Dŵr Cymru
Welsh Water

Ref 5.8P

PR19: Wastewater NEP

September 2018

Wastewater NEP

Dŵr Cymru Welsh Water

Contents

Executive summary

Driver for investment

Our customers value the natural environment and recognise the important relationship we have with it. We are committed to minimising our impact on it and implementing improvements to our assets based on sound evidence and where we are confident of the best outcome for our customers and the environment. Improving the environment is a key service the wastewater business delivers. This investment case focuses on our regulatory requirements to enhance our wastewater service to improve the environment.

We must ensure we meet new environmental obligations in AMP7, as identified through Natural Resources Wales' Water Quality National Environment Programme (WQ NEP)[i] and Environment Agency's Water Industry National Environment Programme (WINEP)[ii]. The NEP outlines the improvements we need to make to comply with new or amended environmental legislation and identifies investigations needed to inform, in an evidence led way, potential investment requirements in subsequent AMP periods.

Our approach to identifying and prioritising our wastewater environment programme has been:

- To meet obligations on environmental improvements as determined by Ministerial guidance, concentrating on the value for money drivers which offer a sustainable way forward for enhancing and protecting our environment in line with customer priorities.
- For appropriate scientific study work to be carried out ahead of setting standards or conservation objectives at sites subject to proposed drivers where the objectives are currently unsubstantiated. This will ultimately ensure the delivery of clear obligations, with sustainable environmental objectives at least cost in AMP8. To this end a number of investigations are promoted to be carried out in AMP7.

Prioritisation of our environment programme has been developed using the following principles:

- Good sound evidence and value for money
- Innovative approaches to unlock better outcomes for the environment, our customers and society
- Customer Support

The environment programme includes investment for the following environmental drivers:

- **Water Framework Directive** (WFD) – Improvements, No Deterioration, Protected Areas, Chemicals, Barriers to Fish
- **Urban Waste Water Treatment Directive** (UWWTD) – Population thresholds, flow to full treatment, Storm Tank capacity and
- **Coastal Drivers** - Shellfish Water Directive (SWD) and Revised Bathing Water Directive (rBWD)
- **Frequently spilling storm overflows** - Storm Overflow Assessment Framework
- **Conservation Drivers** –Wildlife and Countryside Act (W&C Act), Natural Environment and Rural Communities Act 2006 (NERC Act) and biodiversity priorities, Regulation on Invasive Alien Species (IAS)
- **Monitoring requirements**
- **Investigations** - to understand our future environmental priorities and support innovation.

We have developed a phased programme over AMP7 and AMP8 to deliver our environment obligations. Our phased wastewater environment programme represents our biggest programme for over 10 years and will result in almost 300km of river length improvements in AMP7, significantly more than achieved in previous AMP periods. As currently determined, meeting our environmental obligations in AMP8 will deliver around 100km of river length improvement for a similar investment, which shows that we are now at the point of diminishing returns if we work alone on improving the environment. It is our aspiration to deliver this plan,

with due consideration to current and future generations, in collaboration with other stakeholders where results for both our customers and the environment could be much greater. This is why it is essential we avoid, where possible, conventional solutions of expanding treatment works as this approach adds to cost pressures and carries bill implications for the long term. The phased plan allows us to explore and develop the right solution for each situation, taking into account the need to pursue new approaches, best available techniques and best value costs.

The Investment

We propose to invest £ 288.108 million during AMP7 to protect and enhance the environment along with building our understanding for investment in future AMPs. We have identified £ 32.197 million of efficiencies within this plan.

The breakdown of our proposed expenditure is shown in table 1 which meets the requirements of the WQ NEP4.1 from Natural Resources Wales and the WINEP3 from Environment Agency. This was identified following scrutiny of potential expenditure scenarios by our Executive team and is supported by our environmental regulators and Welsh Government.

Programme of work	Proposed AMP7 programme total budget (£m)	Proposed AMP8 programme total budget (£m)
Water Framework Directive Including our Gwili Gwendraeth Programme	160.7	115.0
Urban Wastewater Treatment Directive Including our Storm Overflow Assessment Framework programme	76.8	134.2
Coastal Improvements	15.5	To be Confirmed at PR24
Conservation Schemes	0.8	
Monitors	24.7	
Investigations	9.5	
Total	288.1	249.2

Table 1 Wastewater Environment Programme Investment for AMP7/8

This work will meet the following of our customer promises:

Safeguard our environment for future generations: By working with others to protect and enhance the environment we can ensure improvements are sustainable for future generations to come.

Put things right when they go wrong: Meet our customers' expectations and reduce the risk of environmental impact.

A better future for all our communities: A more integrated approach to environmental improvements by our wastewater service will improve the natural environment for people, and help communities create a better future for themselves.

Delivering for the future

In Welsh Water 2050, we identified future trends. Our proposed investment will ensure that our wastewater service and the environment are resilient to the following trends:

Climate change: Climate change will result in more extreme rainfall events, which could lead to an increase in discharge of our wastewater assets to the environment. Dryer summers will result in low river flows leading to any sewage discharge being less diluted and therefore increasing impact on the environment.

Demographic change: We will identify long-term investment requirements to meet environmental need at lowest cost taking into account population growth impacts in our catchments

Changes in customer expectations: Changing customer and societal expectations may require us to do more to protect and enhance the environment. By carrying out sustainable management of natural resources pilots we can see how to involve greater participation.

Changes to the structure of the economy: The growth of the digital, knowledge based economy will create opportunities to provide services in more efficient ways. However, it could also have an impact on the nature of society, and present a challenge to continuing to meet the needs and expectations of our customers and the environment.

Protecting public health: We will have a role to play in promoting healthier and more sustainable lifestyles for our customers through protecting and enhancing the environment which can contribute to physical and mental health and wellbeing

Delivering our strategic responses

In Welsh Water 2050, we set out to deliver eighteen strategic responses. This investment will contribute to the following:

Strategic response 16: Cleaner rivers and beaches – improving our wastewater assets to do our part to help achieve 'good' environmental status for our rivers, lakes and coastal waters for our customers to enjoy.

Achieving our measures of success

In AMP7 we will continue to measure our performance against our Measures of Success (MoS) / Performance commitments. This investment will specifically contribute to achieving our MoS for Km of river improved, but will also support the MoS / Performance commitments as identified in table 2.

Measure of Success	End of AMP6 Position	End of AMP7 Position
En6 - Km of rivers improved	562	418
En3 - Pollution incidents from wastewater	107	90
En1 - Wastewater Treatment works compliance	100%	100%
En2 - Wastewater Treatment works look-up table compliance	99%	100%
Ft12 - Risk of sewer flooding in a severe storm	3.63% (2017-18 figure)	5% improvement from 19/20 performance
Ft4 - Surface water removed from sewers Roof Top Equivalents (RTE)	25,000 RTE	47,000* RTE

*This is a cumulative target i.e. we are planning to remove 22,000 RTE in AMP7 giving a cumulative total of 47,000 RTE for AMP6 and AMP7.

Table 2 Measures of Success

1 Delivering our customer outcomes

Investment need

We must ensure we meet new environmental obligations in AMP7, as identified through Natural Resources Wales' Water Quality National Environment Programme (WQ NEP) and Environment Agency's Water Industry National Environment Programme (WINEP). Our environmental regulators programmes outline the improvements we need to make to comply with new or amended environmental legislation and identifies investigations needed to inform, in an evidence led way, investment requirements required in future AMP periods. We remain committed to minimising our impact on the environment.

Views of our customers and stakeholders

We have undertaken extensive consultation with customers through our PR19 preparation programme, including our Welsh Water 2050 strategy consultation held in the summer of 2017, which engaged with 19,980 of our customers.

Customers value the natural environment and recognise the importance of our work in this area. We have also utilised wider industry-level research and assessed its implications for our region, our stakeholders and our future plans.

We identified our customers` priorities through our engagement, which showed strong support for investment which contributed to 'Cleaner rivers and beaches', 'Working with nature for cleaner water' and 'Better water quality for all' – topping the list for all demographic groups.

We will continue to act on feedback throughout AMP6 and AMP7 by working with the Customer Challenge Group and listening to focus groups.

We pursue a pro-active approach to development of our wastewater environment programme, working jointly with NRW and EA, with regular meetings to discuss PR19 being held. This approach enables us to challenge and influence our environment programme at each step of its evolution, producing a robust programme that meets our environmental obligations whilst ensuring the best outcomes for both our customers and the environment.

Our environment programme has been developed taking into account guidance documents that have included, but have not been limited to, the following:

- Water Strategy for Wales[iii]
- Reasons for Not Achieving Good (RNAG) Database[iv]
- Water Industry Planning: identifying measures for the WINEP including individual driver guidance documents[v]
- PR19 Expectations and Obligations including individual driver guidance[vi]
- Water industry strategic environmental requirements[vii]

Benefits of Investment

Our proposed investment for our Wastewater Environment Programme will contribute to the sustainable management of wastewater to ensure the improvement of environmental water quality (both our rivers and coastal waters) and the wider environment.

It will therefore support our customer priorities which showed a strong support for investment in this area, with 'Cleaner rivers and beaches' being the statement given the highest importance overall with high scores across all demographic groups.

Our Wastewater environment programme will:

- Improve water quality in 294km of rivers.
- Support achievement of guideline class for the Menai Strait Shellfish waters
- Pilot the Sustainable Management of Natural Resources approach to achieve long term environmental and societal benefits cost-effectively.
- Start delivery of improvements to sites that require an increase in flow to full treatment and larger storm tanks, whilst preparing a

programme of further sites for delivery in AMP8

- Install monitors to measure pass forward flows at wastewater treatment works, providing evidence to feed into investigations to further understand the impact of our assets on the environment.
- Carry out investigations at frequently spilling overflows, deliver improvements at the highest priority sites where it is cost beneficial to do so and support development of a programme for AMP8.
- Investigate our assets that may cause barriers to fish migration, deliver affordable high priority sites in AMP7 and support development of a programme for AMP8
- Understand the risks of spreading Invasive Non-Native Species
- Understand how to enhance and protect biodiversity on our land and at operational sites
- Undertake activities to protect and enhance biodiversity sites where we impact.

2 Investing for now and the long-term

Future Challenges

There is a great deal of uncertainty around the future within which we will be operating. There are several foreseeable future trends that are likely to have a significant impact on how our wastewater service may impact on our environment. It is essential that we consider the challenges and opportunities presented by these trends.

In our Welsh Water 2050 strategy document, we have set out our long-term vision and our approach to achieving this, so that we can demonstrate how we will continue to meet our customer and the environmental needs into the future. It considers both the direction for our own business and outlines the impact we want to have on the people, economy and natural environment of our operating area in Wales and England in the long-term.

Our Welsh Water 2050 strategy identifies significant trends (external factors) over the next 30 years, to see and how these will impact on us and our customers.

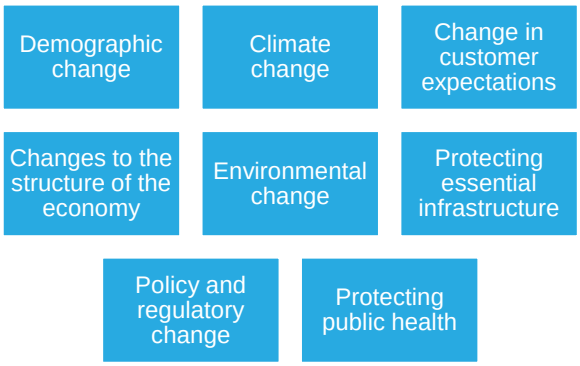


Figure 1 Trends impacting on Wastewater Services

Demographic change

Increased population growth will inevitably increase flows in our wastewater network and at our wastewater treatment works, which can increase our pressure on the environment requiring us to find new and innovative ways to protect and enhance the environment.

Climate change

We expect climate change to have an influence on our assets and the environment. It will be increasingly important to ensure strong wastewater catchment management is undertaken to meet these challenges in a joined up way. Increased extreme rainfall events will lead to higher flows to be treated and spills from our assets. Warmer drier climate events will lead to lower flows in rivers. When water levels drop, any sewage discharge is less diluted and therefore increases the risk of impact on the environment.

Environmental change

Land use change, invasive species, and an increased risk of environmental pollution may lead to a reduction in water quality and biodiversity. However, co-operative approaches for the delivery of enhanced ecosystems services could lead to better environmental outcomes.

Changes in customer expectations

Increased expectations of reducing our impacts on the environment will put increasing pressure on existing assets to be able to achieve current and future consents.

Changes to the structure of the economy

A projected increase in tourism in Wales could see an increase in pressure on rural and coastal wastewater networks and treatment works at peak times to meet demand.

Policy and regulatory change

Uncertainty following the UK's decision to leave the European Union may lead to changes in environment regulation.

Protecting public health

Our improvements to the environment also help protect human health. For bathing waters the improvements made in past AMPs have enabled us

to no longer prevent bathing water standards from being met, providing improved health benefits to bathers. 99% of our bathing waters passed the revised Bathing Water Directive standards in 2017. For the one bathing water that did not pass the standards, Cemaes Bay, our analysis proved the source of pollution to be from a number of small streams free of wastewater discharge. Improvements at shellfish waters not only support the coastal environment, but also support guideline standards for shellfish where beds are harvested. Future climate change, specifically extreme rainfall events may impact on bathing and shellfish waters with resultant potential health impacts to the public. A healthy environment can contribute to physical and mental health and wellbeing.

Regulatory Requirements

Our wastewater environment programme is driven by a variety of environmental legislation, which sets environmental obligations for us to meet.

Water Framework Directive

Our operating area has over 4500 miles of Water Framework Directive (WFD) classified rivers

Through investigations carried out by the Environment Agency and Natural Resources Wales it has been identified that of all the WFD classified rivers in our operating area, up to 17% may be prevented from achieving "good status" due to our assets, of which 4% is confirmed. It should be noted that we are only identified as the sole sector that may be impacting on less than 1% of rivers. For the remaining rivers there are other sectors identified as potentially having an impact as well. In order for good status to be achieved for such waterbodies other actions must be carried out by other sectors. Figure 2 shows the rivers in Wales and England that have been identified as being impacted by water industry wastewater from all the water and sewerage companies (WaSC) areas in England and Wales.

The WFD aims to provide a common approach with common objectives, principles and basic measures designed to prevent any further deterioration of surface and ground waters and to protect and enhance the quality and quantity of the water environment both inland and along the coast. The WFD is a move away from the pure compliance of past water related directives towards a strategic approach of integrated water management.

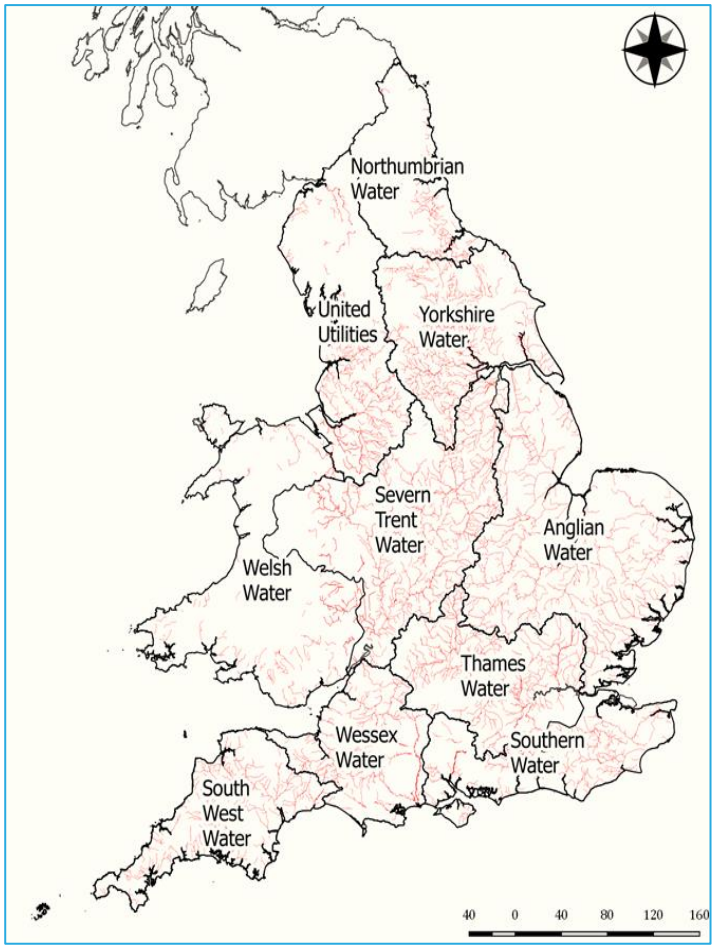


Figure 2 The rivers polluted by wastewater in England and Wales (WFF UK 2017)

The WFD involves looking at how the entire water environment functions together, so interconnections need to be explored from raw water, to water treatment and distribution, from wastewater collection, treatment and release back into the environment, to build in flexibility to meet WFD requirements.

To achieve the optimal cost benefit solutions we need to understand how investment can be best targeted now and into the future to meet WFD objectives. To this end we are proposing a programme of investment that endeavours to take an integrated approach through the sustainable management of natural resources, tackling the highest priority areas that provide most benefit to

the customer in protecting and enhancing the environment.

WFD Improvements

The Reasons for Not Achieving Good databases published by NRW and EA provides a list of water bodies that have been identified as having potential water industry impact.

WFD investigations are currently underway for water bodies that have been identified as being impacted by the water industry, i.e. those areas where our assets are suspected of causing water bodies to not achieve Good Status.

Schemes required for WFD improvement cover a variety of pressures:

Nutrients – One of the main pressures preventing rivers from achieving WFD good status is too much phosphorus. Phosphorus is an essential element for plant life, but when there is too much of it in water, it can speed up eutrophication in rivers, causing excessive growth of plants and algae leading to depletion of oxygen available for other organisms. Where our assets have an impact we are required to reduce our fair share of that impact.

Sanitary Determinands – Ammonia levels in excess of the recommended limits may harm aquatic life. Similar to nutrients, where our assets have an impact we are required to reduce our levels.

Diffuse sources – Where our intermittent discharges are preventing a river from achieving WFD good status through increasing pollutant loads to rivers and coastal waters we need to look at how we can improve them to reduce their impact.

Barriers to Fish – We have some sewer pipes that traverse rivers that may be causing a barrier, preventing fish from migrating further upstream. We need to understand where these are, their impact and which ones we need to remove to provide the most benefit to rivers.

Shellfish Water Protected Areas - These areas under the WFD concern the quality of shellfish waters that need protection or improvement in order to support shellfish and contribute to the high quality of commercial shellfish products.

There are mandatory and guideline standards. For guideline standards member states should "endeavour to achieve" such standards as set out in the UK regulations. England and Wales are required to identify shellfish waters and NRW/EA must adopt "appropriate" measures to secure compliance.

Bathing Water Protected Areas - Bathing waters, like shellfish waters, are classified as "protected areas" under WFD. The purpose of the revised Bathing Water Directive (rBWD) is to preserve, protect and improve the quality of the environment and to protect public health. The rBWD offers the public a higher level of health protection based on the most recent and up-to-date scientific and technical developments. Bathing waters are classified into the following categories:

- Excellent
- Good
- Sufficient
- Poor

Most WFD improvements are subject to cost benefit assessment, meaning that if costs outweigh the environmental benefits then alternative standards should be set for the waterbody.

Habitats protected areas - The exception to WFD cost benefit assessment is for where rivers require standards to be met in order for sites identified under the Habitats Directive to be protected.

WFD No Deterioration

The WFD introduces a statutory requirement to prevent deterioration. Water bodies are not allowed to deteriorate from the baseline status, reported in the River Basin Management Plans.

Deterioration may occur, in part, to headroom in the permitted flow at WWTWs being reduced or over-performance in the effluent treatment compared to the permitted level. If the works were to move towards discharging at full permitted flow and load, there is the possibility of causing deterioration in the status of the receiving water body or downstream water bodies.

As a statutory requirement WFD No Deterioration schemes are not subject to assessment of affordability.

Urban Waste Water Treatment Directive

The objective of the UWWTD is to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors and concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. :

With respect to treatment obligations the following requirements can arise:

a) improvement to discharges that through population growth have crossed population thresholds in the UWWTD.

b) reduction in phosphorus levels in qualifying discharges (from agglomerations >10,000pe) associated with the 2016 review of freshwater Sensitive Areas (Eutrophic), or

c) optimised nitrogen reduction through the treatment process for any qualifying discharges (from agglomerations >10,000pe) associated with the 2016 review of freshwater Sensitive Areas (Nitrate).

UWWTD obligations are 'must do' and so are not subject to cost-benefit appraisal.

Additional measures may be required to reduce the frequency of spills to the environment where identified under Urban Wastewater Treatment Directive or other Water Quality drivers.

Where assets require spill frequency reduction and/or improvement to the continuous discharge treatment (under other PR19 drivers / within other programmes), improvements in flow to full treatment and/or Storm Tank capacity should be linked with these where possible.

Conservation Duties

Natural Environment and Rural Communities (NERC) Act 2006 - The NERC Act places a duty on every public authority (including water companies) to have regard, so far as is consistent with the proper exercise of its functions, to the purpose of conserving biodiversity. We need to take account of this duty, through action on discharges to meet water quality requirements, or through land management schemes

Wildlife and Countryside (W&C) Act 1981 (as amended by Countryside and Rights of Way (CRoW) Act 2000) - The W&C Act requires statutory undertakers (including water companies) and public bodies to take reasonable steps, consistent with the proper exercise of their functions, to further conservation and enhancement of the flora, fauna or geological or physiological features of Sites of Special Scientific Interest (SSSIs).

Invasive Non Native Species (INNS) - This driver identifies investigations and schemes to deliver the new Invasive Alien Species regulation and strategy for INNS, focussing on the pathways of introduction and spread. There is a need to understand the key pathways of spread of INNS on assets and catchments, and how those pathways of spread can be mitigated.

Planning for the future

Our plans for AMP7 are the first stage of our long-term strategy outlined in Welsh Water 2050, published in 2017.

In planning our environment programme we apply the following principles:

- Good evidence and value for money
- Identify innovative approaches to unlock better solutions for the environment
- Customer Support

Improvements need to be based on sound evidence and deliver substantive outcomes

We welcome the move to longer-term and more integrated planning by NRW and EA. By piloting Sustainable Management of Natural Resources, integrating Natural and Social Capital approaches and developing our Drainage and Wastewater Management Plans we can identify more innovative and sustainable solutions providing multiple benefits.

We want to help improve understanding and add to the evidence base with our environmental investigations and enhanced monitoring of our assets.

Building on progress

Our AMP6 environment programme is:

- Enabling improvement to 150km of WFD river through meeting tighter phosphorus and tighter sanitary consents at 22 WWTWs.
- Contributing to achievement of meeting sufficient status at Swansea Bay bathing water. Following our Rainscape approach to delivery of our obligations, Swansea Bay bathing water is currently classed as Good.
- Providing improvement to 1.16km^2 of a site of special scientific interest (SSSI) at Llyn Padarn through phosphorus reduction at our Llanberis WWTW
- Installing event duration monitors (EDM) at all our intermittent assets, so we can gain understanding of when our assets spill to the environment. This will provide us with data to enable us in AMP7 to identify high frequency spillers which may be adversely impacting the environment.
- Contributing to water industry wide phosphorus removal pilots by trialling new technologies at 3 of our sites to of treat to the lower levels of phosphorus that we are now being required to meet.
- Supporting the chemical investigation programme with our environmental regulators and other water and sewerage companies (WASCs), ensuring sound science is available to make future environmental improvements. This programme is being built on in AMP7 as we look to further expand certainty on dealing with chemical contaminants.

Also in AMP6 we have undertaken a number of investigations to build sound evidence and find the most cost effective way of making improvements to the environment. The following three case studies, two looking at supporting cleaner rivers and one looking at supporting cleaner beaches, provide an overview of how we have progressed this aim.

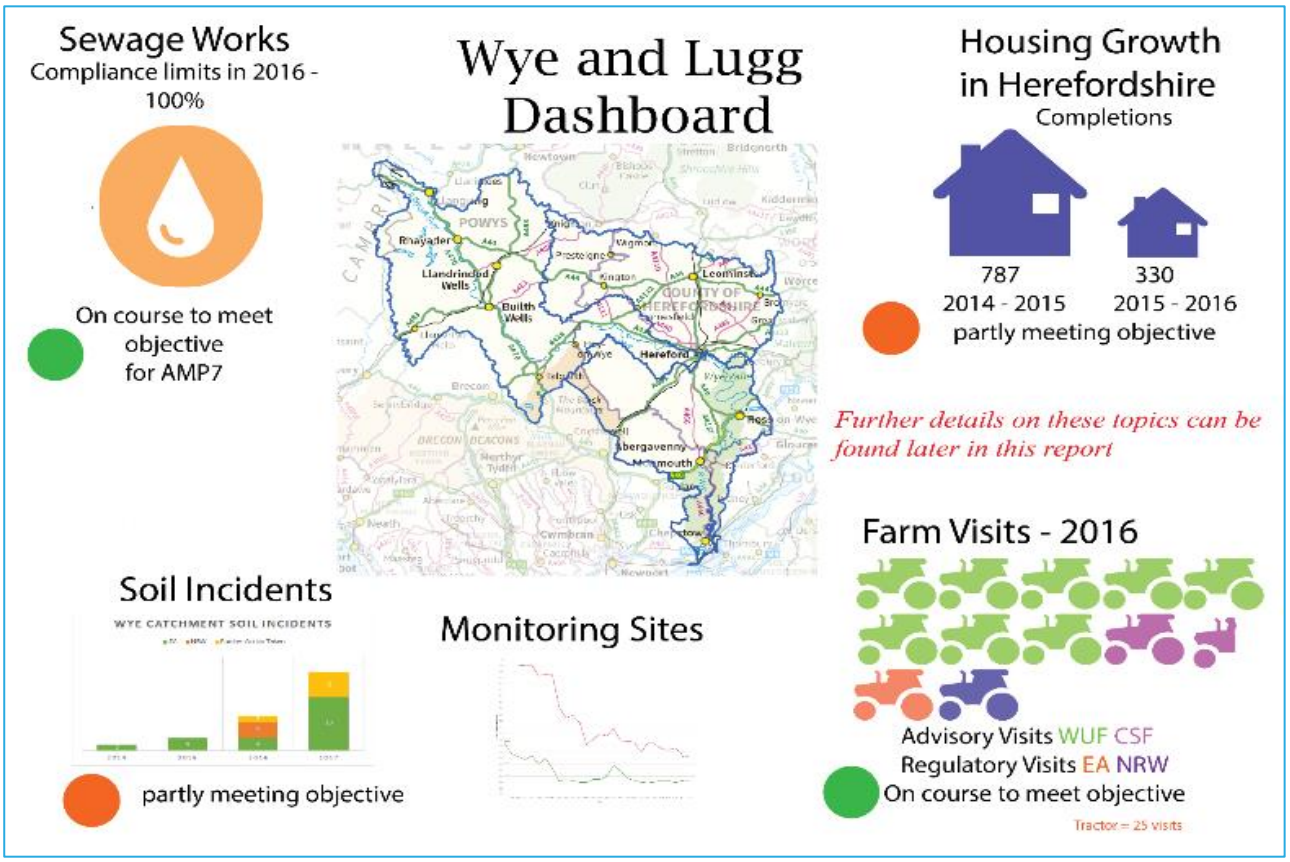


Figure 3 Wye and Lugg Dashboard for monitoring the Nutrient Management Plan

Cleaner Rivers

Rivers Wye and Lugg Investigation

As part of our participation in the Nutrient Management Plan for the Wye and Lugg rivers, in AMP6 we have undertaken a source apportionment investigation to identify which of our activities and those of others are impacting the rivers Wye and Lugg, along with where this impact occurs. The collaborative working partnership supporting the Nutrient Management Plan brings together council bodies from both Herefordshire and Powys, Natural England, Environment Agency, Natural Resources Wales, Wye and Usk Foundation, Farm Herefordshire, National Farmers Union and ourselves.

Figure 3 shows an output from the Nutrient Management Plan dashboard showing how activities of the partners are being tracked.

The outcomes of the investigation are:

- The identification of where phosphorus reductions are needed to best achieve environmental requirements in the Wye and Lugg catchments.
- Inclusion of an allowance for forecast population growth in catchments
- Improved cost effectiveness by taking a catchment wide approach

Our part in the Nutrient Management Plan for AMP7 will be to undertake phosphorus removal at 11 of our WWTWs.

Gwili Gwendraeth Programme

The Gwili and Gwendraeth Fawr rivers are located in Carmarthenshire, South West Wales. The rivers receive treated effluent from eight of our WwTWs (Cross Hands, Cwmtawel, Cwmgwili, Llanedi, Pontyberem, Pontyates, Carway and Trimsaran). These collectively serve a population of more than 25,000 people.

Both rivers are currently failing the water quality requirements of the WFD to achieve the target status of 'Good'. We undertook water quality modelling on the Gwili and Gwendraeth Fawr rivers. We found that to achieve 'Good' status, improvements would be required at all of the existing WwTWs.

The majority of assets at the existing works, although meeting current permit standards, are either in poor condition or will reach the end of their useful life in the next five to ten years. The sites are currently operating at a heightened risk of compliance failure and pollution incidents but managed closely operationally at increased cost.

This combination of drivers created an opportunity to do something different for our customers and the environment at a wider area level rather than asset by asset level to help identify the best long term cost effective options:

- To meet our formal obligations driven by the Water Framework Directive (WFD) and included in the National Environment Programme (NEP).
- Deal with regional growth, asset ageing and the increasing running costs of our current assets.

Further details of our plan for the Gwili Gwendraeth are contained in Supporting Document 5.8P.1

Cleaner Beaches

Our coastal investigations undertaken in AMP6 have looked at 49 Bathing and Shellfish waters in Wales to understand sources of pollution and whether the highest level of water quality, 'Excellent' for Bathing waters and 'Guideline' for Shellfish waters, could be achieved through investment in our assets.

The main conclusions of the investigations are:

- Diffuse loads to rivers were the dominant pollutant source at most sites and hence further investment at our assets was shown to be of little benefit.
- The benefits of our ongoing maintenance plans were demonstrated.
- Further investment in our assets would not benefit bathing water quality or reduce potential risks from climate change. Delivering a 10 spill solution at all CSOs discharging to shellfish waters would deliver little improvement in water quality and would not deliver Guideline quality in any shellfish water.

For shellfish waters NRW cost benefit assessment indicates that achieving the 2016 Guideline standard

would deliver an annual additional benefit to the Welsh shellfish industry of around £1m / year.

To deliver 10 spills at all CSOs in three key Shellfish waters could cost in excess of £600m with no likelihood of delivering significant improvement or Guideline compliance.

The only improvements that are found to be proportionate to benefit is for five of our assets that impact Shellfish waters in parts of the Menai Strait. Improvements at these assets will support achievement of Guideline class.

3 Options

Background

The National Environment Programme (NEP) produced by Natural Resources Wales and the Water Industry National Environment Programme (WINEP) produced by Environment Agency are both programmes that identify environmental improvements required to ensure European and National targets related to the water environment are met. The NEP/WINEP include requirements to undertake improvement schemes, or where more evidence is required, to investigate particular issues. The NEP is split into two programmes: water quality (WQ); and water resources (WR). The WINEP includes both water quality and water resources programmes in one document.

There are discrepancies between the timescales for PR19 and the Water Framework Directive (WFD). As a result Natural Resources Wales and the Environment Agency have issued the NEP/WINEP in phases. The phases and timetable are shown in table 3.

Phase	Release date	Contents
1	March 2017	Phase 1 programmed to support water companies during the development of their water resource management plans. WQ NEP produced by NRW. No phase 1 WINEP from EA.
2	September 2017	WQ NEP and WINEP releases
2.1	December 2017	Update of WQ NEP by NRW only
3	March 2018	WQ NEP and WINEP releases
4	July 2018	WQ NEP release by NRW only

Table 3 Phasing of PR19 NEP and WINEP

Due to the mismatch of environmental planning cycles and business plan time scales the NEP/WINEP will not be completely finalised until after Ministerial Sign Off of the River Basin Management Plans in December 2021. Therefore the NEP/WINEP issued by NRW and EA contain Green (certain), Amber (probable) schemes and Red (unlikely) schemes. The expectation of NRW and EA is that all Green and Amber schemes will have funding allocated.

Following the above NEP/WINEP publications, it is expected that there will be annual updates of the NEP/WINEP up to the final determination of business plans for PR19.

Through every stage of the NEP/WINEP we have pursued a pro-active approach to development of our wastewater environment programme, working jointly with NRW and EA, with regular meetings to discuss PR19 being held. This approach enables us to challenge and influence our environment programme at each step of its evolution, producing a robust programme that meets our environmental obligations whilst ensuring the best outcomes for both our customers and the environment.

Our investigations tell us the likely areas where we would need to invest. This enabled us to start to build up a view of investment required in AMP7 and beyond. In the areas of high certainty we started to look at options in detail for meeting potential new obligations. In areas with greater uncertainty, we developed costs at a programme level to enable us to understand the potential investment required to meet each iteration of the NEP/WINEP. We undertook extensive modelling of all proposed NEP/WINEP schemes identified, again at each iteration, to understand the environmental benefit in relation to potential investment.

High-level options appraisal

Three high-level options were considered in the development of this investment case:

Option 1: Do nothing;

Option 2: Deliver all improvements identified in the NEP4.1 and WINEP3 in AMP7, or

Option 3: Deliver a programme that meets legal obligations and provides the best outcome for our environment and our customers.

Further detail on these options is provided below:

Option 1: Do nothing in AMP7 and challenge all our environmental obligations.

Option 2: Deliver all improvements identified in the NEP4.1 and WINEP3 in AMP7

We would meet all obligations as identified in the WQ NEP4.1 and WINEP3 in AMP7. This would require an investment of £611m, to meet the funding requirements of all obligations identified as green and amber. It would deliver approximately 400km of river improvement.

Option 3: Deliver a programme that meets legal obligations and provides the best outcome for our environment and our customers

We have looked at prioritising our environment programme using the following principles:

- Good evidence and value for money
- Innovative approaches to unlock better outcomes for the environment and society
- Customer Support

We would look to achieve a longer-term and more integrated approach through learning how to implement a sustainable management of natural resources approach supported by natural and social capital assessment. We want to help improve understanding of the impacts on the environment and ecosystem services, adding to the evidence base through our environment programme investigations to deliver better environmental outcomes.

To achieve these aims, we have learnt through AMP6 that we need to adopt new approaches to our environment programme and the following descriptions in figures 4 and 5 provides an outline of how we would take new approaches forward in AMP7.

Assessment

Our customers value the natural environment. Obligations identified by our environmental regulators are to meet regulatory duties. We can neither ignore our customers nor our regulatory duties. This means that “option 1 – Do nothing” is not tenable.

With option2, whilst meeting all our obligations we would be investing in some areas that lack sound evidence to support good value investment that deliver outcomes. It would be challenging to deliver, being nearly four and a half times larger than our AMP6 wastewater environment programme. With such a large programme to deliver we may not be able to develop synergies within the wider AMP7 business programmes or explore new ways or working. It would substantially increase customer bills now and in the future.

Option 3 is the preferred option to take forward for more detailed definition. This is because it delivers well evidenced cost effective environmental improvements during AMP7, whilst being the most environmentally and cost effective way to deliver better environmental outcomes for our customers in AMP8 and the longer term.

Sustainable Management of Natural Resources

The Environment (Wales) Act 2016 places a duty upon Natural Resources Wales (NRW) to deliver the Sustainable Management of Natural Resources (SMNR). The objective of SMNR is to maintain and enhance the resilience of ecosystems and the benefits they provide. The Act sets the expectation that natural resources are used wisely and that the ecosystems they support should contribute to the wellbeing of present and future generations.

In our long-term vision 'Water 2050' we set out a commitment to support NRW in its delivery of SMNR by setting ourselves the challenge, "to become a truly world class, resilient and sustainable water service for the benefit of future generations". Our statutory Biodiversity Plan 'Making time for nature' describes how the Company will protect and enhance biodiversity in the exercise of our functions.

To maximise benefits for ecosystems, biodiversity and the wellbeing of our customers, we have recognised that there is an opportunity to develop a new strategic approach to integrated environmental management for AMP7, the next cycles of River Basin Management Plans and Flood Risk Management Plans, Drainage and Wastewater Management Plans and into the future.

As such we are looking to develop pilots for areas where our impact on waterbodies is a contributing impact, but others will need to play their part in supporting the waterbodies in achieving environmental benefits.

Figure 4 Sustainable Management of Natural Resources

Natural and Social Capital Assessment

We have developed six customer promises to reflect the service it should provide to all customers. Two of these promises are to *Safeguard our environment for future generations* and *A better future for all our communities*. In order to support meeting these promises we are developing tools and strategies to better understand environmental and social benefits from the work we undertake.

We impact and depend on the natural environment (natural capital) for its raw product and to receive treated effluents, and experiences risks and/or opportunities (ecosystem services) associated with its interaction with the natural environment. Impacts can be negative, e.g., pollution, or positive, e.g., improved water quality. While these impacts are more commonly measured, dependencies are not fully recognized and understood, e.g., the need for improved raw water quality in drinking water production.

All the impacts and dependencies create costs and benefits not only for our customers through our operations, but also for other businesses, society and more widely. Understanding the connections between our operations, society and the environment, and the associated risks and opportunities will inform better, timelier decision making.

Taking account of the environment and society in our planning processes will allow a more complete evaluation of the costs and benefits of our activities. The approach to environmental evaluation is not new, however wider consideration of environmental and social costs and benefits is not undertaken across the whole investment programme.

We have developed a roadmap identifying the areas that we need to be consider in relation to natural and social capital (N&SC) evaluation alongside external policies, requirements and potential time frames. It is clear that it will take a number of planning periods for us to fully embed N&SC approaches. A conceptual tool has already been developed to appraise a range of our investments within different catchments, which we are starting to trial.

The following activities are being undertaken to integrate N&SC approaches:

- Support Welsh Government / Natural Resources Wales in building the evidence base and through demonstration of how N&SC can be undertaken at a project and programme planning level within Wales.
- Progress and further develop activities identified in our N&SC roadmap
- Further development of N&SC appraisal tool
- Active participation on UKWIR N&SC project

Figure 5 Natural and Social Capital Assessment Definition

4 Preferred option

Preferred option

We propose to invest £288.108m (pre-efficiency) during AMP7 in delivering our Wastewater Environment Programme and expect a further £375m for delivery in AMP8, which responds to both our NEP and WINEP obligations that have been identified as Green and Amber, as detailed in table 4 and figure 6 respectively.

Programme of work	Proposed AMP7 programme total budget (£m)	Proposed AMP8 programme total budget (£m)
Water Framework Directive Including our Gwili Gwendraeth Programme	160.7	115.0
Urban Wastewater Treatment Directive Including our Storm Overflow Assessment Framework programme	76.8	134.2
Coastal Improvements	15.5	To be Confirmed at PR24
Conservation Schemes	0.8	
Monitors	24.7	
Investigations	9.5	
Total	288.1	249.2

Table 4 Proposed Wastewater Environment Programme Investment

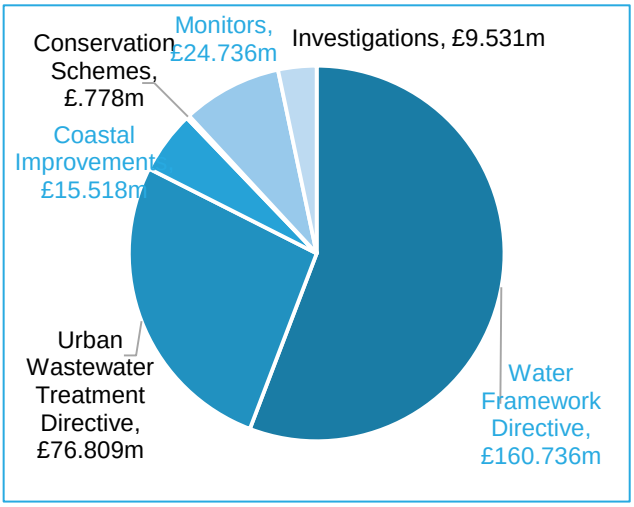


Figure 6 Proposed Wastewater Environment Programme Investment Split

Our preferred option is a phased programme over AMP7 and AMP8 to deliver our environmental obligations. Our phased wastewater service environment programme represents our biggest wastewater environmental programme for over 10 years and will result in almost 300km of river length improvements in AMP7, significantly more than achieved in previous AMP periods. As currently determined meeting our environmental obligations in AMP8 will deliver around 100km of river length improvement for a similar investment, which shows that we are now at the point of diminishing returns if we work alone on improving the environment. It is our aspiration to deliver this plan, with due consideration to current and future generations, in collaboration with other stakeholders where results for both people and the environment could be much greater. In AMP7 we will focus, where possible, on avoiding conventional solutions of expanding individual treatment works as this approach adds to cost pressures and carries bill implications. The phased plan allows us to explore and develop the right solution for each situation, taking into account the need to pursue new approaches, best available techniques and best value costs.

Planned Investment

Water Framework Directive Schemes

Our performance commitment to deliver 418 km of rivers improved in AMP7 is supported by our investment programme linked to tightened consents to meet WFD obligations in the NEP4.1 and WINEP3. Improvements made under our wastewater environment programme will account for 294km of rivers improved.

Wastewater Treatment Works

Our environmental regulators have identified requirements for meeting:

- Tighter Phosphorus limits at 42 WWTWs
- Tighter Sanitary Determinands limits at 32 WWTWs
- Both tighter Phosphorus and Sanitary Determinands limits at 7 WWTWs

Our environment programme looks to deliver these improvements over two AMP periods.

AMP7 implementation

We have prioritised 33 WWTWs, which currently provide treatment for a population equivalent of 233,000, and have been identified as providing the most benefit to rivers for implementation in AMP7 and which are backed up with sound evidence:

- 18 WWTWs to meet tighter phosphorus limits
- 8 WWTWs to meet tighter sanitary determinands limits
- 7 WWTWs requiring both tighter Phosphorus and Sanitary Determinands limits.

As described in section 2, our investigation for the Wye and Lugg Nutrient Management Plan has identified 12 of the above WWTWs for our AMP7 programme, whilst our Gwili Gwendraeth Programme plans to improve 7 of these WWTWs in AMP7.

We have investigated a potential rationalisation scheme for 5 sites, and preliminary feasibility undertaken for PR19 shows that there are potential economic and environmental benefits in joining two of these sites together.

Following the outcome of one of our AMP6 WFD investigations we will look to understand a catchment wide scheme for 4 other sites for 2 related waterbodies.

These schemes will support 294km of river improvement.

Phased AMP7/8 Implementation

The remaining 48 WWTWs, which currently provide treatment for a population equivalent of 103,000, provide smaller river improvements at much higher costs. At some sites our source apportionment is only 1% of total contribution to the river not achieving good status. Other sectors will have to play their part for the river to achieve better environmental outcomes.

At these 48 sites we will carry out SMNR pilots, as described in section 3, and investigations in AMP7 with the aim to deliver more sustainable environmental outcomes for the waterbodies linked to those WWTWs. Proposed completion for these schemes are December 2027, to tie in with the WFD River Basin Management Plan cycle 3, but the SMNR pilots may identify and deliver environmental benefits in AMP7.

Schemes falling under this investment have been initially estimated as supporting just over 100km of river improvement.

Barriers to Fish

The evidence base for identifying where our assets may be causing barriers in rivers to fish migration is still being developed. NRW have identified 29 potential sites, but the impact of these sites on fish migration is still to be confirmed. In AMP7 we will first fully investigate the 29 sites and assess possible solutions. As provided in the NEP4.1 and in agreement with NRW we will deliver affordable high priority sites in AMP7 and for higher cost priority sites that meet WFD cost benefit assessment these will be developed for delivery in our AMP8 programme.

UWWTD Improvements

Population Growth

We have four WWTWs in England that will go over population thresholds linked to the UWWTD in AMP7.

The population equivalent (PE) at two WWTWs will go above 250 and a numeric consent will be applied. Investment is allocated to meet these new consent limits

Two WWTWs will go above a PE of 2000. Whilst there are no requirements to improve these sites we need start sample monitoring in line with UWWTD requirements.

Increase to Flow to full treatment (FFT) and Storm tank capacity

During our PR19 planning we undertook detailed desktop studies to identify which of our assets may meet our environmental regulators guidance for works requiring to meet an increase in FFT or storm tank capacity. We identified:

- 36 sites potentially requiring an increase in FFT
- 112 sites requiring additional or new storm tank capacity

We are proposing to undertake improvements in AMP7 at:

- 5 sites requiring an increase in FFT
- 13 sites requiring additional storm tanks

The sites have been selected on the basis of the assets being in WFD waterbodies that are not at good status and where we are identified as being a reason for not achieving good.

In AMP7 we will be installing monitors to directly measure FFT, rather than the indirect method we use at present, which will provide robust evidence as to whether the remaining identified sites will require improvement and the scale required.

The learning we will gain by undertaking the proposed schemes in AMP7 will provide us with better information to enable the most cost-effective solutions to be designed at additional sites.

Where we see links between the proposed AMP7 / future AMP8 sites and Storm Overflow Assessment Framework (SOAF) investigations, SMNR pilots or Drainage and Wastewater Management Plans (DWMPs) we will integrate our activities to achieve the best outcome for the environment and our customers.

Storm Overflow Assessment Framework Programme

The need for investment has been evidenced through new requirements for Event Duration Monitoring (EDM) implemented at the end of AMP5 and continuing throughout AMP6. This has shown that some of our assets have, and will have, a spill frequency above a formal trigger frequency that has been prescribed by Natural Resources Wales and Environment Agency as part of their development of an EDM driven spill frequency permitting regime.

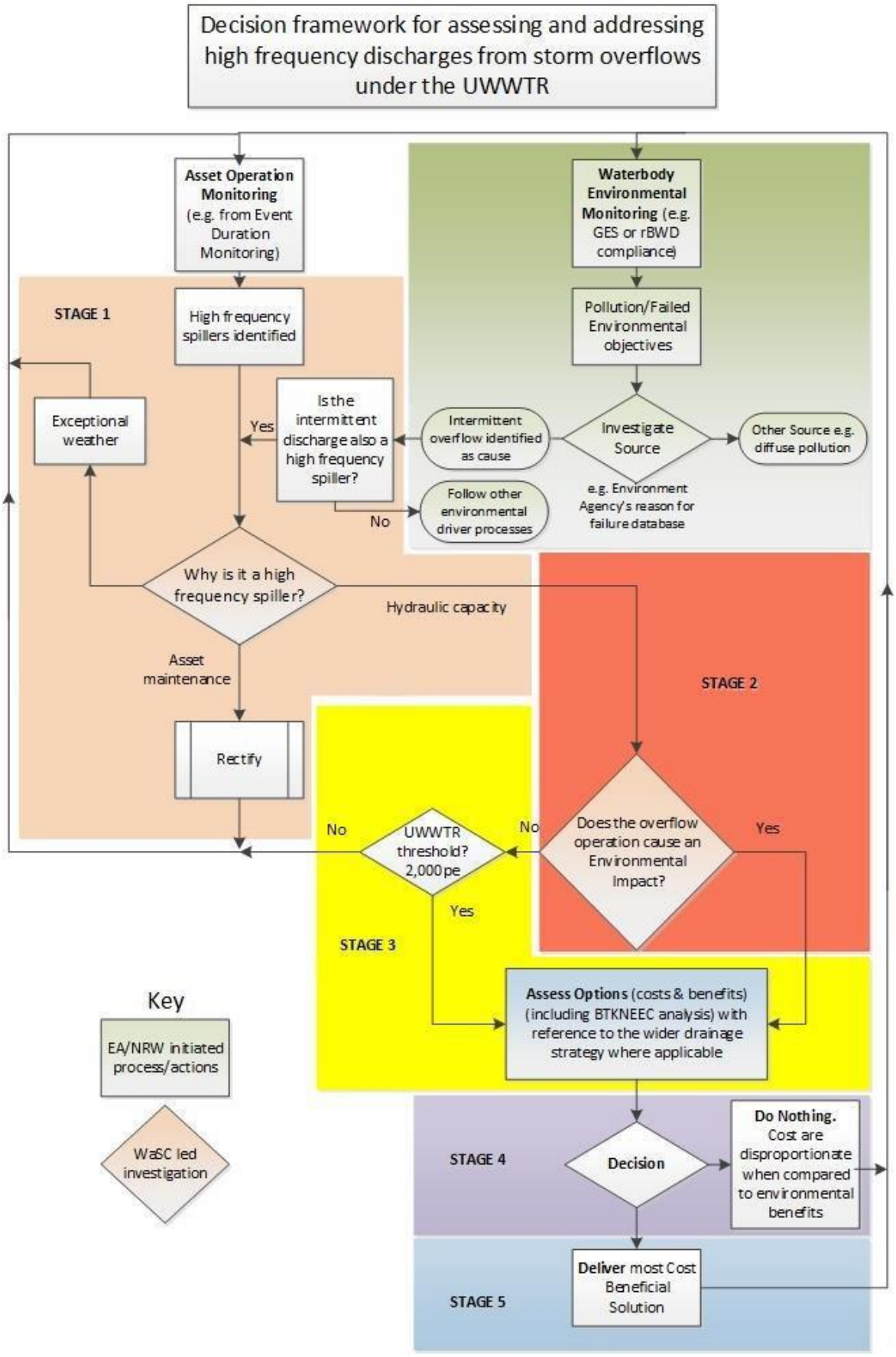
In Wales, Welsh Government have set a more demanding installation rate (full coverage) compared to the phased approach taken by the rest of the water industry (England). Consequently, the need to address poorly performing assets will arise earlier in Wales (AMP7) than in England (AMP8).

We have used our available EDM data to date to forecast the expenditure required for our intermittent storm overflows to meet the spill frequency requirements during AMP7. Due to the immaturity of the EDM process, there are inherent uncertainties within our projections. In light of this, we have set out a plan for AMP7 that:

- is proportionate to our current understanding of the risk
- is balanced against delivering an affordable and demanding wastewater environment programme

and in light of our long-term Welsh Water 2050:

- delivers the level of service embedded in our customer promises
- supports the delivery of our strategic responses to future trends


Decision framework for assessing and addressing high frequency discharges from storm overflows under the UWWTR
Asset Operation Monitoring (e.g. from Event Duration Monitoring)
Waterbody Environmental Monitoring (e.g. GES or rBWD compliance)
STAGE 1
High frequency spillers identified
Pollution/Failed Environmental objectives
Exceptional weather
Is the intermittent discharge also a high frequency spiller?
Yes
Intermittent overflow identified as cause
Investigate Source
Other Source e.g. diffuse pollution
No
Follow other environmental driver processes
e.g. Environment Agency's reason for failure database
Why is it a high frequency spiller?
Hydraulic capacity
Asset maintenance
STAGE 2
Rectify
No
UWWTR threshold? 2,000 pe
No
Does the overflow operation cause an Environmental Impact?
Yes
Yes
STAGE 3
Assess Options (costs & benefits) (including BTKNEEC analysis) with reference to the wider drainage strategy where applicable
Key
EA/NRW initiated process/actions
WaSC led investigation
STAGE 4
Decision
Do Nothing. Cost are disproportionate when compared to environmental benefits
STAGE 5
Deliver most Cost Beneficial Solution

For AMP7, we will adopt a risk based approach to investment to ensure that our high-risk / high impact intermittent storm overflows meet spill frequencies that are in-line with requirements set out in EA and NRW's Storm Overflow Assessment Framework[viii] (SOAF), a schematic of which is detailed in figure 7.

The key activities we are proposing include:

- an investigation programme to determine environmental impact (High Frequency Spillers)
- Improvements to the spill performance of overflows (High Frequency Spillers) where it is cost beneficial to do so.

Our investment will address those assets most at risk within our intermittent storm overflows asset base that are shown to be having the highest environmental impact and provide a forward programme for improvement in future AMP periods. Our need for investment over the medium term (2020 – 2030) will be determined by each and every investigation we undertake in AMP7 as part of SOAF. These investigations will determine the impact our assets are having and will also determine the scale of the intervention where required. It is anticipated that our AMP7 catchment planning and investment decision making will be influenced by our adoption of the 21st century Drainage and Wastewater Management Plan Framework that is presently under development along with our proposed pilots using a Sustainable Management of Natural Resources approach. In the future our management of EDM performance will continue to reflect our aims set out in Welsh Water 2050, which is to seek opportunities for using nature to reduce flood risk and pollution whilst minimising the impacts of our assets to support cleaner rivers and beaches.

Coastal Improvements

Menai Strait

As detailed in section 2, following the outcome of our AMP6 coastal investigations we have identified five of our assets that impact Shellfish waters in parts of the Menai Strait that would require 3000m^3 of traditional storage to meet the required reduction to 10 storm discharges per year. Our experience of carrying out solutions at assets for the shellfish water improvements in AMP6 at the Burry Inlet and Conwy shellfish waters will be applied in delivering improvements in AMP7. Our proposed Investment of £15.5m for the Menai Strait Shellfish waters will support achievement of guideline class.

Conservation Schemes

Biodiversity Driver

Elan Valley Celtic Rainforest - Actions to support biodiversity within the Elan Valley Woodlands Special Area of Conservation (SAC) are required including removal of non-native species, such as Rhododendron, in the valley.

Invasive Non Native Species (INNS)

Programme to support community projects, aiming to contribute to Wales's priority species. Actions to encourage partnership and a catchment approach to tackle INNS. The AMP6 INNS fund have supported some landscape scale projects. The criteria is for focus on benefits to our assets and operations, also prevention of spread or eradication (risk based and species specific).

Nature 2000 (N2K) sites

Programme to deliver actions to support conservation objectives of N2K sites within our land ownership and sites where our operations have impact.

Wildlife and Countryside Act

Programme to deliver actions to ensure favourable condition status of SSSIs within our land ownership and sites where our operations have impact.

Installation of Monitors

In conjunction with our PR19 investigations, a programme of installing monitors is being proposed for PR19 to enhance our understanding of assets for future investment based on sound science and evidence.

Our monitoring requirements, as identified in the NEP4.1 and WINEP3, are summarised as follows.

Figure 7 Storm Overflow Assessment Framework

- Install EDM on 388 WWTW overflows to storm tanks at those WWTW where we can`t use existing monitors to be confident that the permitted FFT setting is being complied with.
- Install 389 flow monitors to MCERTS (Monitoring Certification Scheme) standards as close to the overflow as practicable to record FFT at WWTWs where the existing dry weather flow MCERTS flow monitoring, or other installed flow monitoring, cannot be readily used to confirm the permitted FFT setting is being complied with when the overflow to storm tanks operates.
- Provide MCERTS flow monitoring for the first time at 28 WWTW where permitted dry weather flow (DWF) or maximum daily flow is greater than 50m3/d.
- Provide MCERTS flow monitoring at 10 WTW's with maximum flow over 50m3.

It is assumed that the monitoring programme will be a two stage process:

- Install monitors and gather information to understand impact in AMP7 and subsequent AMPs.
- Any asset improvements needed are to be driven through the PR24/29 process.

In particular the information provided by these monitors will enable us to gather the sound evidence for understanding sites that require an increase to FFT or increase in storm tank capacity.

Investigations

New and amended environmental legislation drives significant investment in AMP periods. In order to inform in an evidence-led way potential future investment, we have identified a programme of investigations, which, based on investigations carried out during previous AMPs, are considered good value for money.

Investigations identify where potential capital investment can be best targeted or avoided through sound science and identify where capital investment can be phased over AMP periods.

Active management of shellfish waters

We are working with NRW and Food Standards Agency (FSA) Wales on a number of pilot studies to provide real-time Active Management (AM) for shellfish waters in Wales. Active Management will provide shellfish harvesters with predictions of water quality, in particular forecasting of pollution events in response to rainfall, so harvesters can make informed decisions on when to gather to maximise the quality of the shellfish harvested. This work is at an early stage, but currently has two main areas of focus. Firstly, during AMP7, we will pilot real time CSO operation alerts to gatherers in selected shellfish harvesting areas in Wales. This system is likely to be similar to that operated for bathing waters through Surfers Against Sewage's Safer Seas Service. Secondly we will use its data, coastal models and knowledge of the response of shellfish waters to rainfall events to support the development of pilot AM systems in Wales through an initiative led by FSA.

WFD Benthic investigations

We will support NRW in identifying potential causes of WFD failures (benthic ecology) in two marine water bodies in Wales. This is the first such investigation carried out in Wales. We will use our coastal models developed in AMP6 to provide information on water movement and circulation, pollutant transport dispersion and physio-chemical reactions to determine baseline conditions and the potential effect of our operations, and other, discharges on water quality and whether this may be linked to WFD failure.

Bathing water investigation – full microbiological profile of the Clywd

Investigations under AMP6 into the causes of Sufficient bathing water quality at Rhyl identified that a significant part of the impact comes from the Afon Clwyd catchment. This is a large rural catchment with significant diffuse inputs from agriculture as well as local sources from small WwTW and CSOs. It was not possible within the scope of the AMP6 investigations to determine the proportion of agricultural and anthropogenic sources in the catchment. As part of proposed studies we will undertake a full assessment of

microbial pollutant sources in the Clwyd catchment. Field sampling will be used to support the development of a catchment model that can represent these sources, their response to rainfall events and determine the relative contribution of each source to bathing water quality. The model can then be used to assess the effectiveness of remedial measures, e.g. our investment and improvements to agricultural land management, to determine the most appropriate investment route to improve bathing water quality. The model could also be used to provide more robust data for bathing water management and could form the basis for similar studies at other bathing waters that are at risk from diffuse pollution. In addition to microbial pollution the model will be developed to assess other water quality parameters to assess wider water quality issues to support our investment and NRW's SMNR objectives.

Chemical Investigation Programme

The Chemical Investigations Programme (CIP) is the UK water industry's response to current and emerging legislation on trace substances in the water environment. It brings together the water and wastewater companies in England and Wales with the various regulators in a collaborative programme. CIP2 ran in AMP6 at a cost to the water industry of £200m and looked at over 600 hundred sampling sites in England and Wales as well as the potential removal technologies for specific chemical pollutants. CIP3 will run for AMP7 and includes research into pharmaceuticals and other emerging hazardous substances in rivers, groundwater and wastewater effluent. CIP3 will also be investigating the mechanisms of removal for these substances including what products they break down into, and how they can be removed during the treatment process. The investigations are wide reaching and include a module on microplastics in the environment, potable and waste water.

WFD Investigations

We will continue a programme of WFD investigations for waterbodies where we have been identified as a reason for not achieving good but have not investigated in our AMP6 programme or where our AMP6 programme has identified further areas requiring investigation. Our WFD investigations to date provide the sound evidence for understanding whether our assets are impacting the environment and the benefits of improvements if required.

Conservation Investigations

An investigation into scales and types of habitats on our owned land. - to enable us to understand the scale and conditions of habitats within our landownership, in order to formulate prioritised action plans to maintain and enhance the habitats, therefore delivering our Biodiversity duty.

An investigation into the status of all SSSIs within our land ownership. -. There is an opportunity for us to work with NRW to identify and prioritise actions to ensure favourable condition status of SSSI within our ownership and for us to have an action plan in place to ensure biodiversity values are maintained and enhanced. Also includes our sites which are currently managed or planned to be managed for recreational use of the public.

An investigation into scale (population distribution and area cover) of Section 7 list of priority species on our operational sites. - With the vast number of operational assets across Wales, some of our sites may house priority species. Clarity on where they are, their conditions, scale and connectivity with populations outside of our land holdings will enable us to develop an action plan to maintain and enhance the priority species.

Mitigation framework and operational licences for protected species - There are cases where our routine operational activities, including ground maintenance, are delayed due to presence of a protected species. Our best practice is to put the activities on hold till a suitable licence is obtained. However, this may cause risks to public health or affect serviceability of the asset e.g. maintenance of service reservoirs. A clarity on which of our operational assets are regularly used or occupied by protected species will allow us to develop suitable guidance to local staff. A mitigation framework and operational licences (for specified species) will also allow routine operation and maintenance of the asset to proceed while meeting conditions of the licences and with acceptable mitigation measures as part of the routine works.

INNS surveillance and risks analysis on our assets (pathway assessment) - Support Wales to build evidence with focus on the Priority Species for

Action for Wales and the priority species relevant to our activities.

5 Cost Efficiency and Innovation

Cost efficiency

We are proposing to deliver £32.2 m of cost efficiencies as part of this investment programme, as shown in table 5.

We will deliver these savings by challenging our Alliance partners to improve efficiency and by maximising opportunities to innovate.

Programme of work	Total Budget
Total programme (pre-efficiency)	£288.1 m
Total programme (post-efficiency challenge)	£255.9 m

Table 5 Cost Efficiencies

Summary of innovation in this programme

Throughout this document we have highlighted a variety of innovation that we have applied in AMP6 and where we are looking to do something different in AMP7. Areas that have been highlighted include:

AMP6

- Coastal investigations
- Catchment approach to achieving best long term cost and environmental benefit for the Gwili and Gwendraeth rivers.
- Participative catchment approach through our involvement in the Wye and Lugg Nutrient Management Plan
- Novel solutions for meeting our obligations in Llanelli and Gowerton
- Implementation of full-scale schemes to achieve low phosphorus limits as part of the National Phosphorus Trials.

AMP7

- Plans to pilot a Sustainable Management of Natural Resources approach
- Looking to integrate Natural and Social Capital Assessment into our planning processes.
- Figure 8 Proposed cost efficiency
- Investigations to build sound evidence and trial innovative processes to provide better outcomes for the environment and our customers

Partnering and co-creation

Working closing with our partners is essential to the way we plan our wastewater environment programme for AMP7 and beyond. We also highlight this in our 2050 strategy highlights through identifying partners for each of our programmes of future work.

We aim to undertake our wastewater environment programme in partnership with customers and communities, the Customer Challenge Group, other sectors and, crucially, our environmental regulators Natural Resources Wales and the Environment Agency.

6 Value for money and affordability

Impact on customer bills

We understand the importance of balancing the need for investment with the affordability of our bills. We believe the investment will help to deliver the best benefits to the environment and to our customers whilst meeting our environmental regulators expectations. We believe it represents an optimal approach for sustainable long term environmental protection and improvement.

Value for money

We recognise the need to demonstrate value for money in everything that we do. In arriving at the proposed investment, we have closely considered the costs and benefits of different approaches to make sure that the investment represents long term value to our customers and to the environment.

The programmes of work have been developed so that they are delivered in conjunction with other programmes of work, to achieve multiple benefits through integration and finding synergies with other activities.

As outlined in the previous section of this document, we will also seek to ensure value for money by promoting innovation throughout delivery, by learning lessons from the work we have delivered to date, and by working closely with our partners to encourage best practice and incentivising efficiency.

7 Delivery

Procurement

We have undertaken an assessment of the applicability of direct procurement for these projects. At this time we do not consider a direct procurement approach would not be in the best interests of customers.

The various projects will be managed by our wastewater Assets team throughout AMP7 with scope and programme adjustments being made to meet our environmental obligations. We will monitor performance month by month so that we can respond quickly to emerging signs if we are not getting the benefits we have projected.

Programme

A prioritised programme of work has been produced linked to the investments, costs and associated benefits of the environment programme. Interventions to target improvements in Water Quality will be targeted for completion in line with completion dates given in the NEP and WINEP.

These programmes of work will be continually updated following review of investigation and SMNR outputs. This may lead to reprioritisation of the interventions undertaken during the AMP7 period and those proposed for AMP8 completion.

Our plan will be to continue with each of the investment programmes beyond March 2025 with the latest study, cost, performance and benefits data used to prioritise the interventions for each periodic review starting with PR24.

We have set out a full five year AMP7 programme and a further AMP8 programme to meet all our requirements in the NEP4.1. However programmes for AMP8 and beyond will be based on our continuous review during AMP7.

Uncertainty & external factors

We have assumed that there will be no change to standards over the period of investment. Risks have been identified by understanding those assets that have not yet received investment and carrying out surveys to understand gaps. Work to provide clarity on environmental obligations is continuously ongoing, there are a number of uncertainties that could have a significant effect on the final programme and hence delivery of the programme.

The following are all areas of uncertainty:

- Further designations could be made within the region for Shellfish, Bathing Waters, Habitats or other ‘sensitive’ sites.
- Further designations could be made following the publishing in December 2021 of the Third River Basin Management Plan (RBMP3), setting objectives for water bodies and the measures planned to meet these objectives.
- Further controlled waters within our region, could be designated as a “Sensitive Water” under the Urban Waste Water Treatment Directive (UWWTD) requiring nutrient removal or other types of enhanced treatments at our Wastewater Treatment Works.
- It should be noted that there continue to be new proposals from the EU on such issues as new Water Framework Directive (WFD) Sister/Daughter Directives for Dangerous Substances along with uncertainty on how the UKs environmental regulations will change following Brexit. These changes may drive requirements for investigations or schemes late in AMP7 and early AMP8.
- The specific nature of requirements (if anything) needed to bring sites in line with the Industrial Emissions Directive (IED) has yet to be determined by the regulators and as such cannot be costed for the PR19 submission. IED would be a new obligation once any regulatory requirements have been confirmed.
- The RBMP3 will set WFD objectives for water bodies and the measures planned to meet such objectives. To deal with this uncertainty, forecast investment related to potential activities has been included in PR19 under a “Managing Uncertainty” approach. Some sites have a high degree of certainty, others will be re prioritised or excluded following further

investigation, modelling, or disproportionate cost analysis.

Risk mitigation and customer protection

We have developed a Measure of Success for kms of river improved , which will provide protection for our customers in the event that schemes planned for AMP7 completion are removed from the WINEP or NEP by EA and NRW due to cost benefit assessment revisions for WFD or investigations providing better value options for meeting environmental obligations. If such events arise we will move forward schemes, prioritised in agreement with our environmental regulators from our current NEP4.1 AMP8 programme to enable meeting our MoS target.

8 Assurance

Governance

Our current wastewater environment programme is supported by the Waste Totex Steering Group. The team meets on a monthly basis and is chaired by the Director of Wastewater Services. This helps to ensure that the full focus of the business is directed at this investment.

Our wastewater environment programme performance is monitored by our environmental regulators and meetings are held with them every quarter to this end. Regular PR19 meetings have been held with our environmental regulators in planning our AMP7 and AMP8 wastewater environment programme.

On a daily basis our current performance is shared internally to ensure that emerging trends and problem areas are targeted quickly. There is also strong awareness of our commitment to improve meet our environmental obligations.

Our Capital Investment is governed by the Capital Gateway process overseen by our Capital Programme Board (CPB) which meets monthly. Papers are submitted for key decisions on significant individual schemes. Lower level schemes are managed by delegated authority on behalf of the board.

We will continue to apply these effective governance systems for our proposed AMP7 investment programme.

Cost assurance

We have undertaken a high-level feasibility study to enable the high-level scope of work and cost benefit of the options to be assessed.

The proposed total expenditure has been derived on a combination of outturn costs of AMP6 projects and average costs from projects undertaken during AMP5 and 6. In addition more certain projects has been calculated using the Unit Cost Database approach.

As more investigation and research type programmes are delivered a greater assurance will be obtained regarding the unit cost of these types of programmes, providing more certainty of costs for AMP8 schemes.

Customer consultation assurance

Our customers have showed a strong support for investment in this area, with 'Cleaner rivers and beaches' being the statement given the highest importance overall with high scores across all demographic groups.[ix]

It will therefore support our customer priorities. In addition our customers have also indicated that they expect us to be planning ahead and our investment supports this by looking forward to AMP8 obligations.

Measures of Success

This investment will contribute to achieving 294km for our MoS of Km of river improved, but will also support the MoS / Performance commitments as identified in Table 6.

Measure of Success	End of AMP6 Performance Target	Performance target by end of AMP7
Km of rivers improved (C12)	562	418
Pollution incidents from wastewater (O8)	107	90
Wastewater Treatment works compliance (O14)	100%	100%
Wastewater Treatment works look-up table compliance (C2)	99%	100%
Risk of sewer flooding in a severe storm (Ft2)	3.63% (2017-18 figure)	5% improvement from 19/20 performance
Surface water removed from sewers (Ft4)	25,000 RTE	47,000 RTE

* This is a cumulative target i.e. we are planning to remove 22,000 RTE in AMP7 giving a cumulative total of 47,000 RTE for AMP6 and AMP7

Table 6 Measures of Success

Future assurance

We have strong governance procedures for the planning and delivery of our capital investment. Our Board will continue to provide the high level overview and governance to ensure that we deliver our wastewater environment programme in the interests of the environment and our customers.

Appendix 1: Sub-Programme Costing Overview

Programme of Work	Sub-programme	AMP7 Investment (£m) pre-efficiency	Detailed scheme development	Historic Cost Assessment	Estimates	Comments
Water Framework Directive	P Removal - Completion in AMP7	67.047	✓	✓		Detailed scheme development was undertaken for 35 WWTWs where there was high certainty of inclusion in the environment programme. In areas with greater uncertainty, we developed costs using historic cost assessment, enabling us to understand the potential investment required to meet each iteration of the NEP and WINEP.
	P Removal - Completion in AMP8	9.878		✓		
	Sanitary Determinands - Completion in AMP7	11.408	✓	✓		
	Sanitary Determinands - Completion in AMP8	10.684		✓		
	Gwili Gwendraeth programme	60.745	✓			Detailed costs developed as scheme is progressing through our Gateway delivery process.
	WFD Fish Barriers Schemes / Investigations	0.973			✓	A new NEP driver for PR19. No experience of delivering internally. Estimate and funding allocated agreed with NRW, with the understanding that schemes that do not fit within the allocated funding will be delivered through PR24.

Urban Wastewater Treatment Directive	Population Growth	0.486		✓		Historic cost assessment used for 2 sites.
	Increase FFT - Completion in AMP7	26.710	✓	✓		Detailed scheme development was undertaken for 7 WWTWs to assess the implications of this driver that was introduced late to the PR19 process. The detailed scheme costs validated the high-level cost assessment for the other sites, enabling us to understand the potential investment across all sites required to meet this driver.
	Increase FFT - Completion in AMP8	3.718		✓		
	Storm Tanks	6.394	✓	✓		Analysis of each site requiring increases in storm tanks was undertaken. This provided a storage volume which was costed for each site using unit rates.
	SOAF Schemes	39.501			✓	Estimates of high spillers developed from our early EDM installations provided a forecast requirement to meet high spillers at £80m. The investment allocated to this line will deliver the high priority schemes in AMP7 and allow development of schemes for AMP8. Scheme priority will be carried out in agreement with our

						environmental regulators.
Coastal Improvements	Menai Strait Shellfish Water	15.518		✓		Our AMP6 coastal models developed storage volumes against all assets that were found to be impacting. High level costs based on historic cost assessment were developed for use by NRW and EA for cost-benefit assessment.
Conservation Drivers	Conservation Schemes	0.778		✓	✓	Costs developed from similar schemes undertaken in AMP5 and AMP6, with estimates used for new areas of work not undertaken previously.
Monitors	Monitors	24.736		✓		Unit rates used for costing of installations at all sites.
Investigations	SOAF Investigations	4.378		✓	✓	Costs developed from investigations undertaken in AMP5 and AMP6, with estimates used for new investigative areas not undertaken previously.
	CIP3 Investigations	2.283		✓	✓	
	WFD / Coastal / Conservation Investigations	2.870		✓	✓	

Appendix 2: Cost adjustment mechanism to address unconfirmed requirements in environmental programmes drawn up by the EA and NRW

As a company that serves communities in both Wales and England, we have obligations under both the Welsh NEP and the English WINEP. The status of the two programmes, and their implications for the AMP7 cost adjustment mechanism, is slightly different.

NEP cost adjustment mechanism

In agreement with Welsh Government and Natural Resources Wales, environmental outputs identified in the NEP that are confirmed, categorised as green, have been phased for completion over AMP7 and AMP8.

Out of the 862 outputs categorised as green or amber in the WQ NEP4.1 and WR NEP3, only 18 are categorised as amber. Of these 18, only 4 have been identified and costed in our environment programme for completion in AMP7, all others are phased for completion in AMP8. These 4 amber sites are included within our plan as they are linked to other drivers which have been categorised as green and are part of the Gwili-Gwendraeth Programme (see Supporting Document 5.8P.1)

There is an expectation from Welsh Government that we seek out opportunities, alternative ways of working and identify different approaches to deliver environmental improvements, as we move through delivery of our environment programme, with a particular focus of bringing forward any programmed work if headroom is made available through efficiencies or alternative ways of working.

Therefore, in the event that any schemes planned for AMP7 completion are removed from the NEP by NRW, due to cost benefit assessment revisions for WFD or investigations providing better value options for meeting environmental obligations, we will move forward schemes from our current NEP AMP8 programme, in agreement with NRW to meet the expectations of Welsh Government.

In other words, given that almost all the schemes in the NEP are green and the Welsh Government has signalled its expectation that headroom created (for any reason) should prompt the bringing forward of schemes from AMP8 in consultation with NRW, a “cost adjustment mechanism” is already effectively in place. This will be subject to ongoing scrutiny by both NRW and the Welsh Government as the programme is delivered.

WINEP cost adjustment mechanism

By contrast, the AMP7 WINEP programme is subject to greater uncertainty, and we are proposing more specific cost adjustment mechanisms.

We have 9 unconfirmed outputs identified in the WINEP3, which are as follows:

Unique ID	Scheme Name/Name of Investigation/Site Name/License name	Driver Code (Primary)	Completion Date (DD/MM/YY)
7DC300014	Chester WwTW	U_IMP6	31/03/2025
7DC200077	Moreton on Lugg WwTW	U_IMP6	31/03/2025
7DC200084	Peterchurch WwTW	U_IMP6	31/03/2025
7DC200094	Ruardean WwTW	U_IMP6	31/03/2025
7DC200029	Malpas WwTW	WFD_IMPg	22/12/2024
7DC200030	No Man's Heath WwTW	WFD_IMPg	22/12/2024
7DC200033	Whitchurch WwTW	WFD_IMPg	22/12/2024
7DC200031	Tattenhall WwTW	WFD_IMPg	22/12/2024
7DC200026	Neston WwTW Storm Tanks	U_INV	31/03/2025

The cost adjustment mechanisms we are proposing for these schemes vary by driver, and are set out below.

U_IMP6

The U_IMP6 driver is applied to WWTWs where schemes are required to increase the storm tank capacity. Storm tank capacity must be increased to either 68 litres/head or to 2 hours at maximum flow through the tanks. (This is in line with TGN 7.01).

Scheme costs have been developed by assessing the required additional storm tank capacity at the individual sites. Note that the Environment Agency does not associate any environmental outcome against schemes with the U_IMP6 driver, so we are providing a unit cost linked to storage capacity in m^3 as follows:

Cost of additional storage (£) = 474 x additional storage capacity required (in m3) + 240632.

WFD_IMPg

For the 4 outputs identified in the NEP with WFD drivers we have developed options for each site through meetings held with EA.

For Malpas and No Mans Heath WWTWs we have identified a rationalisation option providing the best whole life cost solution, which is to pump No Mans Heath WWTW to an improved Malpas WWTW for treatment. As such we have costed these two outputs as one solution, so a unit cost for these two sites would not be representative of this scheme. The cost for this solution is £4.615m. In the event that the scheme is removed from the programme we will enter into discussions with the EA to agree an alternative scheme or schemes to a similar value.

Two drivers have been applied at Whitchurch WWTW, these being WFD_ND (categorised as green) and WFD_IMPg (categorised as amber). Both drivers require a tighter Phosphorus limit to be met. The limit under the WFD_ND driver would require 0.4mg/l P removal, whilst the WFD_IMPg driver would require 0.3mg/l P removal. Our analysis shows that the solution required at Whitchurch WWTW to meet 0.3mg/l and 0.4mg/l are not significantly different, with the main difference between the two options being linked to increased operational costs for the tighter limit. Therefore we believe that the difference between the green and amber outputs are trivial and will not require a safeguard linked to unit cost.

At Tattenhall the proposed WFD_IMPg driver requires a tightening of the Phosphorus limit from 1mg/l to 0.5mg/l. We have used a unit cost for calculating investment at this site of £3.004m as the site has a

population equivalent (PE) of 2,511. In the event that the scheme is removed from the programme we will enter into discussions with the EA to agree an alternative scheme or schemes at the same unit cost.

Our Unit Costs for P removal linked to PE are as follows:

Population Equivalent (PE) of WWTW	Unit Cost (£m)
0 - 500 PE	£1.603m
500- 2000 PE	£2.150m
2000 – 10000 PE	£3.004m

U_INV

We have 1 investigation identified with the U_INV driver categorised as amber. As the investment for this investigation is trivial we are not proposing a cost adjustment mechanism for it.

Supporting Documents

5.8P.1 - Gwili Gwendraeth Investment Case

References

[i] National Environment Programme Version 4.1 Water Quality, National Resources Wales, July 2018
[ii] Water Industry National Environment Programme 3, Environment Agency, March 2018
[iii] Water Strategy for Wales, Welsh Government, May 2015
[iv] Reasons for Not Achieving Good (RNAG) Database, Environment Agency / Natural Resources Wales, July 2016
[v] Water Industry Planning: identifying measures for the WINEP including individual driver guidance documents, Environment Agency, May 2017
[vi] PR19 Expectations and Obligations including individual driver guidance documents, Natural Resources Wales, May 2017
[vii] Water industry strategic environmental requirements (WISER), Environment Agency / Natural England, October 2017
[viii] Storm Overflow Assessment Framework – version 1.6, Environment Agency, June 2018
[ix] WTP Qualitative research, Welsh Water consultation, August 2016