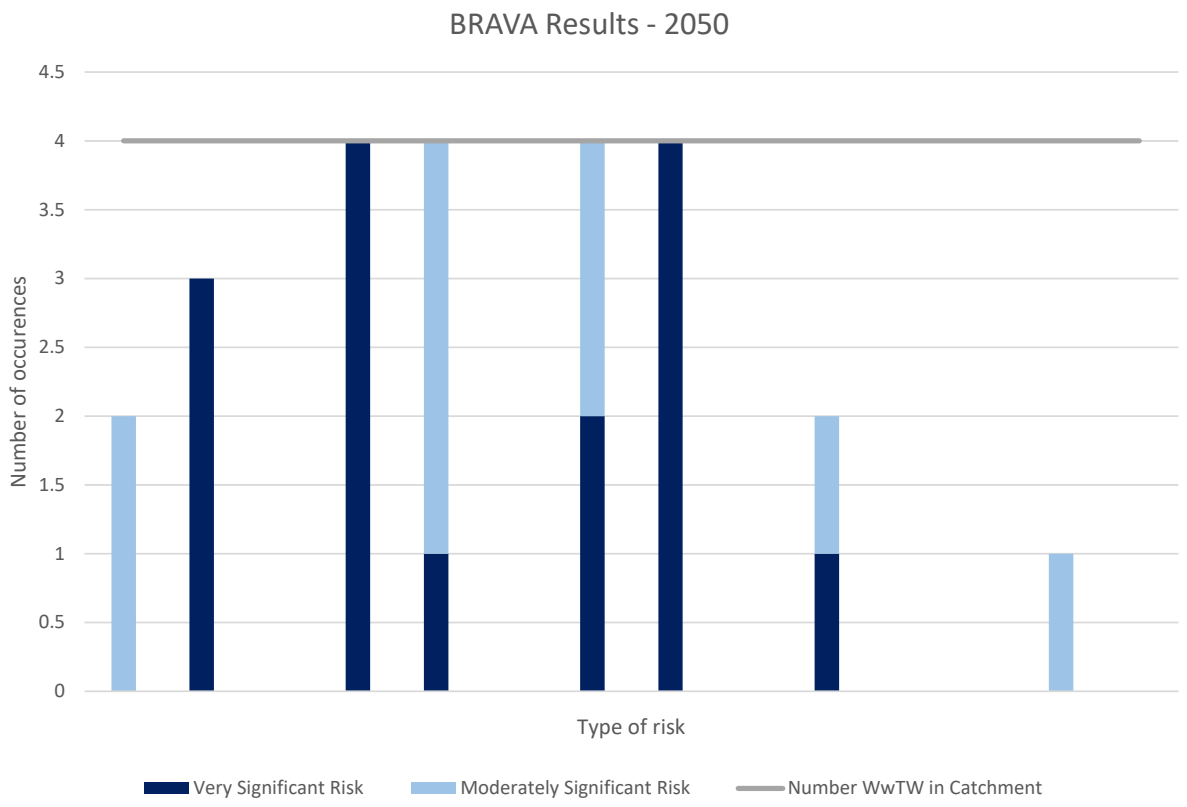


Figure 5 - BRAVA 2050 Summary

In 2050 there is an increased risk of pollution and compliance issues at the WwTW during major storm events. This is may be due to increased amounts of rainfall due to climate change.

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.

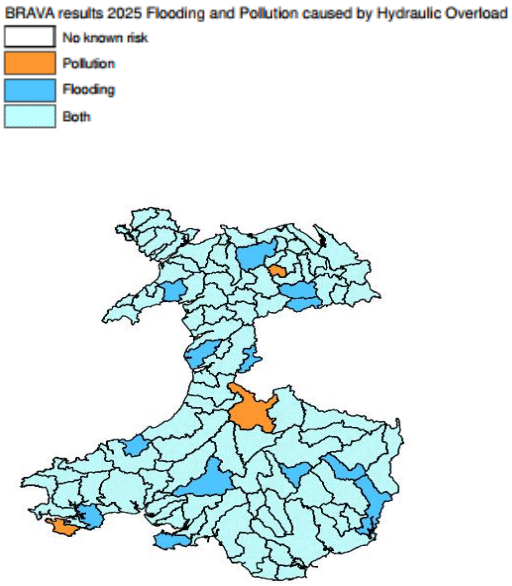


Figure 6 - Associated Strategic Planning Areas priority (2025)

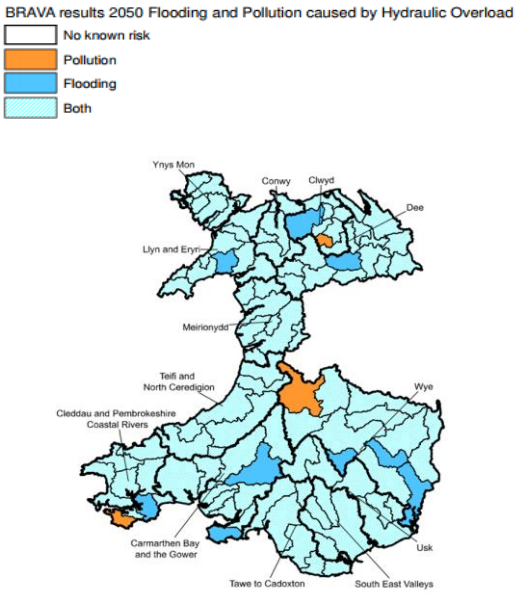


Figure 7 - Associated Strategic Planning Areas

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. Morlais - headwaters to tidal limit 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?

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
Morlais - headwaters 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.

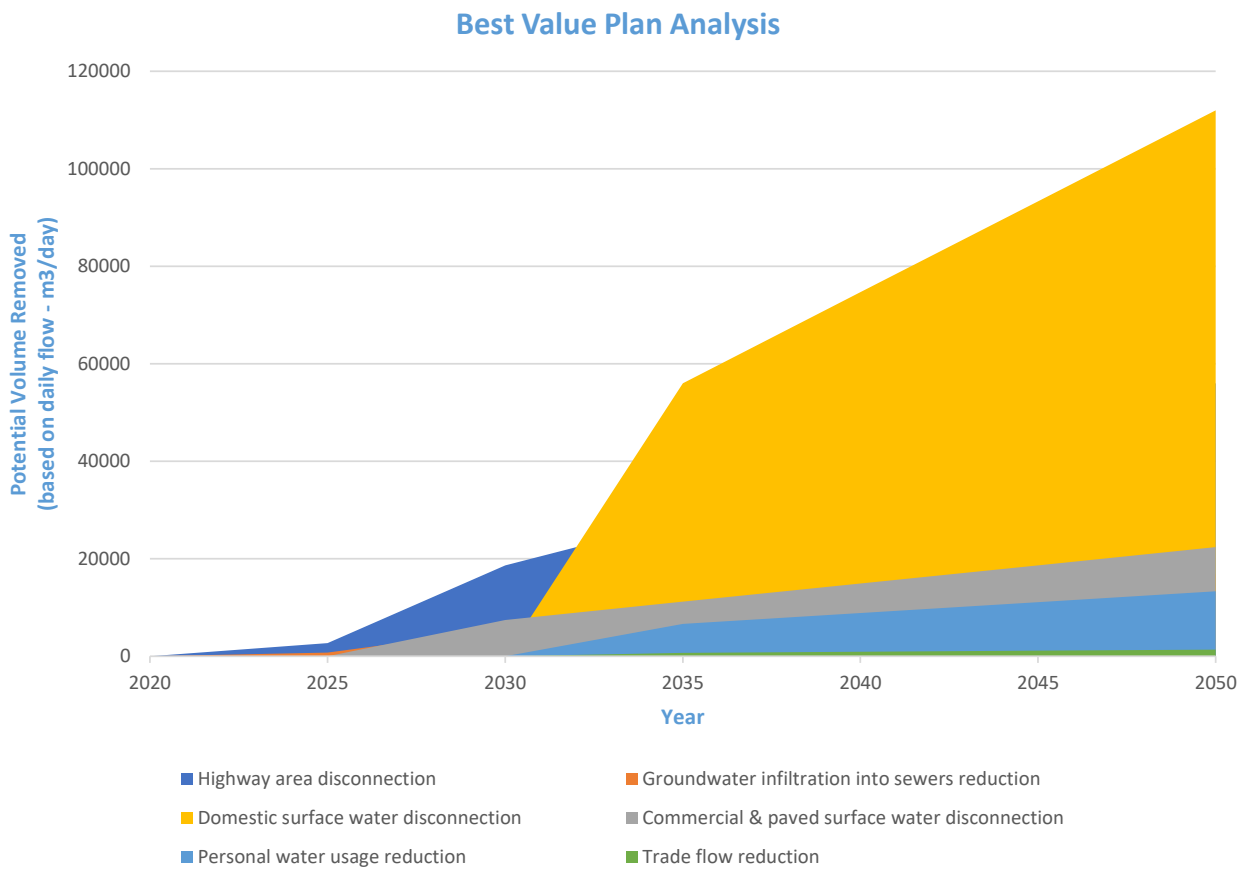


Figure 8 - Best Value Plan Analysis

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*	-	£4,000,000.00	£5,000,000.00
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	£2,000,000.00	£2,000,000.00
10 spills in a Typical Year	£2,000,000.00	£2,000,000.00	£2,000,000.00
0 spills in a Typical Year	£5,000,000.00	£5,000,000.00	£6,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	27.00	29.00	32.00

* 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	£8,000,000	£11,000,000	£11,000,000
External escapes in gardens	£0	£0	£0
Escapes in highways	£22,000,000	£27,000,000	£35,000,000
No flooding	-	£1,000,000	£2,000,000
Total	£30,000,000.00	£39,000,000	£48,000,000

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
LLANELLI COASTAL	1
LLANNON	0
PEMBREY	0
LLANGENNECH STW	0

DWMP Tactial Planning Catchment Summary

Nant Pibwr - headwaters 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 Nant Pibwr - headwaters to tidal limit planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 7 wastewater catchments (see Figure 2 below). There is a combined population of 23756, this is set to decrease to 23648 by 2050, a change of 0%. There is a total sewer length of 186km, with a foul sewer length of 87km, a surface water length of 23km and a combined sewer length of 74km. There are 7 Wastewater Treatment Works (WwTW), 36 Sewerage Pumping Stations (SPSs), and 36 Combined Storm Overflows (CSOs) across this tactical planning unit.

The Nant Pibwr catchment stretches from the Brechfa forest in the north to the mouth of the river Tywi in the south. Large parts of the catchment are covered by forest however there are also a number of villages and small communities throughout the catchment. The largest settlement is the town of Cardigan near the south of the catchment. The river Tywi runs along the eastern boundary of most of the catchment and a number of smaller rivers are also present throughout the catchment including Fernhill Brook and a tributary of the Tywi, the Gwili.

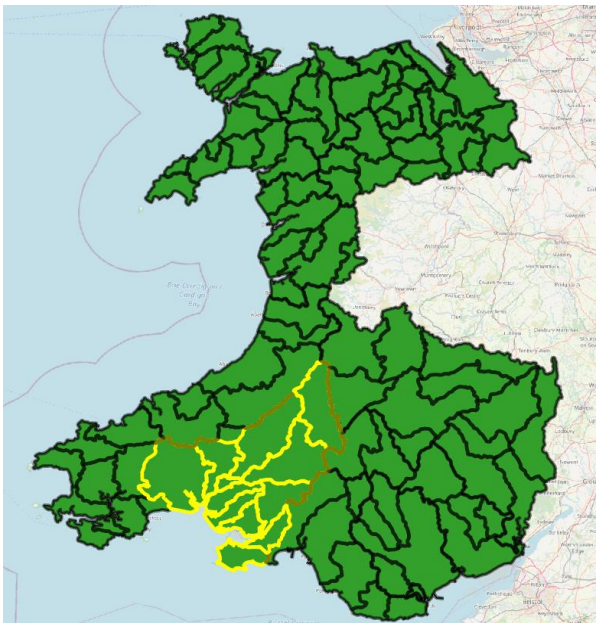


Figure 1 - River basin location detailing the associated tactial planning catchments

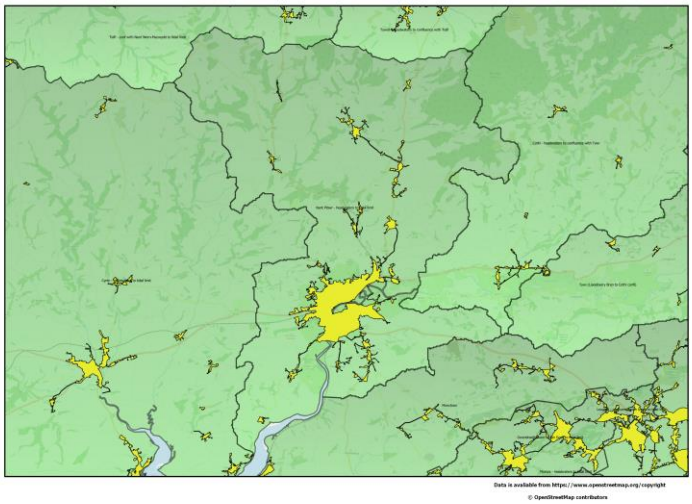


Figure 2- Tactical planning catchment

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.

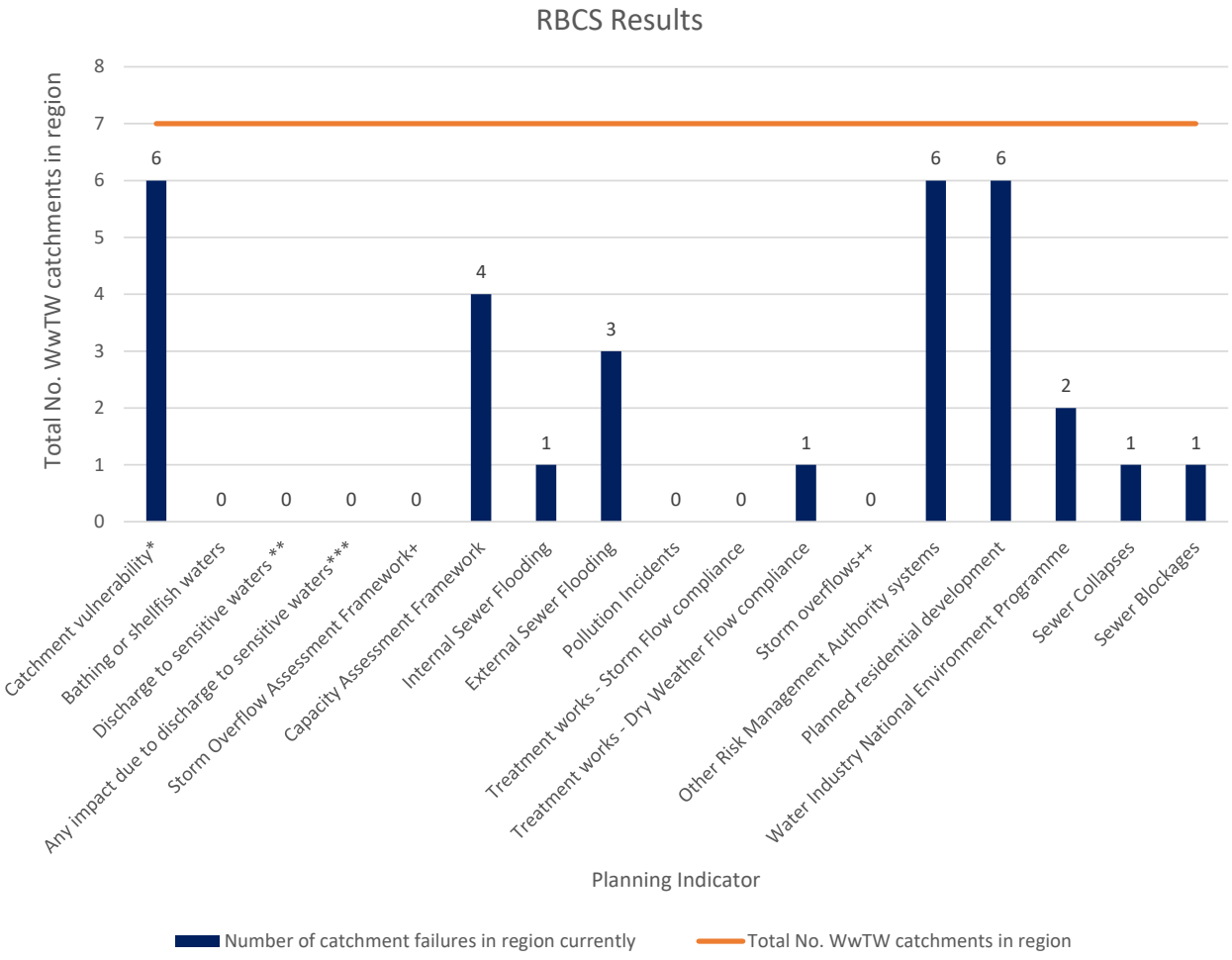
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 23600 by 2050, a change of 0% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including West Carmarthen with 1,100 units and Penymorfa with 180 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 6 out of the 7 L4 catchments within this L3 are vulnerable to sewer flooding as a result of extreme storm events. Planned residential developments and flooding that falls under the scope of other risk management authorities were also flagged as potential areas 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.

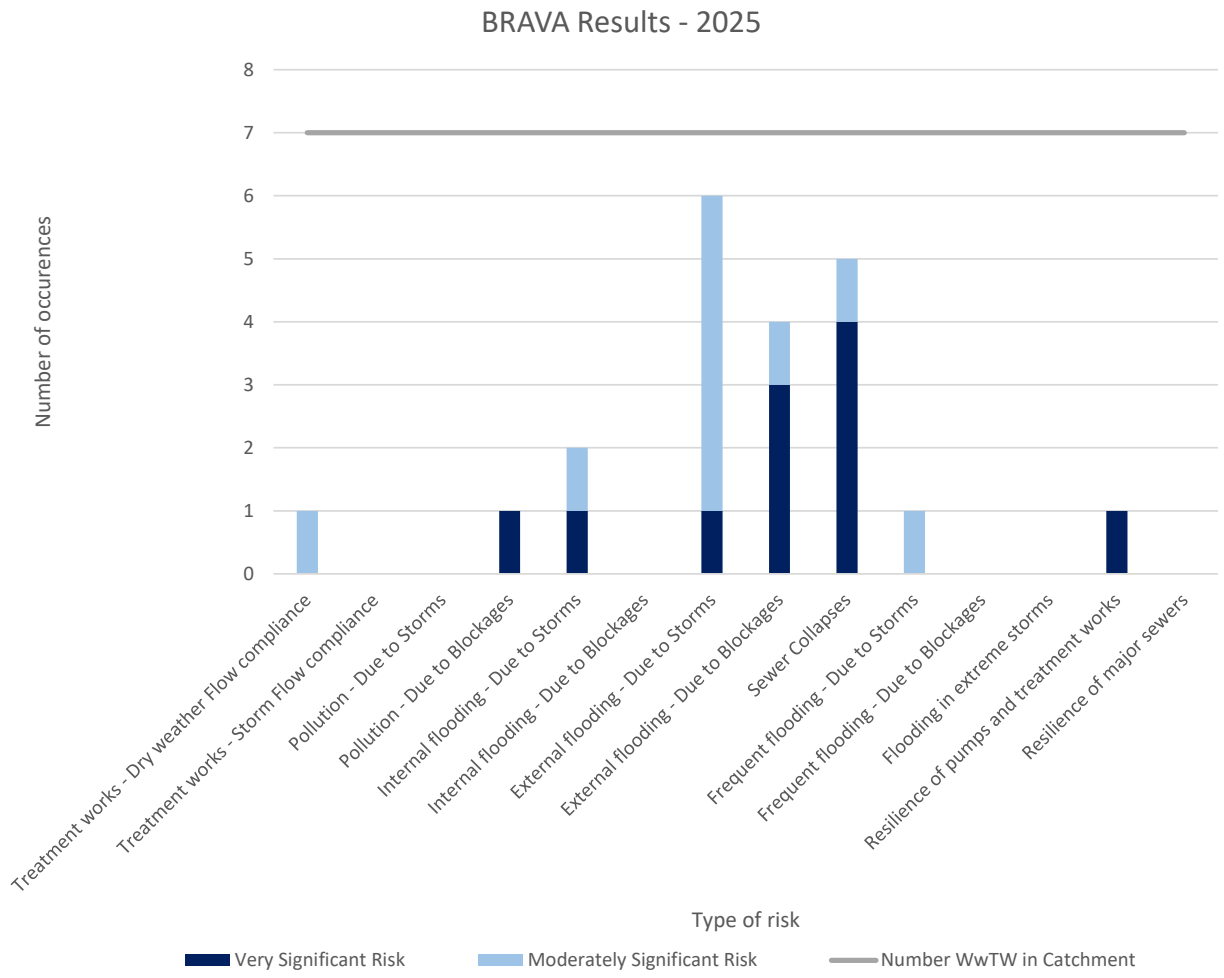


Figure 4 - BRAVA 2025 Summary

In 2025 it is predicted that the most significant risk for the catchment will be treatment work compliance during storm events, followed by pollution due to storm events. 5 other types of risk are predicted to occur to a lesser extent.

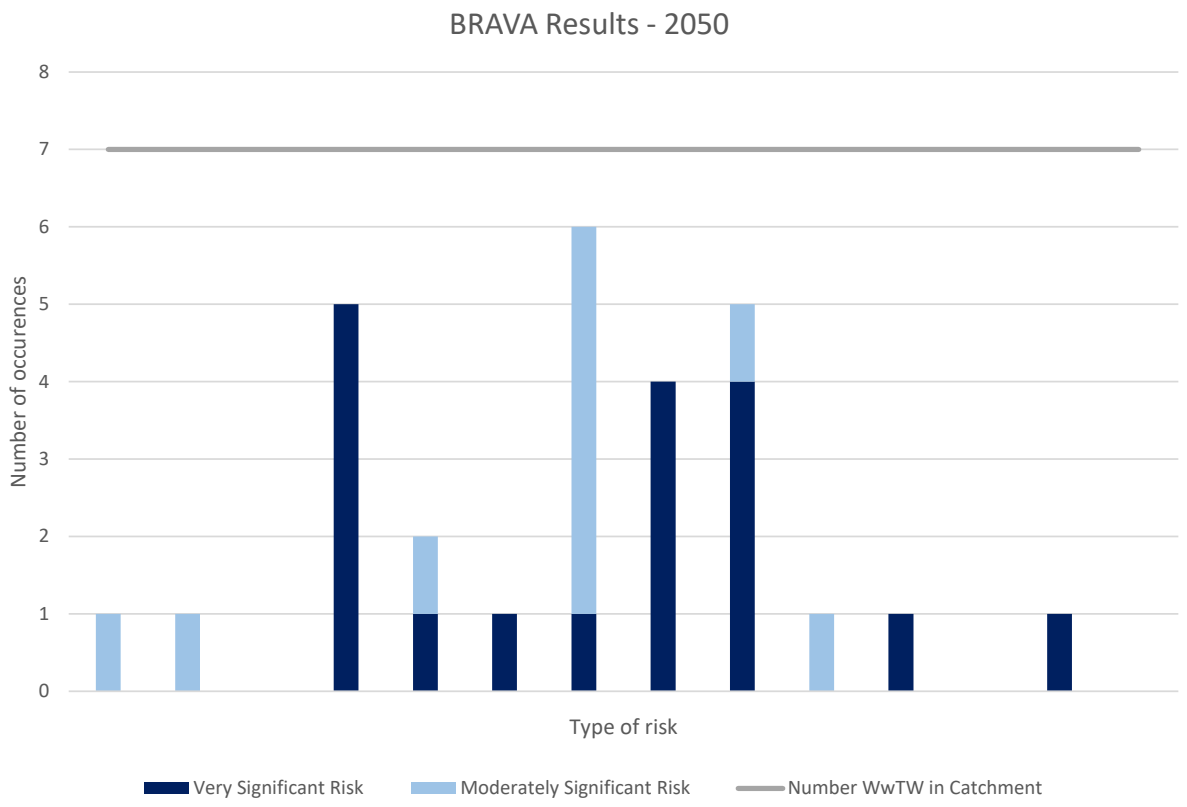


Figure 5 - BRAVA 2050 Summary

In 2050 pollution due to storm events is expected to be the most significant concern for the catchment. Sewer collapse, external flooding due to storms, internal flooding due to blockages and treatment work compliance are also expected to be concerns, but to a lesser extent.

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.

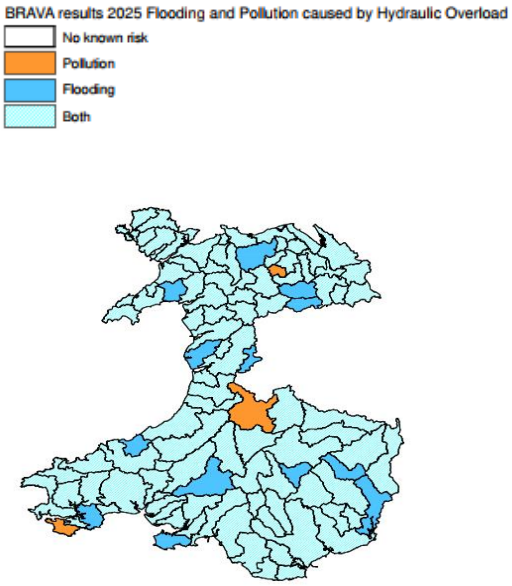


Figure 6 - Associated Strategic Planning Areas priority (2025)

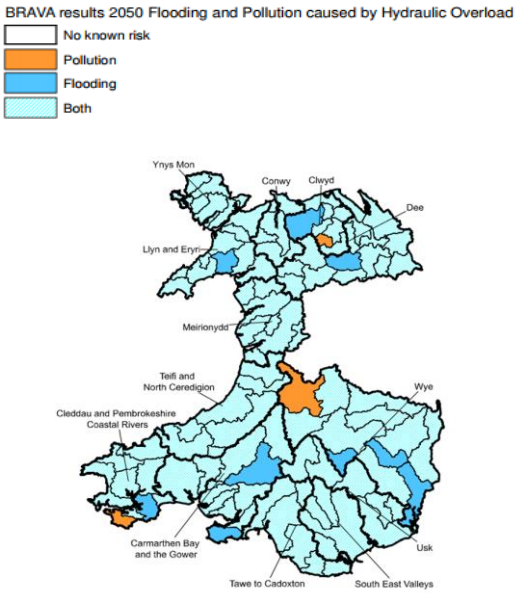


Figure 7 - Associated Strategic Planning Areas

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. Nant Pibwr - headwaters to tidal limit 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?

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
Nant Pibwr - headwaters 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.

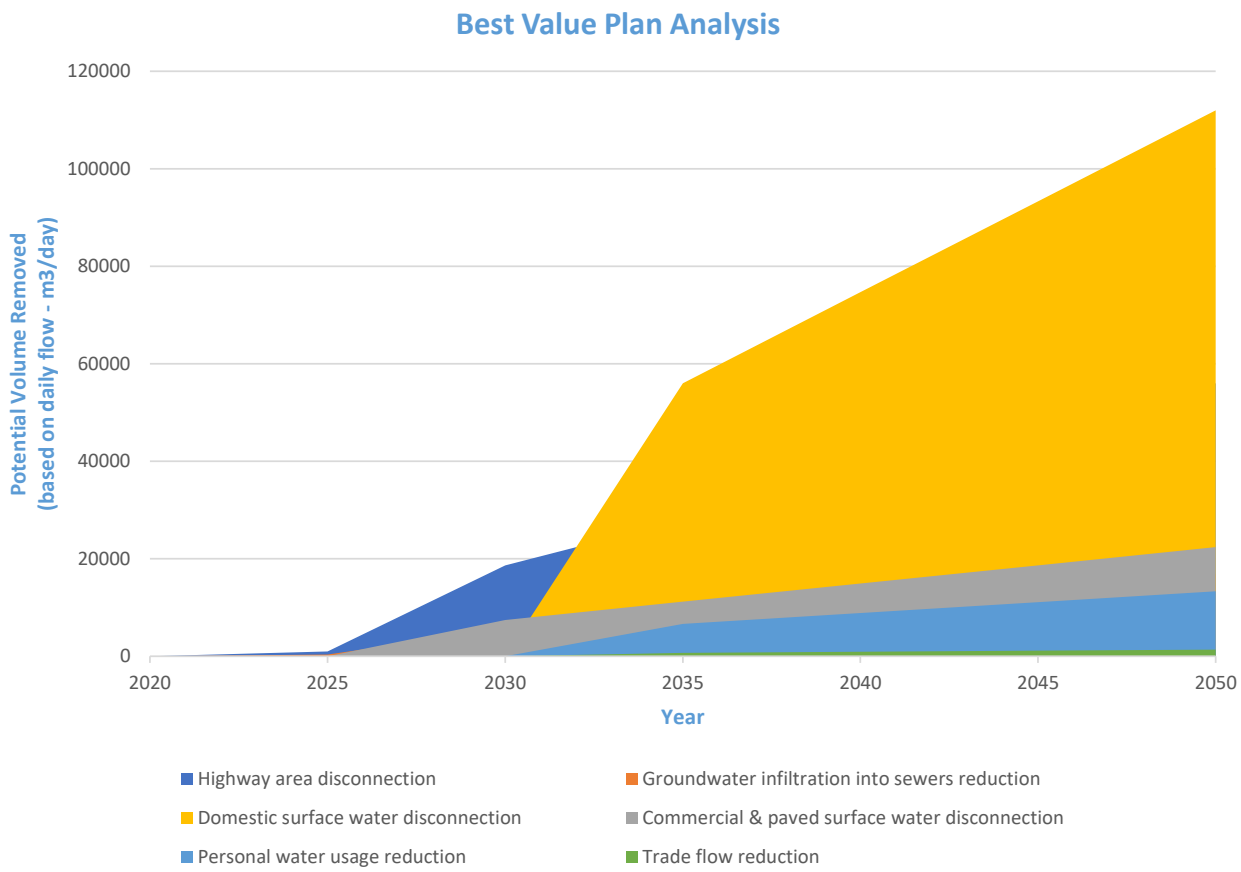


Figure 8 - Best Value Plan Analysis

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*	-	£18,000,000.00	£25,000,000.00
40 spills in a Typical Year	£11,000,000.00	£10,000,000.00	£10,000,000.00
20 spills in a Typical Year	£24,000,000.00	£24,000,000.00	£24,000,000.00
10 spills in a Typical Year	£33,000,000.00	£34,000,000.00	£34,000,000.00
0 spills in a Typical Year	£64,000,000.00	£66,000,000.00	£67,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	129.00	141.00	147.00

* 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	£0	£0	£0
Escapes in highways	£15,000,000	£19,000,000	£19,000,000
No flooding	-	£3,000,000	£9,000,000
Total	£16,000,000.00	£23,000,000	£29,000,000

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
PARC-Y-SPLOTTS	0
ALLTWALIS STW	0
PANTYRATHRO	0
CWMDUAD	0
BRONWYDD (NR CARMARTHEN) STW	0
LLANPUMSAINT	0
CYNWYL ELFED	0

DWMP Tactial Planning Catchment Summary

Tywi - conf with Doethie to conf with Gwydderig

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 Tywi - conf with Doethie to conf with Gwydderig planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 4 wastewater catchments (see Figure 2 below). There is a combined population of 2379, this is set to decrease to 2149 by 2050, a change of -10%. There is a total sewer length of 18km, with a foul sewer length of 5km, a surface water length of 1km and a combined sewer length of 12km. There are 4 Wastewater Treatment Works (WwTW), 6 Sewerage Pumping Stations (SPSs), and 3 Combined Storm Overflows (CSOs) across this tactical planning unit.

Tywi (Doethie to conf with Gwydderig) catchment is located just north of the Brecon Beacons National Park. The cathment is steep and heavily forrested. In the South East of the catchment is located the town of Llandovery where The Rivers Bran and Gwydderig conflunece and into The River Tywi.

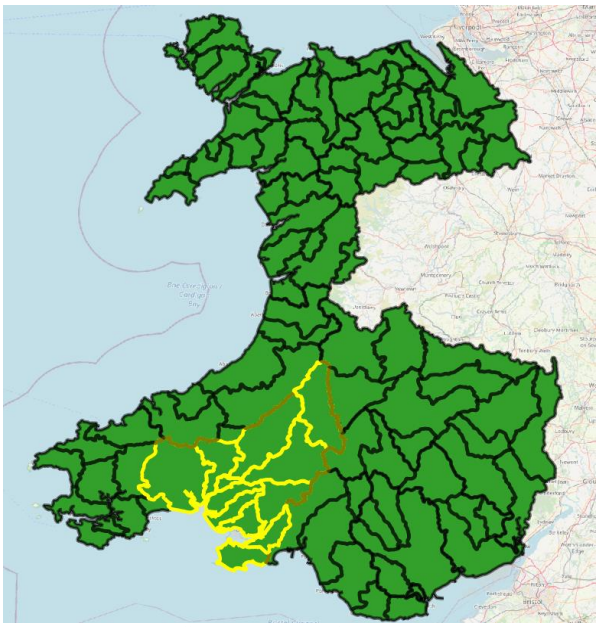


Figure 1 - River basin location detailing the associated tactial planning catchments

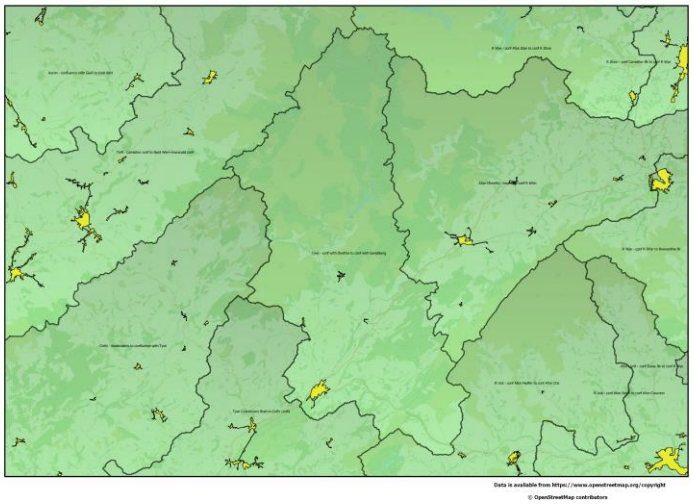


Figure 2- Tactical planning catchment

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.

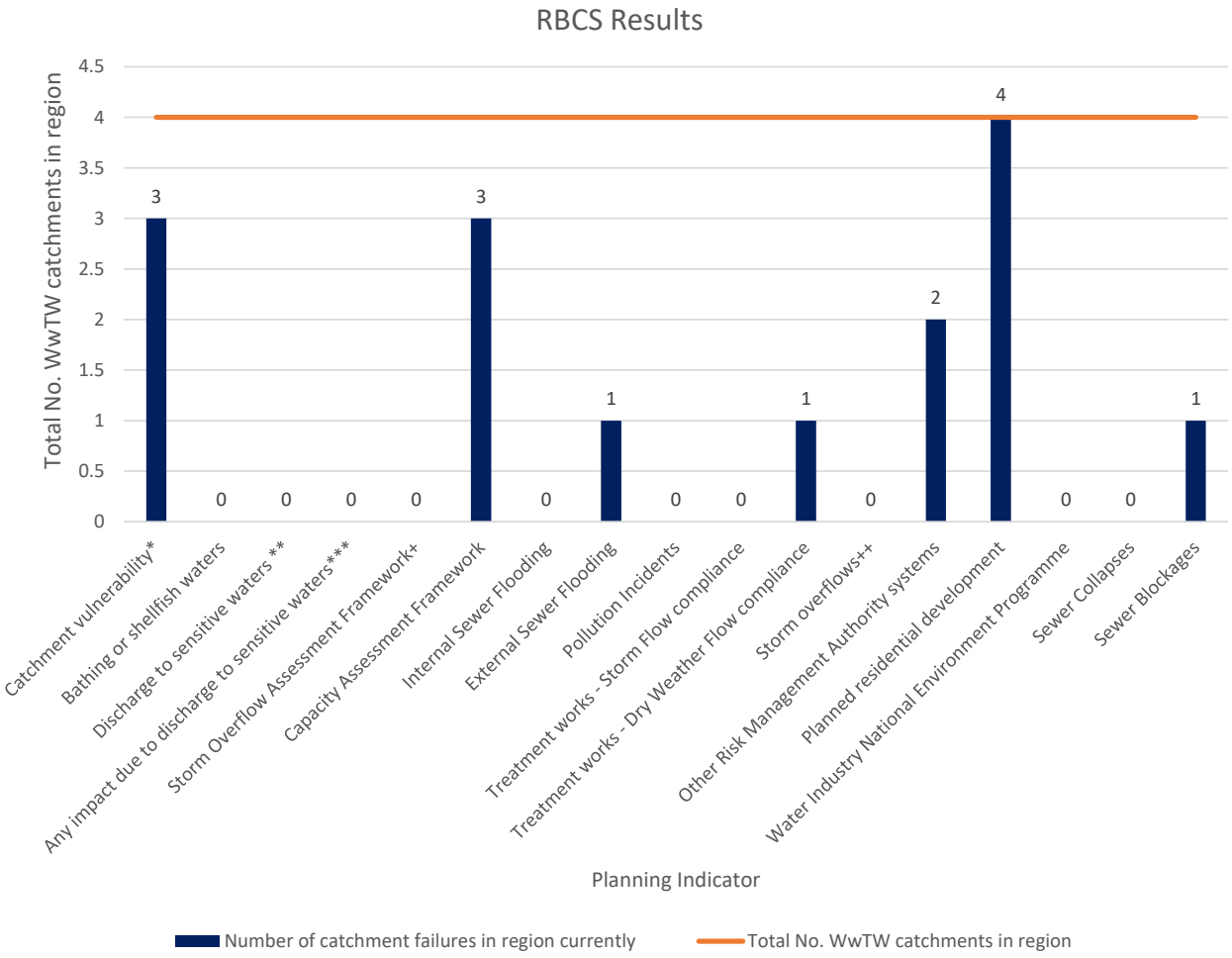
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 2100 by 2050, a change of -10% based on our future projections. However there are major developments in localised areas that will contribute to future pressures on the network, including Dan Y Crug, Llandovery with 61 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 3 of the 4 catchments in Tywi are predicted to flood. The main risk is related to capacity constraints. This is a due to of the projected population growth in these catchments being high.



*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.

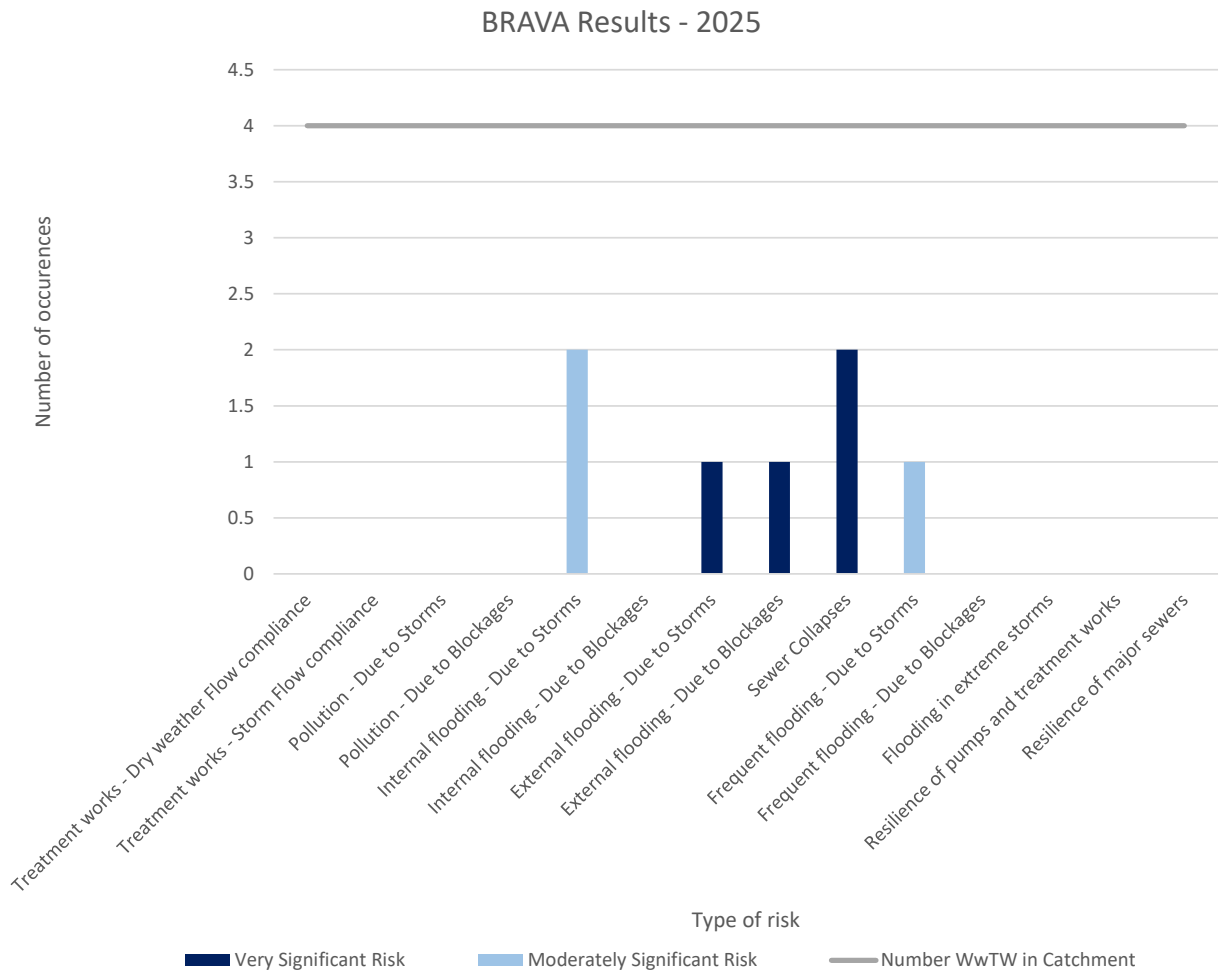


Figure 4 - BRAVA 2025 Summary

In 2025 there are a relatively low amount of risks reported. All risk are related to flooding and blockages in wet weather conditions.

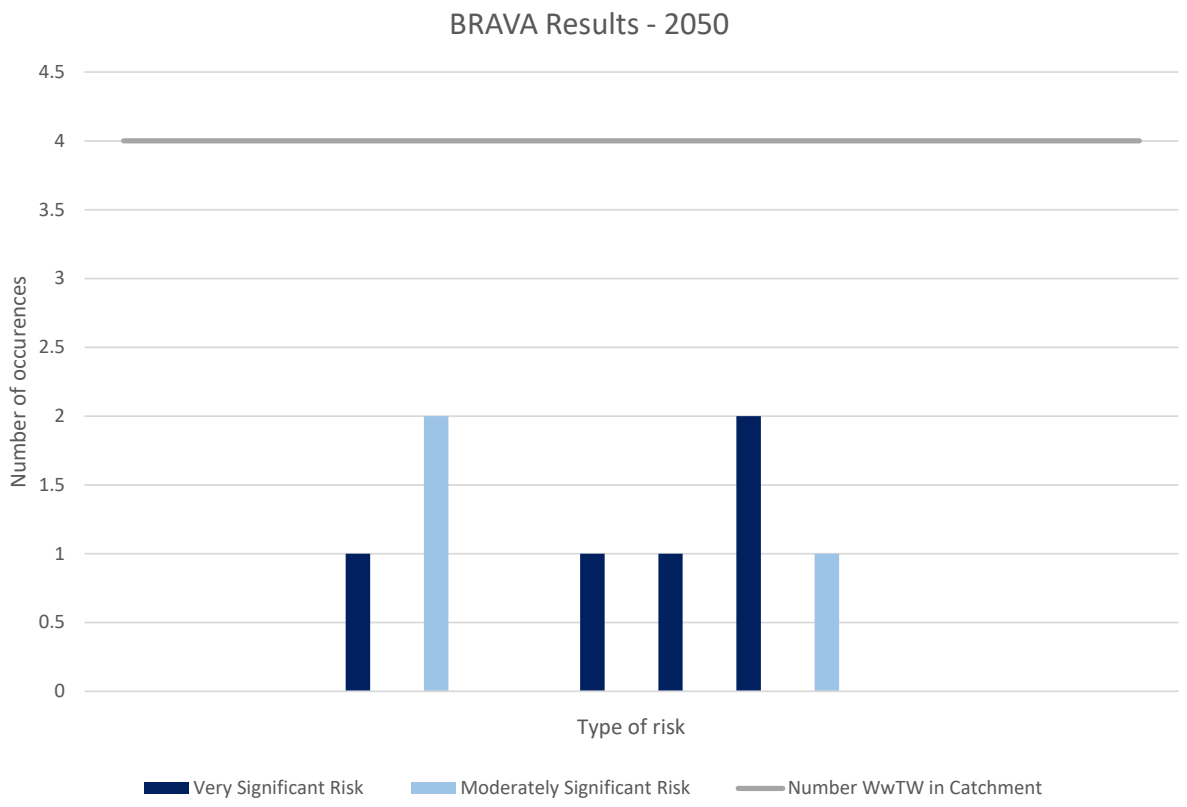


Figure 5 - BRAVA 2050 Summary

In 2050 the risk of compliance issues at the WwTW and pollution due to wet weather conditons arises.

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.

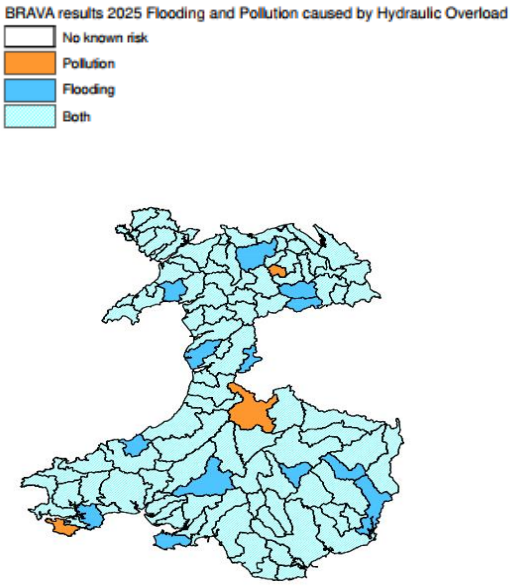


Figure 6 - Associated Strategic Planning Areas priority (2025)

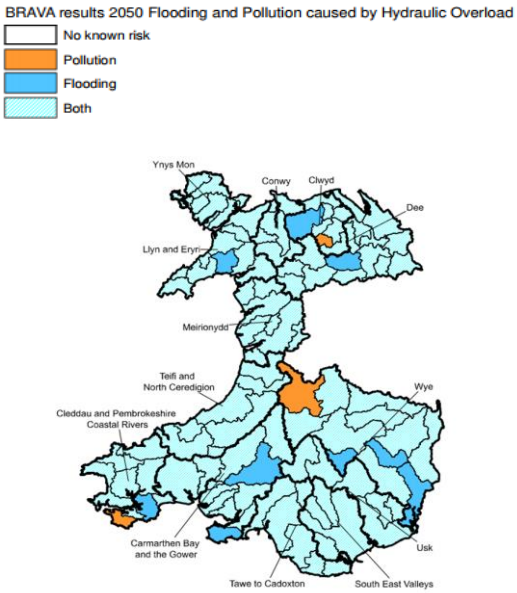


Figure 7 - Associated Strategic Planning Areas

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. Tywi - conf with Doethie to conf with Gwydderig 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
Tywi - conf with Doethie to conf with Gwydderig	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.

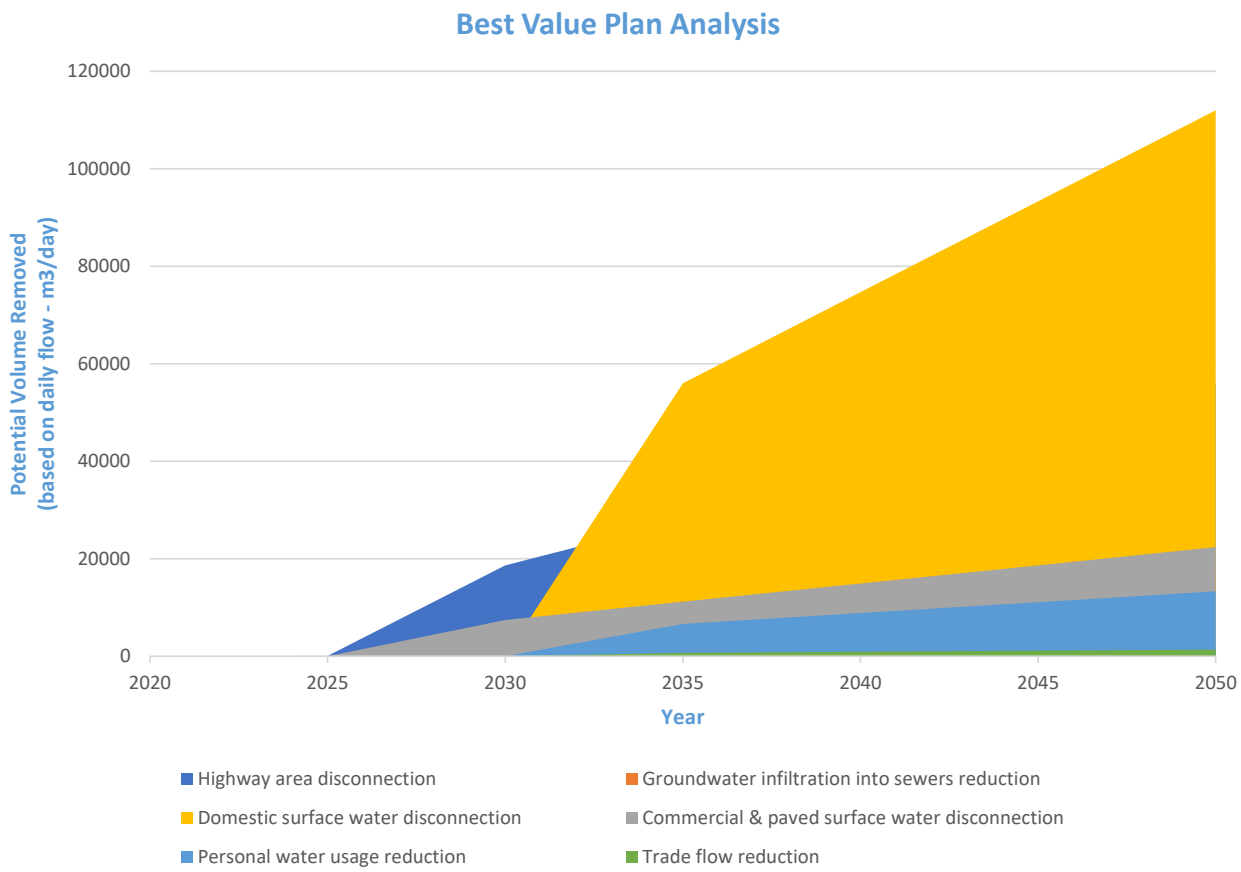


Figure 8 - Best Value Plan Analysis

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*	-	£4,000,000.00	£5,000,000.00
40 spills in a Typical Year	£3,000,000.00	£3,000,000.00	£3,000,000.00
20 spills in a Typical Year	£4,000,000.00	£4,000,000.00	£4,000,000.00
10 spills in a Typical Year	£4,000,000.00	£4,000,000.00	£4,000,000.00
0 spills in a Typical Year	£10,000,000.00	£11,000,000.00	£11,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	13.00	14.00	16.00

* 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	£2,000,000
No flooding	-	£2,000,000	£6,000,000
Total	£1,000,000.00	£3,000,000	£8,000,000

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
LLANDOVERY	0
CYNGHORDY	0
CILYCWM	0
RHANDIRMWYN STW	0

DWMP Tactial Planning Catchment Summary

Tywi (Llandovery Bran to Cothi confl)

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 Tywi (Llandovery Bran to Cothi confl) planning catchment lies within the Carmarthen Bay and the Gower river basin catchment, (see Figure 1 below), it consists of 13 wastewater catchments (see Figure 2 below). There is a combined population of 7412, this is set to decrease to 4876 by 2050, a change of -34%. There is a total sewer length of 59km, with a foul sewer length of 43km, a surface water length of 0km and a combined sewer length of 13km. There are 13 Wastewater Treatment Works (WwTW), 14 Sewerage Pumping Stations (SPSs), and 17 Combined Storm Overflows (CSOs) across this tactical planning unit.

The catchment of Tywi (Llandovery Bran to Cothi confl) covers a middle portion of the river Tywi as it runs from the town of Llandovery in the east past the village of Llantharne in the west. Much of the catchments east lays within the Brecon Beacons national park. The east and north of the catchment are mostly steep and rural with few settlements, whereas the western part is flatter and has a number of settlements including Llangathen and Llandeilo. The river Tywi runs throughout the catchment, as well as numerous smaller tributaries.

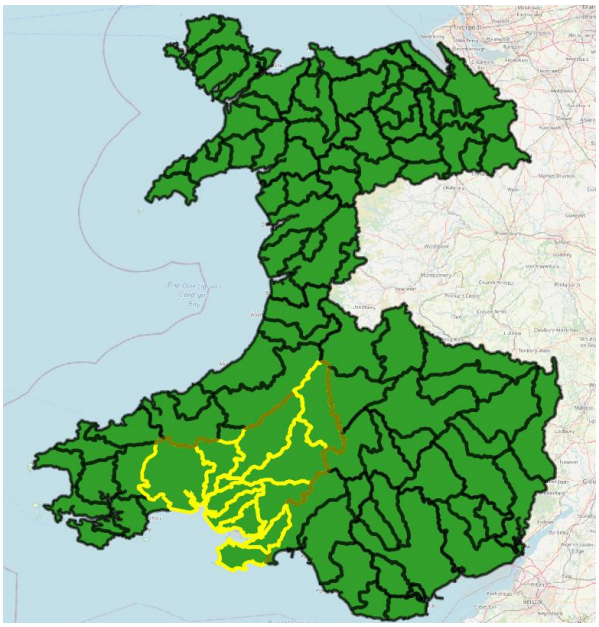


Figure 1 - River basin location detailing the associated tactial planning catchments

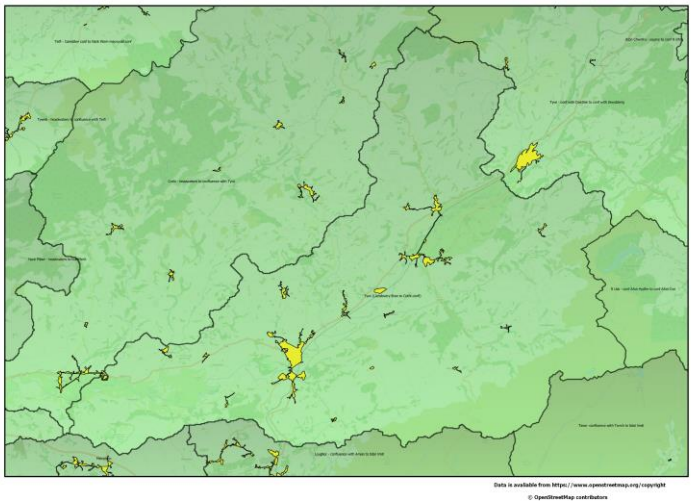


Figure 2- Tactical planning catchment

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.

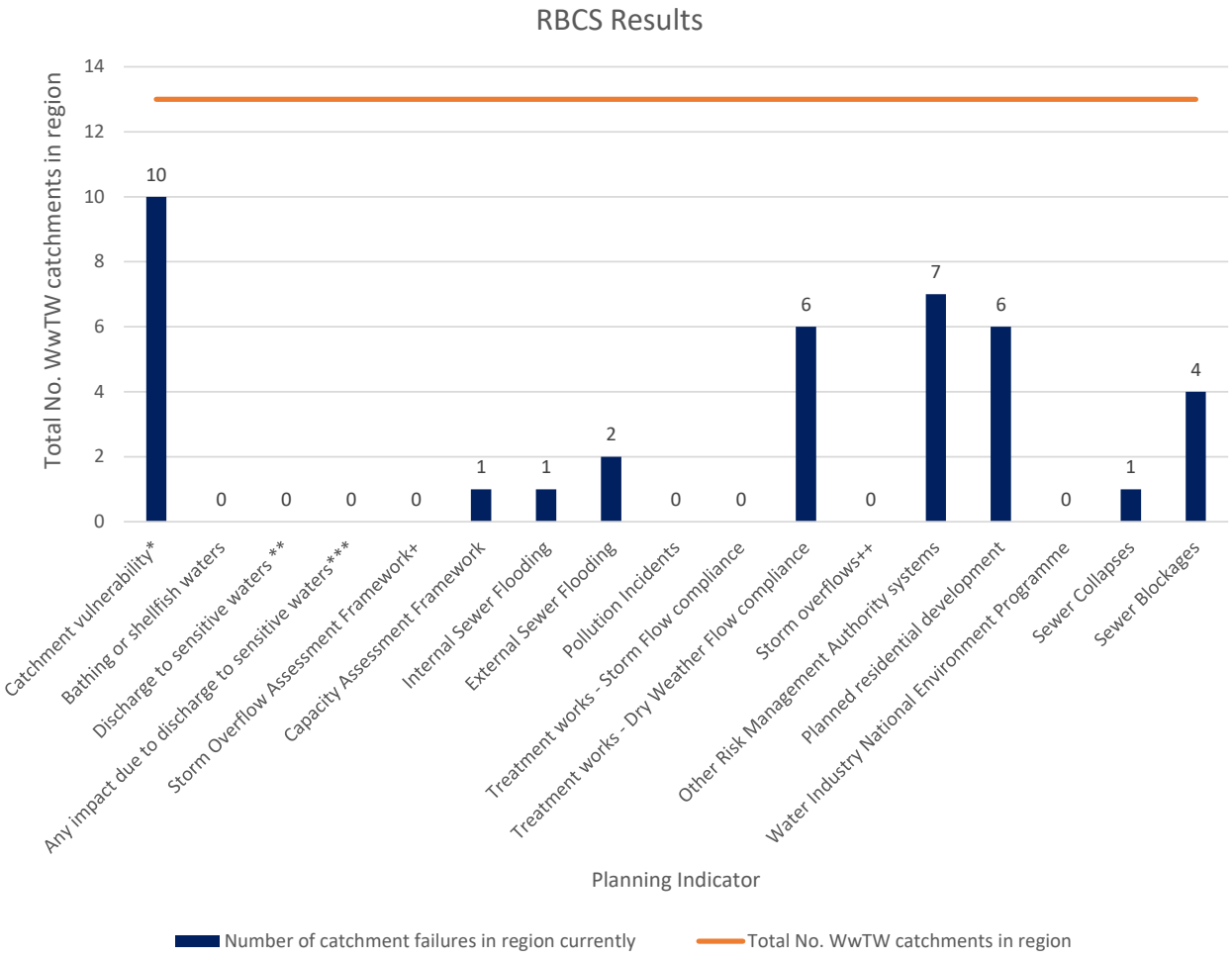
Urban creep is the term used to explain loss of green spaces, for example when new driveways or house extensions are built. It often leads to more rainwater entering sewers. Our forecasts suggest that urban creep will add up to 0.63 metres squared of impermeable ground per house per year.

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 Carmarthen Bay and the Gower region is set to decrease to 4900 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 Llandeilo Northern Quarter with 215 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 10 out of the 13 L4 catchments within this L3 were likely to be vulnerable to sewer flooding due to an extreme storm event. Flooding under the scope of other risk management authorities, treatment work flow compliance and planned residential development were also flagged as potential risks within this 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.

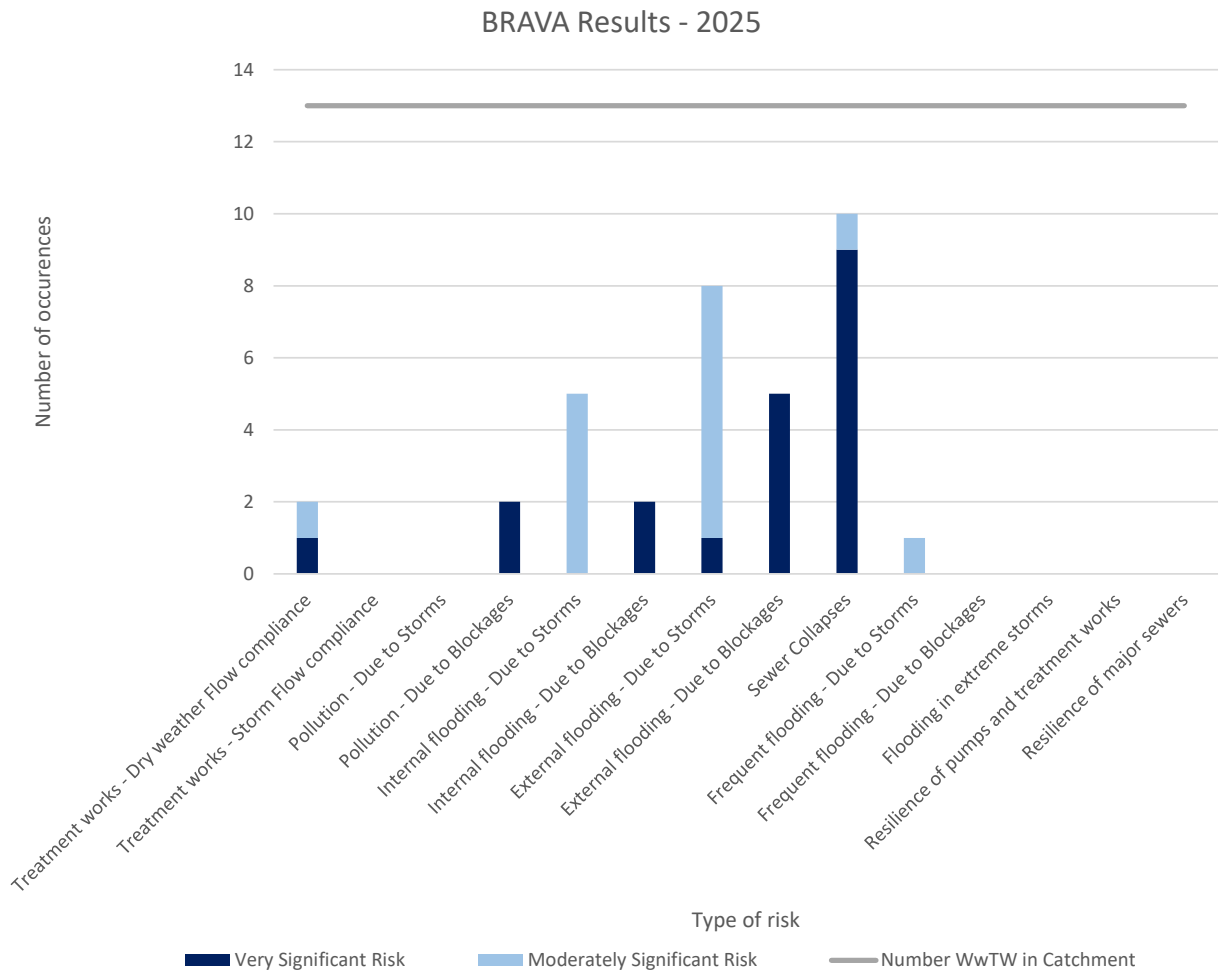


Figure 4 - BRAVA 2025 Summary

In 2025 it is expected that overall risk within the catchment will be of a similar level between four risk types and that the number of occurences for each type will be small. As a result of storm events it is expected that there will be risks associated with treatment work compliance, pollution and internal flooding. The other risk is internal flooding due to blockages.

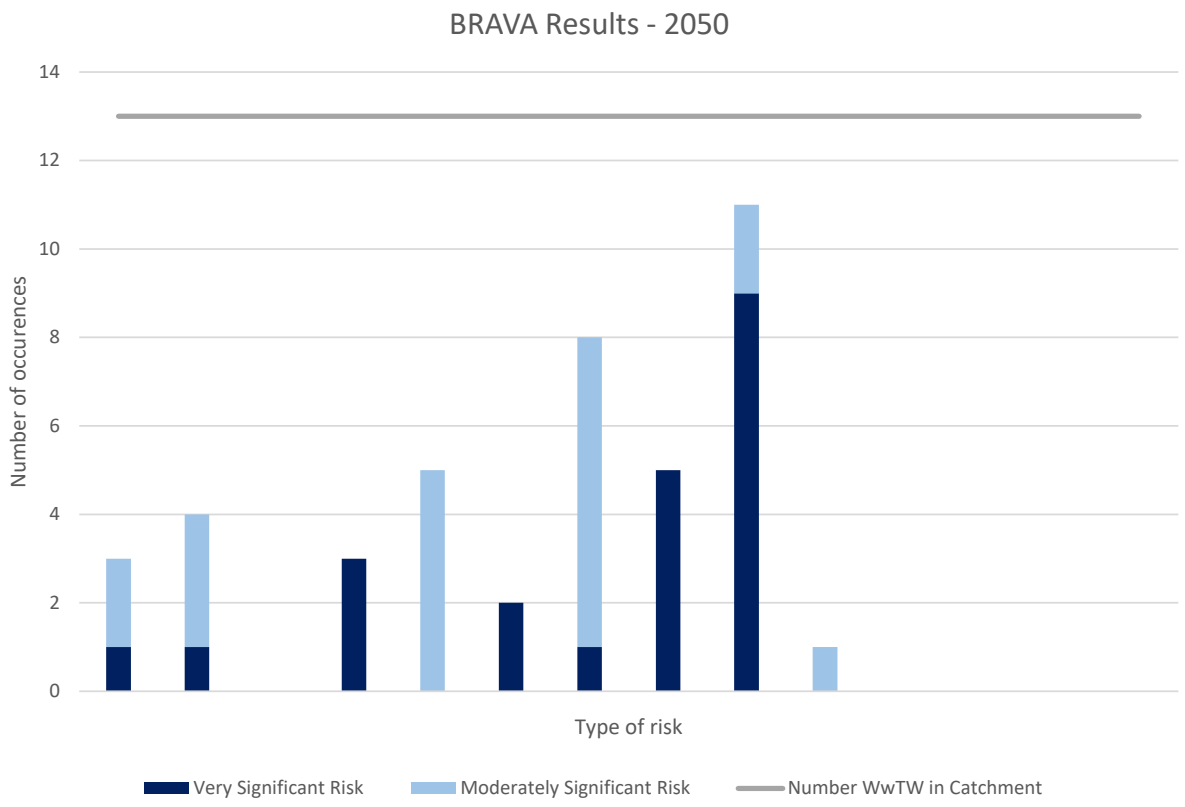


Figure 5 - BRAVA 2050 Summary

In 2050 it is expected that internal flooding due to blockages will be the greatest concern, followed by pollution due to 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.

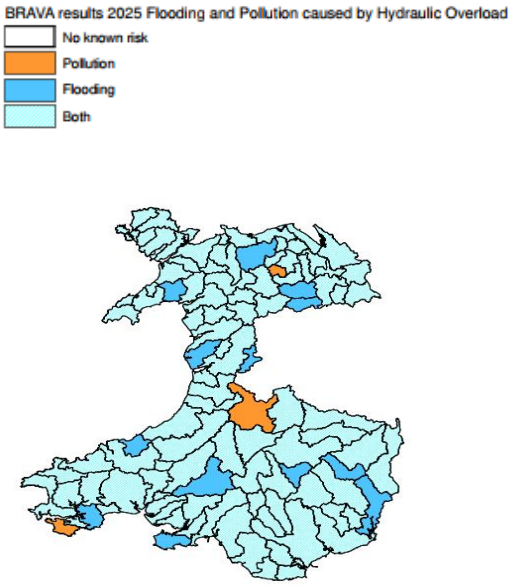


Figure 6 - Associated Strategic Planning Areas priority (2025)

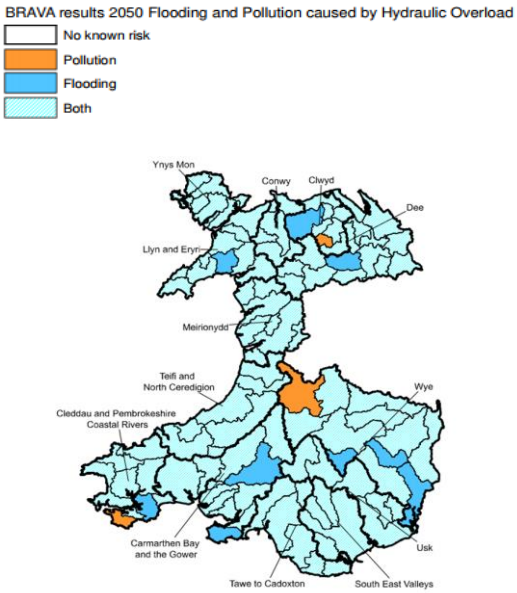


Figure 7 - Associated Strategic Planning Areas

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. Tywi (Llandovery Bran to Cothi confl) 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?

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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
Tywi (Llandovery Bran to Cothi confl)	0%						
	10%						
	20%						
	Treatment Target	2025	2030	2035	2040	2045	2050
	70%						
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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
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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.

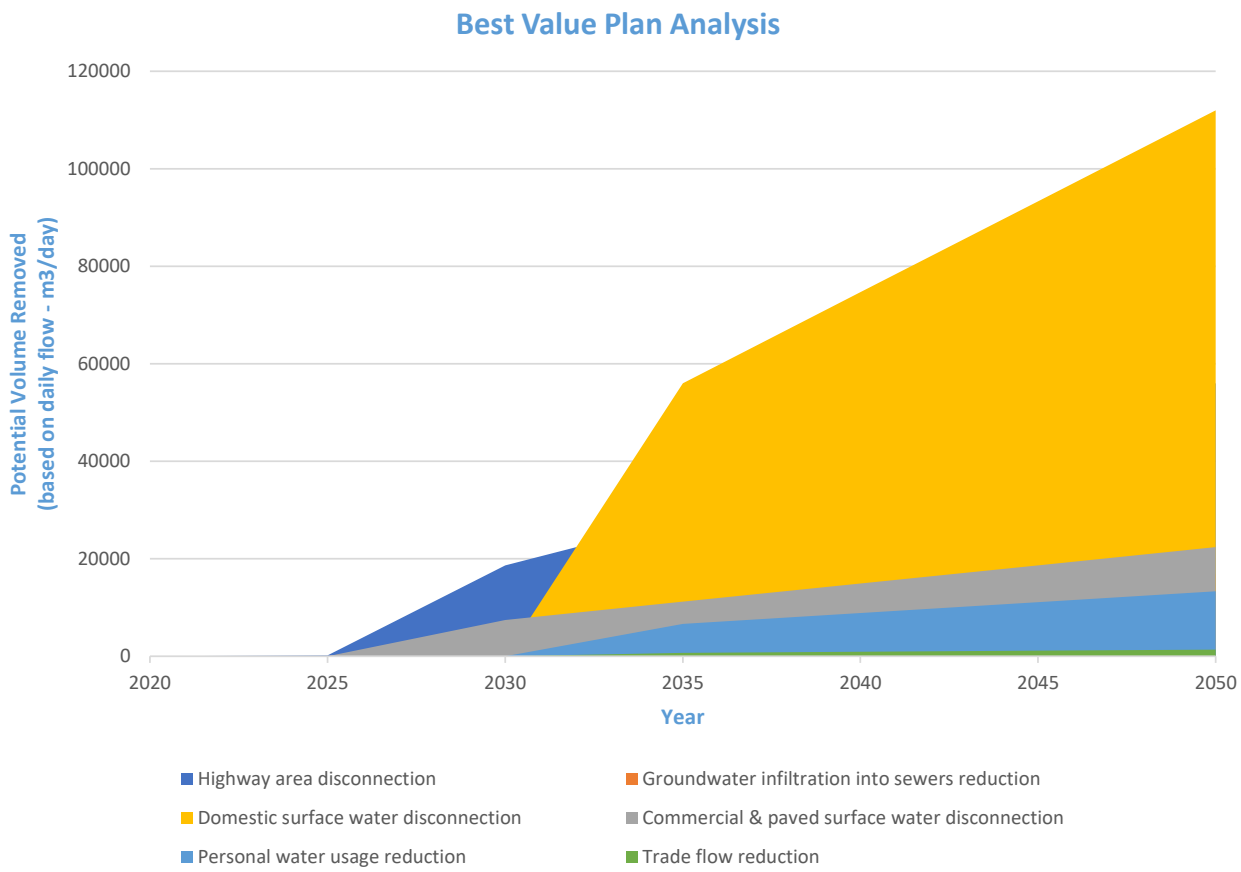

Figure 8 - Best Value Plan Analysis

Approaches to managing risk

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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*	-	£24,000,000.00	£31,000,000.00
40 spills in a Typical Year	£29,000,000.00	£33,000,000.00	£39,000,000.00
20 spills in a Typical Year	£37,000,000.00	£43,000,000.00	£50,000,000.00
10 spills in a Typical Year	£45,000,000.00	£53,000,000.00	£59,000,000.00
0 spills in a Typical Year	£70,000,000.00	£79,000,000.00	£86,000,000.00
Equivalent No. Olympic Swimming Pools in 10 spills scenario	856.00	1071.00	1112.00

* 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	£1,000,000	£0
Escapes in highways	£11,000,000	£17,000,000	£15,000,000
No flooding	-	£7,000,000	£17,000,000
Total	£11,000,000.00	£25,000,000	£32,000,000

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.

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

L4 Catchments	No. Schemes
FFAIRFACH	0
CWM IFOR	0
CWRT HENRI	0
LLANGADOG	0
SALEM STW	0
BRYNGWYN (E OF LLANDEILO)	0
TRAPP	0
CAPEL GWYNFE	0
TWYNLLANAN	0
BETHLEHEM	0
MYDDFAI STW	0
GOLDEN GROVE	0
BROAD OAK (NR LLANDEILO)	0