

# 3.3.6

# WASTEWATER

# WINEP

**TABLE WWS2: WHOLESALE WASTEWATER CAPITAL AND  
OPERATING ENHANCEMENT EXPENDITURE BY PURPOSE**

**LINES: 6, 7, 9, 10, 11, 12, 13, 16, 18, 19, 20**

**August 2019**

## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

Name of claim	Wastewater WINEP (Water Industry National Environment Programme)
<b>Business plan table lines where the totex value of this claim is reported</b>	WWS2 Lines 6,7,9,10,11,12,13,16,18,19,20
<b>Total value of enhancement for AMP7</b>	£173.9M
<b>Total opex of enhancement for AMP7</b>	£0.0M
<b>Total capex of enhancement for AMP7</b>	£173.9M
<b>Remaining capex required after AMP7 to complete construction</b>	Will complete scheme by date specified in WINEP – all schemes are AMP7 completion.
<b>Whole life totex of claim</b>	N/A
<b>Do you consider that part of the claim should be covered by our cost baselines? If yes, please provide an estimate</b>	No
<b>Materiality of claim for AMP7 as percentage of business plan (5 year) totex for the relevant controls</b>	14.4% of Wastewater Network.
<b>Does the claim feature as a Direct Procurement for Customers (DPC) scheme? (please tick)</b>	Yes <span style="margin-left: 150px;">No</span>
	<hr style="width: 50%; margin-left: auto; margin-right: auto;"/> No
<b>Need for investment/expenditure</b>	Completion of these enhancements are mandatory as regulatory commitments. Ofwat and the EA expects funding requirements to be accounted for in the Company's PR19 Business Plan to account for WINEP obligations. The need for specific expenditure against each EA driver (driven by UK Regulations and EU Directives) are detailed within this business case.
<b>Need for the adjustment (if relevant)</b>	n/a
<b>Best option for customers (if relevant)</b>	Optioneering has been dependent on the level of certainty and prescriptive detail behind each driver. The best solution has been proposed for the level of detail and certainty known at the time of submission. We are proposing a cost adjustment mechanism that will protect customers against late or non-delivery of

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Name of claim	Wastewater WINEP (Water Industry National Environment Programme)
	enhancement schemes.
<b>Robustness and efficiency of claim's costs</b>	See costing section: NWG has assessed the costs through a structured and robust approach, involving benchmarking of cost estimates against alternatives. The cost assurance process and associated costs generated for the wastewater enhancement schemes have been subject to third party assurance provided by Mott Macdonald in July 2018.
<b>Customer protection (if relevant)</b>	See customer protection section: An appropriate cost adjustment mechanism is proposed and outlined within this document. Further detail is also presented in Appendix 3.9 of the business plan.
<b>Affordability (if relevant)</b>	<p>See affordability section: Overall the analysis shows that the bill impacts would be rising from £0.25 a year (year 1) to £5.33 a year (year 5).</p> <p>This is set within an overall bill drop of more than 12% (wastewater) in AMP7, including all enhancement investments, one of the largest across the sector.</p>
<b>Board Assurance (if relevant)</b>	See board assurance section: The details of all our enhancement cases have been reviewed by our PR19 Board Sub-Committee and full Board both prior to plan submission and following IAP. During these discussions the board sub-committee have challenged the details of our enhancement proposals in a number of ways which are reflected in our final enhancement cases.

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#### Executive summary

This business case is for the Wastewater Water Industry National Environment Programme (WINEP) enhancement plan. Enhancement expenditure provides an identifiable, measurable and permanent step change in overall level of service to existing customers above the standard previously provided. These enhancements are detailed in the Ofwat Table WWS2 Wholesale wastewater capital and operating expenditure by purpose and are summarised in the following table together with the Totex breakdown (£M). This indicates the relevant Ofwat table lines and cross references with the appropriate environmental objective, Directive and Environment Agency (EA) WINEP drivers:

Directive	EA Drivers	Ofwat Table WWS2 Line references	Description	Totex £M
<b>Urban Wastewater Treatment Directive (UWWTD) and Bathing Water Directive</b>	UMON1,2,3,4, BWMON, UIMP4, UIMP5, UIMP6 and BWND	Lines 6,7,9,10 and 11	Treatment capacity to deal with Increased Flow to full treatment (inc. Storm tank storage). Flow and spill frequency measurement. Increased network storage capacity to prevent deterioration to Bathing and river water quality.	£56.7M
<b>Water Framework Directive (WFD) Nutrients</b>	WFDND, WFDIMPg,m,p	Lines 18,19, 20	Treatment to remove phosphorus and / or ammonia in order to meet WFD river water quality standards with the aim of meeting Good status	£99.6M
<b>WFD Chemicals</b>	WFDIMP, ND and NDLS	Lines 12	Removal and prevent deterioration of chemicals	£7.5M
<b>WFD Chemicals</b>	WFDINVCHEM1-14	Line 13	Chemicals Investigations as part of National Chemicals Investigation Programme (CIP3 Programme)	£1.9M
<b>Investigations</b>	UINV2, HDINV, BWNDINV, BWINV4	Line 16	Bathing waters investigations, raising ambition to excellent, plus specific investigation measures.	£8.2M
<b>Total Wastewater WINEP</b>				£173.9M

Completion of these enhancements are mandatory as regulatory commitments. Ofwat and the EA expects funding requirements to be accounted for in the Company's PR19 Business Plan to account for WINEP

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obligations. They will enhance the capacity and quality of services beyond current levels and support our Environmental outcomes. The EA's environmental outcome identified as the measure of benefit in WINEP3 (as measured by the EA's key performance indicator (KPI)), is 'length of waterbody enhanced in kilometres (km)'. The total km river length improved by the wastewater drivers covered by this business case is 186 km.

We know many of our customers use amenity areas to access the water environment (rivers, becks and streams, lakes and reservoirs, coasts and beaches). This can make them healthier and happier. We know that our customers are generally satisfied with current standards of bathing water quality, but would like more facilities and cleaner beaches. We also know that they have different ways of judging water quality at rivers and beaches to regulators and stakeholders and that their priorities for improvement do not always align with regulatory targets. We have to take this into consideration when ensuring that what we deliver as a WINEP enhancement is fully justified and cost beneficial.

We have not conducted specific customer research into any of our WINEP programmes. This is because these programmes are a statutory obligation and as such our customers cannot influence whether or not we conduct them. However we have found consistently high levels of customer support for improvements to the environment from several customer research and engagement projects.

The business case demonstrates how the WINEP enhancement schemes have been developed and agreed with the EA, and the level of support and engagement received by customers and Water Forum representatives. The business supports inclusion of **all** of the certain WINEP3 enhancement obligations (amber and green certainty categories) and will make allowance for their inclusion within the plan.

#### Need for enhancement

This business case is for the Wastewater Water Industry National Environment Programme (WINEP) enhancement plan. Enhancement expenditure provides an identifiable, measurable and permanent step change in overall level of service to existing customers above the standard previously provided. Completion of the WINEP will enhance the capacity and quality of services beyond current levels and support our Environmental outcomes.

The WINEP, formerly known as the National Environment Programme (NEP), is a national investment programme for all water only and water and wastewater companies. It includes investigations, monitoring, options appraisals and schemes to drive improvements and prevent deterioration and protect the water environment. These commitments form part of each water company's Asset Management Plan (AMP) and form a set of regulatory obligations which must be delivered.

The WINEP is a key part of the overall programme of measures to meet the requirements of the Environment Agency (EA)'s Water Industry Strategic Environmental Requirements (WISER) document. This includes objectives to meet Water Framework Directive (WFD) 'Good' status in our rivers by 2027 and prevent deterioration in status, together with other international regulatory drivers including the Urban Waste Water Treatment (UWWT) and Habitats Directives.

At NWG, we recognise our role in meeting water quality objectives for rivers and coastal waters, and we aim to ensure that our customers' money is spent on well justified cost beneficial schemes that will deliver real improvements to water quality and ecology. To achieve this, we have worked very closely with our local and national EA River Basin Management Service (RBMS) representatives, through smaller technical specialist areas and sharing of knowledge from work undertaken with other external groups and stakeholders, to agree the obligations included in the PR19 WINEP and ensure all of the requirements identified in the WISER document are covered.

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In addition to WISER, the EA has provided a comprehensive series of guidance documents; PR19 Driver Guidances and Guiding Principles<sup>1</sup>. These were shared with water companies and Natural England in order to assist in the collaborative development of WINEP.

The EA has adopted an iterative approach to development of the Water Industry National Environment Programme (WINEP) for PR19. There have been three releases:

- WINEP1 in March 2017 focused largely on water resources actions to inform draft Water Resource Management Plans and included only some wastewater schemes;
- WINEP2 in September 2017 provided the latest position on the environmental measures to include in PR19 plans;
- WINEP 3 published on 29<sup>th</sup> March 2018 was the final update and includes a comprehensive list of schemes to be included in company business plans.

The WINEP is published in spreadsheet format, with each line being a commitment to be undertaken. The level of certainty for each line is classified as green (certain evidence and cost beneficial, must be undertaken), amber (certain evidence and cost beneficial, requires further approval), red (uncertain evidence and/or non-cost beneficial) or purple (intended to provide a direction of travel for potential future work areas that may inform business plans beyond PR19). The certainty of schemes changed between each iteration of the WINEP as the EA gathered additional evidence to support inclusion.

WINEP3 includes schemes which will not have to be undertaken in AMP7. These have been allocated a red category of certainty and have been included as a separate tab in WINEP3. The level of certainty will be developed further to decide whether they will need to be delivered in AMP8. The EA expect to see cost allowances in company business plans for all green and amber measures in WINEP3. NW and ESW has decided that we will treat ambers as if they were green in that we expect to deliver all of the amber and green schemes and investigations unless better, more efficient delivery mechanisms can be identified. Any alternative proposals (such as catchment partnership projects) would need to be approved by the EA and logged via a formal change protocol procedure. If a scheme is not delivered due to removal of an obligation (change in regulatory driver) an appropriate cost adjustment mechanism will be applied (in accordance with the Ofwat methodology reference section 9.4.3) in order to ensure our customers are not paying for schemes that have not been delivered.

This business case covers the wastewater elements of WINEP only. As we do not manage wastewater in our ESW operating area, the commitments referred to here are only relevant to our NW operating area.

These enhancements are detailed in the Ofwat PR19 Table 'WWS2 Wholesale wastewater capital and operating expenditure by purpose', and are summarised in the Table 1 below. This indicates the relevant Ofwat table lines and cross references with the appropriate environmental objective, Directive and EA WINEP drivers:

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<sup>1</sup> PR19 Driver Guidances and Guiding Principles – received via EA Account Manager – River Basin Management Service

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Directive	EA Drivers	Ofwat WWS2 references	Table Line	Description
<b>Urban Wastewater Treatment (UWWTD) and Bathing Water Directive</b>	UMON1,2,3,4, BWMON, UIMP4, UIMP5, UIMP6 and BWND	Lines 6,7,9,10 and 11		Treatment capacity to deal with Increased Flow to full treatment (inc. Storm tank storage). Flow and spill frequency measurement. Increased network storage capacity to prevent deterioration to Bathing and river water quality.
<b>WFD Nutrients (Sanitary parameters)</b>	WFDND, WFDIMPg,m,p	Lines 18,19,20		Treatment to remove phosphorus and / or ammonia in order to meet WFD river water quality standards with the aim of meeting Good status
<b>WFD Chemicals</b>	WFDIMP, ND and NDLS	Lines 12		Removal and prevent deterioration of chemicals
<b>WFD Chemicals</b>	WFDINVCHEM1-14	Line 13		Chemicals Investigations as part of National CIP3 Programme
<b>Investigations</b>	UINV2, HDINV, BWNDINV, BWINV4	Line 16		Bathing waters investigations, raising ambition to excellent, plus specific investigation measures.

**Table 1: PR19 Wastewater WINEP Enhancements - Ofwat Table WWS2 lines cross-referenced with EA WINEP Objective (Directives and Drivers).**

The initial sections of this document are applicable to all areas of the wastewater WINEP.

The later sections (from Options appraisal onwards) are broken down into sections specific to the Directives listed in Table 1 above.

- Urban Wastewater Treatment Directive (UWWTD) and Bathing Water Directive
- WFD Nutrients (Sanitary parameters)
- WFD Chemicals – Improvement
- WFD Chemicals - Investigations
- WINEP Investigations – Supporting information for PR24 planning



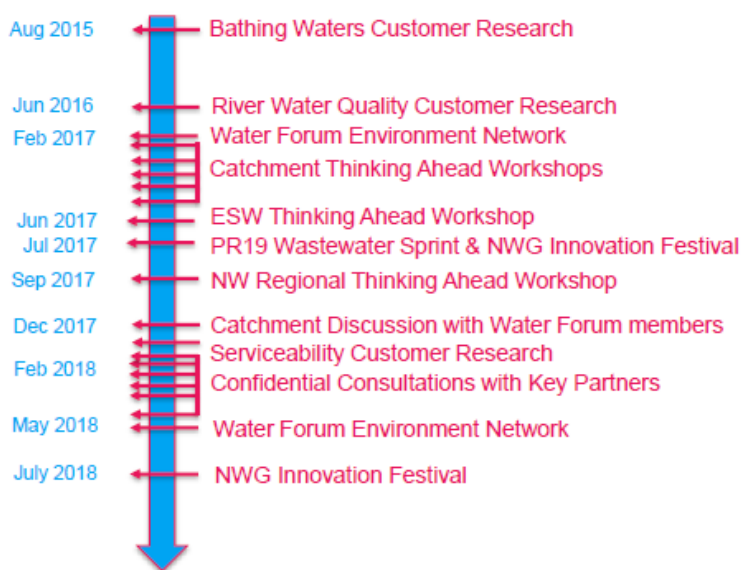
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### Customer and stakeholder expectations

We have undertaken specific research and workshops events to better understand our customers' support to improving river water and bathing water quality.

Delivery of WINEP is a statutory requirement and hence not dependent on customer support, however our plan is stronger for knowing that customers do support this.

The following timeline illustrates how we have engaged our customers, key stakeholders and our Water Forum members during development of and to gauge support of the WINEP enhancement programme.



### Customer engagement

We have not conducted specific customer research into any of our WINEP programmes. This is because these programmes are a statutory obligation and as such our customers cannot influence whether or not we conduct them. However we have found consistently high levels of customer support for improvements to the environment from several customer research and engagement projects.

Our 2015 and 2016 customer research into river and bathing water quality found that our Northumbrian Water customers support shared investment in improving river water quality, between us, our partners, customers, big businesses and key polluters. Our customers also want the bathing waters in our regions to be of the highest quality in England and Wales.

From our PR19 customer research and our tracking surveys we understand that:

- Our customers expect that we will be responsible and effective custodians of the environment and trust that we will make the right environmental decisions;
- Sewage treatment and disposal services are not a 'top of mind' concern for customers;
- Our customers feel the quality of our rivers needs improvement;
- Our customers value the environment and believe that we should be working in partnership to protect and enhance it.

Our customer research into river water quality expectation based on two local deliberative events in 2016 concluded there was an overall balance of support for investment to improve river water quality, except from

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those who saw no personal gain (non-river users). Customers do not want to be the only ones 'footing the bill' and want us to focus more on prevention to reduce costly intervention. Overall there was more support for investment if the benefits to local society are fully understood.

The available research for bathing waters suggests that improving bathing water quality at our beaches is a 'medium priority' to customers. When prompted, there is a desire for bathing water to be of the highest quality, with between 61% of non-users and 76% of beach users agreeing that they'd like the region's beaches to be the cleanest in England. However, in our 2015 Bathing Water research, only a minority (24%) of customers were willing to pay more on their bill to improve the quality of sea water at the (less than Excellent) beaches they regularly used, with 24% agreeing they would be willing to pay more to make sure sea water at all 34 bathing beaches in the North East are classified as Excellent.

The importance our customers place on river and bathing quality was confirmed as part of our Service Valuation Research (2017) and our PR19 Acceptability Research (2018). Participants in our Service Valuation research told us that they want us to meet or exceed our regulatory obligations in relation to bathing water and are supportive of improvements to the accessible water environment and reducing pollution incidents. Participants in our PR19 Acceptability Research agreed that protecting the environment should be a high priority and gave our plans a positive reception.

As part of our customer research for PR19, we asked customers to review service areas across the business (eight for NW and six for ESW), and adjust slider positions representing investment in them for different levels of performance. Support for improvements in the accessible water environment came second, after pollution (which also impacts on the environment).

We tested our strategic themes for PR19 with our customers at our Innovation Festival in July 2017. Customers were very supportive of the strategic themes, were surprised by the amount of 'work' that goes into cleaning their waste and were encouraged by our partnership approach to preventing pollution.

We know many of our customers use amenity areas to access the water environment (rivers, becks and streams, lakes and reservoirs, coasts and beaches). This can make them healthier and happier. We know that our customers are generally satisfied with current standards of bathing water quality, but would like more facilities and cleaner beaches. We also know that they have different ways of judging water quality at rivers and beaches to regulators and stakeholders and that their priorities for improvement do not align well with all regulatory targets.

#### **Wider stakeholder engagement**

##### *Working in Partnerships*

In addition to the EA as a key regulator and local partner, we also work in partnership with a wide range of other stakeholders within our catchments.

Our core business in abstracting water from reservoirs, rivers and groundwater, treating and supplying water and then treating wastewater and returning it to rivers and the sea, means that we play a significant role in the environment. However, there are many other organisations that have responsibilities towards the environment and work in this area. As NWG, we have over 25 years of experience of successful partnership working in the environment, and our work with environmental partners is very important to us.

We are very active participants of the five Catchment Partnerships in our NW operating area, supported by Defra's Catchment Based Approach (CaBA) which was launched in 2013. Together we are working to protect and enhance the water environment and improve WFD water bodies and their catchments.

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In 2017, we ran a series of Thinking Ahead workshops with our environmental partners, engaging over 80 environmental organisations within our regions at both catchment and regional level. We know from this engagement that our partners expect us to:

- Build stronger local engagement with existing partnerships, communities and land managers to deliver improvements for common benefit;
- Continue to support the Catchment Based Approach and to strengthen our partnership working, recognising the successes and opportunities this can bring;
- Use our core business plan investment against regulatory obligations in the WINEP to support catchment investment through partnerships to deliver multiple benefits which will improve the water environment (i.e. not just single issue focused);
- Play a leading role in developing regional partnership ambitions for the water environment which will help link the activities and aspirations of different partnerships.

#### Regulatory expectations

##### *Water Forums*

We provide regular updates to the Customer Challenge Group (CCG) on the progress of WINEP development as part of our 'Regulatory Update'. These are documented and saved in the Water Forum Sharepoint area. We have also provided a number of working group sessions specifically for the 'Environment network' members of the CCG. These include the following sessions:

- February 2017 – Presentation of the customer research on bathing waters and river water quality.
- December 2017 – Catchment discussions with Water Forum members.
- April 2018 – 3 working sessions including presentation of the company's proposed enhancement schemes, including statutory enhancements such as the WINEP.
- May 2018 – Water Forum environment network – discussion on the overall environment theme including overview of WINEP and our wider environment ambitions.

Feedback from the Forum at the April Enhancement sub-group (17<sup>th</sup> April 2018) was generally supportive of the size of the WINEP:

*Members asked John Giles (EA) how the EA viewed the WINEP programme. They were surprised it is not bigger than it was, considering the size of other Companies' programmes. JG said the smaller submission was good, it reflected on asset base. The EA had worked very closely with the company to produce the WINEP programme; there were not many things missing; it was about right; the message that this was statutory was important as well. The Company said there were other reasons for the lighter submission. The rivers in the north were generally good; also the bulk of population was on the coast - this meant there are not many big discharges are made upstream. Other companies, which discharge upstream, had larger investments to make.*

Our Water Forums are supportive of our WINEP proposals. The Water Forums' Report details how members reviewed the statutory enhancement aspects of Our Plan, including WINEP, and that members from the Environment Agency had worked very closely with us to produce our WINEP programme. Water Forum members conclude that that our plans reflect customers' overarching views and have strong customer support, and will improve the environment compared to today – above and beyond our statutory commitments.

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#### Our track record - Service delivery and expenditure prior to AMP7

##### Environmental Performance Assessment (EPA)

The Environmental Performance Assessment (EPA) was introduced by the EA in 2011 as a tool for comparing performance against environmental obligations between water companies across years. It therefore provides a useful tool to demonstrate our historical performance against delivering environmental improvement schemes (NEP).

We aspire to be a 4 star company under EPA within AMP7. This reflects our ethical stance, and our commitment to be responsible and do the right thing. EPA includes measures for discharge compliance for STWs and Water Treatment Works, pollution, and bathing water compliance. We achieved 4 star environmental performance in the 2018 assessment, and we intend to maintain this position (4 star and green across all areas) throughout AMP7.

Since the initial 2012 'Water and sewerage companies' performance' report (published annually in July), we have reported 100% delivery of our planned work on water quality improvement schemes (AMP National Environment Programme delivery).

The EPA has changed for reporting since 2016 to include Security of Supply Index metric, measuring the availability of water for public supply.

The following diagram shows a history of EPA results for Northumbrian Water (source: EPA Published annually in July<sup>2</sup>):

	Pollution Incidents (sewerage)	Serious pollution Incidents (sewerage)	Discharge permit compliance	Satisfactory sludge disposal	Self-reporting of pollution incidents	AMP National Environment Programme delivery	Security of supply index	Overall performance rating
NW 2018	Green	Green	Green	Green	Green	Green	Green	****
NW 2017	Green	Yellow	Red	Green	Green	Green	Green	**
NW 2016	Yellow	Red	Yellow	Green	Yellow	Green	Green	**
NW 2015	Yellow	Yellow	Green	Green	Green	Green	N/A	***
NW 2014	Yellow	Yellow	Green	Green	Yellow	Green	N/A	***
NW 2013	Yellow	Yellow	Yellow	Green	Yellow	Green	N/A	***
NW 2012	Yellow	Yellow	Green	Green	Green	Green	N/A	***

##### Past delivery of environmental obligations in NEP and WINEP

In 2014 Ofwat set the prices that water companies could charge their customers between 2015 and 2020. As part of that price review the EA developed a programme of environmental improvements, the National

<sup>2</sup>Water and Sewerage companies performance – published annually in July

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Environment Programme (NEP), which water companies needed to make over that period to ensure that they meet legal environmental standards related to water.

The NEP AMP6 included schemes, investigations and monitoring to improve and protect both water quality and water resources.

In identifying waste water quality improvements for AMP6 supported by the National Environment Programme (NEP) we developed an approach that has since been adopted in PR19 planning. We worked closely with the EA to ensure that the regulatory requirements identified in the NEP, were both justified and cost-effective.

In AMP6, we are investing £61m in wastewater schemes in the National Environment Programme (former name for the WINEP). This includes investment to meet UWWTD objectives (P removal), plus Phosphorus and ammonia removal to prevent deterioration, or improve the WFD status, together with Chemicals, WFD and Bathing Water Investigations.

AMP6 includes significant investment in phosphorus (P) removal schemes from our sewage treatment works (STWs), which has been the key element of environmental investment for several AMP periods and contributed to improvements in concentrations of phosphorus in river water quality. The following table demonstrates the cumulative increase in phosphorus load removed per day over the last 3 AMP periods. This also illustrates that the average load being removed per scheme is decreasing, which reflects the fact that we are now addressing P removal at smaller works (serving lower population equivalents).

	Pre AMP5	AMP5	AMP6	AMP7
<b>P load removed by schemes delivered in that AMP (kg/day) *</b>	318	101	147	162
<b>Number of schemes</b>	10	5	8	29
<b>Average P removal per scheme (kg)</b>		20	18	5.6
<b>Cumulative P load removed (kg/day)</b>	318	419	566	729

\* Assumes 5 mg/l in the influent and average flow conditions

We have satisfied our obligations to meet all of our AMP6 NEP obligations to date. This includes sign off of obligations up to March 2018. We have some obligations remaining with completion dates up to the end of the AMP (March 2020). We regularly meet with the EA to discuss progress against these obligations and keep them updated on progress against the delivery dates. We have not identified any issues against completing all of the NEP obligations in accordance with expectations. This will contribute to the EPA score and our objective to become a 4\*company.

The environmental outcome identified in the AMP6 NEP as a measure of the benefit of satisfying the NEP obligations is 'km river length improved'.

The following improvements are being reported (Ofwat PR19 tables) based on the km length improved quoted for wastewater schemes in NEP Phase 5 Version 1 29 January 2016:

2015-16	2016-17	2017-18	2018-19	2019-20
<b>38km improved</b>	0	77 km improved	0	1.3 km improved

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This measure of benefit has been further clarified for PR19 through the introduction of the EA's key performance indicator (KPI) of length of waterbody enhanced:

*'Whilst good ecological status is the ultimate aim of the work that we all deliver, the lag time and complexity inherent to the formal classification system mean that ecological status has not always reflected the great work being undertaken by stakeholders in the water environment. To complement classification data, we have created a new measure focussing on the length of water body enhanced in kilometres.'*<sup>3</sup>

#### Forward looking analysis

Future planning for WINEP is focused on meeting regulatory obligations under the EU/UK Directives and Regulations (UWWTD, WFD, Habitats, Bathing Waters etc.). The obligations identified in WINEP3 will enhance the capacity and quality of services beyond current levels and will go above and beyond maintaining our current impact on river water quality. We have worked closely with the EA to identify the enhancement activities which will be supported by the WINEP. A key aim is to ensure that our customers' money is spent on well justified schemes that will deliver real improvements to water quality and ecology.

Improvement schemes identified in the WINEP will result in the introduction of permit changes to reflect the improvements required to river water quality. Compliance with these revised permits is therefore subsequently encapsulated within our discharge compliance Measure of Success, and will also impact on our target to become a 4\* company under EPA within AMP7. The benefits will also contribute to the EA's key performance indicator (KPI) measure to quantify the actual improvements made (length of waterbody (km) enhanced).

It has been important to ensure we identify the right balance between meeting our regulatory obligations (to avoid the risk of UK Infraction), delivering meaningful improvements to the biology of our rivers, whilst also reflecting the improvements that matter to our customers and stakeholders. This has been achieved through collaborative working with our local EA, national EA at task and finish groups, working with external partnerships (such as catchment partnerships) and through regular liaison with and governance from the Water Forums.

We have a long term obligation to address our contribution to achieving 'good' status in our rivers by 2027 under The Water Framework Directive (WFD). In meeting this obligation, we work in partnership with internal and external stakeholders to attain the necessary sustainable improvements in river water quality, supporting a catchment-based approach to managing the water environment.

We have been undertaking extensive Investigations AMP6 to understand our Environmental (WINEP) obligations for the next AMP (AMP7). For example, trialling technologies (in a National Programme of investigations) this AMP to understand what is technically achievable to meet tighter phosphorus standards, what treatment technologies are available and whether there are more innovative and sustainable solutions to meeting phosphorus good status in our rivers. These investigations have also helped to clarify our responsibilities with regard to chemical removal.

Under WISER guidance, water company obligations in AMP7 for WFD should be delivered under a 'fairshare' approach, where water companies remove only their portion of P and ammonia to address a reason for 'not achieving good status' (RNAG). In order for our customers to see the benefit of this investment, other responsible sectors must also play their part in reducing P concentrations in waterbodies. This presents a particular concern around agricultural diffuse pollution, the major secondary contributor to RNAGs for P and ammonia, and is a recognised risk to meeting the required river water quality improvements.

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<sup>3</sup> EA's external briefing note: '161026 km enhanced external brief 1'

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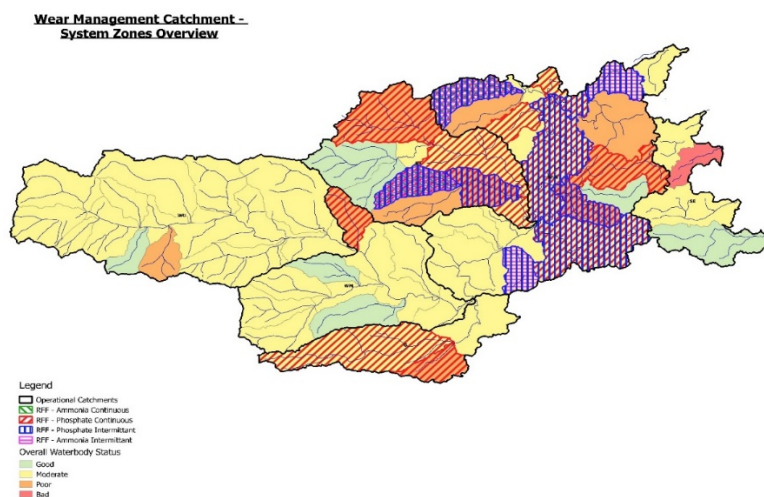
We are in a good position in relation to WFD assessments for our NW rivers and for bathing waters. Further investment in AMP7 will move us closer to delivering our fair share to meeting WFD good status targets, and improve our bathing waters towards excellent.

### Forward looking analysis - Early work (Pre issue of PR19 WINEP and EA Driver Guidance documents)

Based on our PR14 NEP methodology, we continued to work with the EA, using the tools developed during AMP5. Our Environmental performance tool (EPT) is a GIS based tool that trends river water quality. This is used as an asset management tool to inform our asset planning team, as part of risk based prioritisation, on the impact of our assets on the downstream river quality status. It also helps us as a longer term planning tool to consider how we can aim to meet WFD good status by 2027.

### **At catchment level:**

Using catchment maps we were able to identify waterbodies where NWG are identified by the EA as the RNAG (ref. map below) and whether this was due to continuous or intermittent source. We were then able to identify shortlist at catchment level, where assets within a waterbody are clearly having an impact on downstream water quality and move to an operational catchment review.



### **At Operational catchment level:**

Using operational catchment level maps (indicating river water quality at reach level – see Map of the Browney catchment below) we were able to review the impact of STWs (working from top of catchment to bottom), and identify a short list of sites where further improvements should be modelled.





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#### Catchment Partnerships

We are active participants of the catchment partnerships in our operating area. We support the partnerships and together we are working to protect and improve the water bodies in our area and their catchments.

We will take an integrated approach to delivering the WINEP, considering catchment solutions where appropriate, and deliver multiple benefits to the environment wherever possible. This will allow us to address our portion of the Water Framework Directive (WFD) 'challenge' and implement improvements in response to other international regulatory drivers including the Urban Waste Water Treatment and Habitats Directives, and contribute to the delivery of national objectives including the Biodiversity 2020 strategy and the NERC Act 2006.

Taking a catchment approach to the WINEP will allow us to demonstrate leadership in the area of water quality and quantity to other sectors and regions. It will also allow us to deliver a significant level of improvement to WFD waterbodies, as measured by the Environment Agency 'kilometres enhanced' metric. This aligns with, but is a totally separate from our wider environment measure which is 'length of accessible water environment improved for the benefit of our customers and communities' (km). The latter is over and above our WINEP obligations.

We are currently developing a process to consider opportunities to adopt a catchment based approach as an alternative or in support of our own investment, in order to deliver greater environmental benefits. In order to investigate whether these opportunities are viable we are undertaking a feasibility study with our framework consultants to consider and review possible opportunities within seven catchments containing 19 of the 27 sewage treatment works included in WINEP. This work will need to put forward a convincing case to the EA that the same outcome will be achieved as that of an end of pipe treatment solution. We expect to complete this work before October 2019. The EA has confirmed this timeline to be acceptable. As a result of this study we will know how many of the WINEP schemes will be delivered through an end-of-pipe solution, and how many we wish to put forward for a catchment approach. The latter are likely to include a combination of hard engineering and catchment measures for phosphorus reduction. The aim will be to deliver long term sustainable outcomes, whilst maximizing environmental benefit.

## Option appraisal

### Options considered

#### Overview

Optioneering to identify preferred solutions for each WINEP line and driver has been undertaken. Operation teams have been involved in optioneering where possible to identify site specific requirements. Slightly differing approaches were adopted for the different driver groups depending on monetary value. These have been detailed in individual Methodologies<sup>6</sup>, but are discussed in brief in this section under the following sub-headings:

- Urban Wastewater Treatment Directive (UWWTD) and Bathing Water Directive;
- WFD Nutrients (Sanitary parameters);
- WFD Chemicals – Improvement;
- WFD Chemicals – Investigations;
- WINEP Investigations – Supporting information for PR24 planning.

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<sup>6</sup> PR19 Enhancement Methodology Statements

## **DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION**

### **3.3.6 WASTEWATER WINEP**

A summary of the optioneering approach adopted for each of these is provided in the table overpage.

These include:

- Do Nothing
- Options considered to meet the WINEP specified improvement
- Options considered to meet poor, moderate or good status

# DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

## 3.3.6 WASTEWATER WINEP

Directive	EA Drivers	Ofwat Table WWS2 Line references	Description	Do nothing	Option 1	Option 2	Option 3	Option 4
Urban Wastewater Treatment Directive (UWWTD) and Bathing Water Directive	UMON1,2,3,4, BWMON, UIMP4, UIMP5, UIMP6 and BWND	Lines 6,7,9,10 and 11	Treatment capacity to deal with increased flow to full treatment (inc. Storm tank storage). Flow and spill frequency measurement. Increased network storage capacity to prevent deterioration to Bathing and river water quality.	Ruled out as this is a regulatory obligation - do nothing would result in failure to meet revised permit levels, potential prosecution, reputation impact, potential escalation to UK failure to comply with EU Directive etc.UWWTR are 'must do' and so are not subject to cost-benefit appraisal. Non compliance with UWWTD can lead to UK infraction and poor reputational impact.	Cost to install monitoring as required or take account of increased FFT and required treatment capacity			
WFD Nutrients	WFDND, WFDIMPg,m,p	Lines 18,19, 20	Treatment to remove phosphorus and/or ammonia in order to meet WFD river water quality standards with the aim of meeting Good status	Ruled out as this is a regulatory obligation - do nothing would result in failure to meet revised permit levels, potential prosecution, reputation impact, potential escalation to UK failure to comply with EU Directive etc.WFD is subject to cost-benefit appraisal which has been undertaken by the EA at catchment level. Failure to meet national target WFD status improvements can lead to UK infraction and poor reputational impact.	No deterioration - Invest to prevent deterioration taking account of growth and potential impact on treatment capacity and performance	Invest to meet Poor status in the river - permit standards identified to make improvement of status (where Bad) to Poor status only	Invest to meet Moderate status in the river - permit standards identified to make improvement of status (where less than Moderate status) to Moderate status only	Invest to meet Good status in the river - permit standards identified to make improvement of status (where less than Good) to Good status
WFD Chemicals	WFDIMP, ND and NDLS	Lines 12	Removal and prevent deterioration of chemicals	Ruled out as this is a regulatory obligation - do nothing would result in failure to meet revised permit levels, potential prosecution, reputation impact, potential escalation to UK failure to comply with EU Directive etc.WFD is subject to cost-benefit appraisal which has been undertaken by the EA at catchment level. Failure to meet national target WFD status improvements can lead to UK infraction and poor reputational impact.	Investigate source (either in river or sewer catchment) and work with the EA to encourage source control rather than end of pipe treatment	No deterioration or standstill - Investigate source and work with EA to encourage source control, and if required invest to prevent deterioration or remain at standstill status, taking account of growth and potential impact on treatment capacity and performance	Invest to improve chemical reduction to improve chemical status and EQS compliance in the river - permit standards identified to make improvement	
WFD Chemicals	WFDINVCHEM1-14	Line 13	Chemicals Investigations as part of National CIP3 Programme	Ruled out as this is a regulatory obligation - do nothing would result in failure to complete regulatory WINEP obligations, poor EPA score and failure to identify required WINEP investment for PR24, potential prosecution, and poor reputational impact. Contributes to overall National Programme of Investigations.	Cost investigations in accordance with scoping identified by the EA and Atkins as part of a National Chemicals Investigations Programme			
Investigations	UINV2, HDINV, BWNDINV, BWINV4	Line 16	Bathing waters investigations, raising ambition to excellent, plus specific investigation measures.	Ruled out as this is a regulatory obligation - do nothing would result in failure to complete regulatory WINEP obligations, poor EPA score and failure to identify required WINEP investment for PR24, potential prosecution, and poor reputational impact. Contributes to overall National Programme of Investigations.	Cost investigations in line with Measures Specification agreed with the Environment Agency and based on expert judgement from previous investigations costs			

Table 2: Overall Optioneering approach – wastewater WINEP enhancements

# DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

## 3.3.6 WASTEWATER WINEP

### Urban Waste Water Treatment Directive (UWWTD) and Bathing Water Directive

**Including drivers:** UMON1, UMON2, UMON3, UMON4, BWMON, UIMP4, UIMP5, UIMP6 and BWND

(WWS2 Line reference: Lines 6, 7, 9,10 and 11)

The impact of each of these drivers and subsequent identification of schemes and solutions have been guided via discussion at, and output from:

- Water UK Flow T&F Group (UIMP5, UIMP6, UMON1,2,3 and 4).
- Water UK Intermittents T&F Group (UMON1,2 and 3 and BWMON).
- Completion of EDM tracking sheet and Flow drivers tables and implications to expected investment needs in AMP7 and beyond.

There has been limited need for extensive optioneering under these drivers. Flow monitoring and EDM installation will be based on continuation of existing (AMP6) programmes, adopting lessons learnt etc.

Line 6 - This includes the following WINEP drivers: U\_MON1, U\_MON2 and BW\_MON and U\_MON3.

Includes event duration monitoring of storm discharges identified (under the Risk Based Approach to the Monitoring of Storm Discharges).

Line 7 - U MON4 driver - Install MCERTS flow monitoring as close to the overflow as practicable to record FFT at WwTW where the existing DWF 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. Assumed eight different costing categories depending on site conditions etc.

Line 9 - U IMP5 – Schemes to increase Full flow to treatment. The WwTW FFT must be increased to up to 3PG+IMAX+3E but no less than maximum daily peak flow. Twenty nine sites were identified in WINEP2. Late guidance issued via the EA as output from the Task and Finish Group (15-12-2017) clarified this interpretation and resulted in a reassessment of criteria and a reduction to sixteen sites in WINEP3. Identification of the sites is detailed in the methodology for this work. Optioneering involved identification of site specific capacity limitations (pinch points), and the need for additional process units to deal with the additional capacity.

Line 10 – UIMP6 - Storm tank capacity must be increased to 68 litres per head or to 2 hrs at maximum flow through the tanks. WINEP2 listed 106 sites. This was reviewed (reference detailed methodology) using up to date data. Cost estimations were developed for additional storm tank capacity at 8 number works where a shortfall was identified. This included: Pittington, Greatham, Melsonby, Lynemouth, Whittingham, Bellingham, Cassop, Hawthorn. This was reduced (Hawthorn removed) to 7 sites in WINEP3 as a result of re-assessment of flow data.

Line 11 - U IMP4 and BWND - Storage schemes required in the network to reduce spill frequency at CSO's. This includes an estimate for a number of spill frequency improvement schemes. These have not yet been identified but have been estimated as output from the Storm Overflow Assessment Framework ((SOAF) - Driver U INV4). We haven't undertaken any SOAF investigations as yet, in order to arrive at the most cost beneficial solution, so the number of schemes actually required may be more or less than this estimate. We have assumed a total of five schemes. The schemes could also be significantly different (solution could be for example to remove surface water rather than for storage alone).

### 3.3.6 WASTEWATER WINEP

The EA requested completion of the 'NWG PR19 Flow Supplementary Tracker spreadsheet' (returned to the EA on 21-12-2017). NW also issued an accompanying letter which highlighted our concerns around the high cost and low benefits associated with UIMP5 at that time. This included recommendation for a review of the approach and adoption of a proposed stepped approach. Subsequent guidance from the EA resulted in a significant reduction in the required scope, and resulted in a reduction from 29 sites to 16 from WINEP2 to 3.

#### **WFD Nutrients (Phosphorus) and Sanitary parameters**

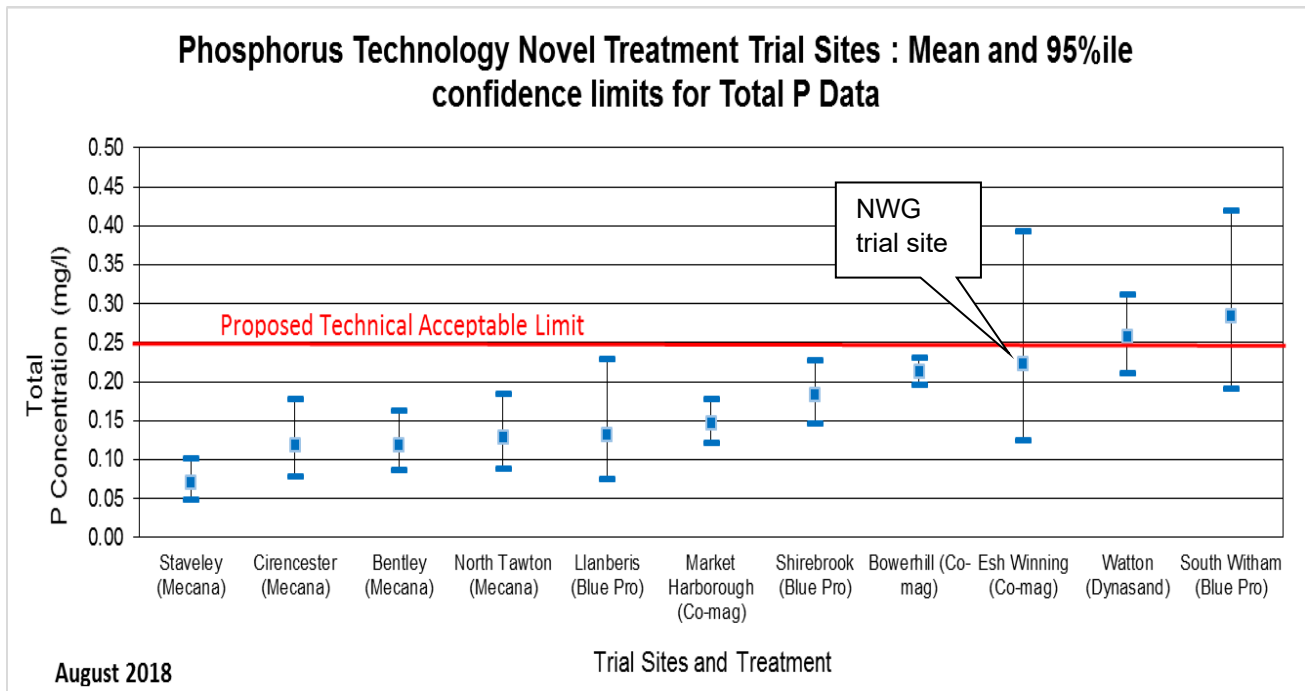
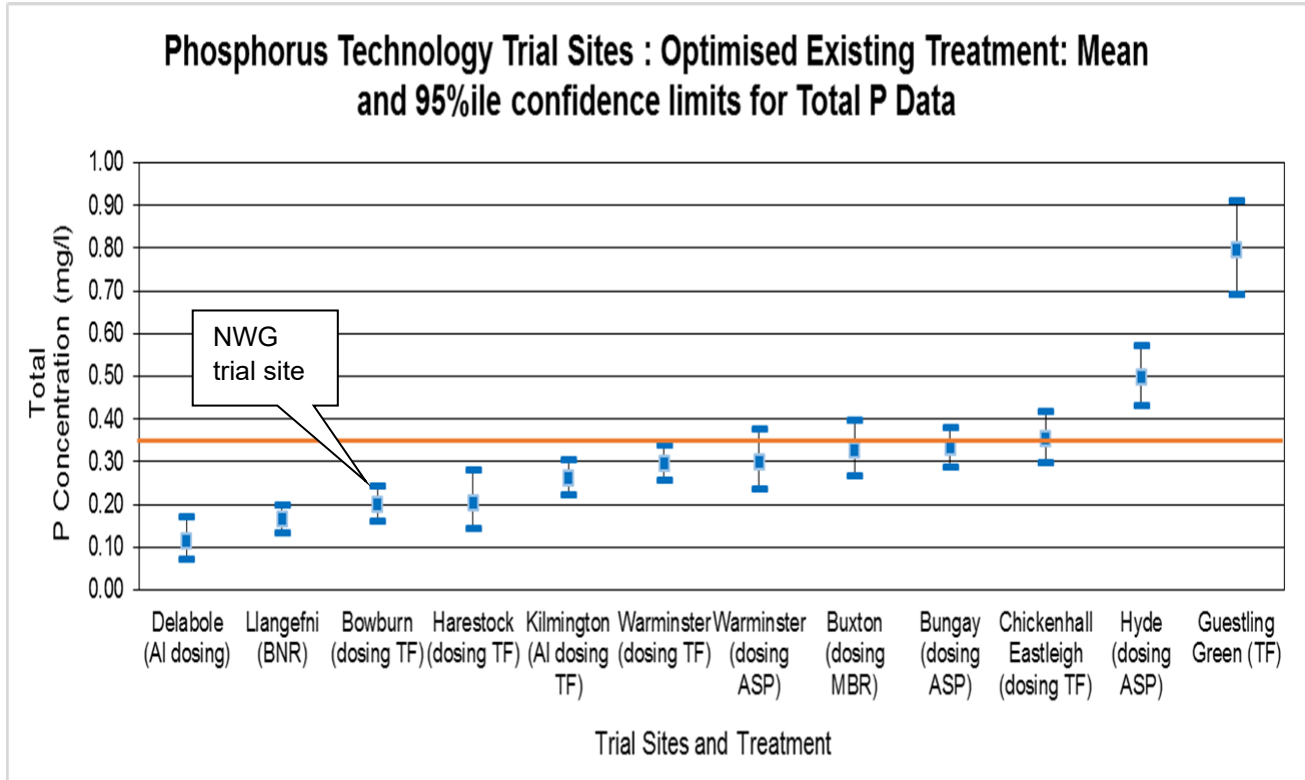
**Including Drivers:** WFD IMPg (good), WFD IMPm (moderate), WFD Imp p (poor), WFD ND (No deterioration), WFD INV (Investigation)  
(WWS2 Line reference: 18,19 and 20)

The impact of each of these drivers and subsequent identification of schemes and solutions have been guided via discussion at, and output from:

- Chemicals Investigations Programme (CIP2) Steering Groups (most specifically relating to the phosphorus technology trials);
- CIP2 Outputs and Conclusions;
- Water UK P T&F Group.
- Internal stakeholders and operational feedback

The preferred solution for P removal uses the conclusions of the AMP6 national programme to investigate technical feasibility of meeting tighter P standards. This includes chemical dosing (assuming ferric) in all instances, and where tighter standards are required (down to the technically feasible concentration of 0.25 mg/l total P for novel technologies, and 0.35 mg/l total P for optimising existing technologies), the addition of a tertiary solids removal process. The AMP6 national programme included extensive pilot trials (undertaken by all water companies, including Optimisation of existing treatment, and Novel technologies). The output from the trials is summarised in the following 2 charts, and a technical summary report on the suitability and cost of the technologies available. These costs were then tailored to meet individual water company applications.

**3.3.6 WASTEWATER WINEP**



The national trials concluded only a limited number of technologies that would meet the tighter P standards, as indicated in the charts (those below the proposed technical acceptable limit).

NWG concluded the technology most suited to application at the sites requiring nutrient removal is to optimise chemical dosing together with a tertiary deep bed sand filter (dosing tertiary filter as per Bowburn indicated in the first chart above). An NSAF (nitrifying submerged aerated filter) was also costed if ammonia

### 3.3.6 WASTEWATER WINEP

removal was considered marginal against the existing permit. Additional capacity requirements as a result of chemical dosing at these sites was considered likely to risk maintaining existing compliance.

Optioneering for P removal involved identification of site specific capacity limitations (pinch points), and the need for additional process units to deal with the additional treatment requirements. An optioneering and costing tool was developed with our cost assurance team on the basis of selecting the following site specific needs, associated directly with knock on effects of meeting the tighter P or ammonia standards:

- Front/back end chemical dosing;
- Alkalinity dosing;
- On-line monitoring;
- Auto desludge requirements;
- Additional sludge storage requirements;
- Additional primary tanks;
- Additional final tanks;
- Tertiary pumping facilities;
- Tertiary solids removal;
- Tertiary Ammonia removal;
- Additional biological filter;
- Paving/Roads etc.

This tool was used to identify site specific needs. The following summary Table illustrates the outcome of the site specific optioneering.

When considering solutions for additional nutrient removal, it became apparent that many of the settlement process units at these locations, whilst performing well under their current permit, could not accommodate either chemical treatment or co-settlement of solids from the tertiary treatment processes. The existing settlement units could not cope with the chemical sludge and could not be effectively de-sludged as frequently as these new processes require. We therefore costed to replace all horizontal flow or pyramidal settlement tanks with radial flow units where they are integral to the nutrient removal process, this could be primary secondary or in some cases both.

# DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

## 3.3.6 WASTEWATER WINEP

Scheme Name/Name of Investigation/Site Name/License name	Driver Code (Primary)	Primary driver - element	Driver Code (Primary) More than one driver	Second primary driver - element	Element	Improvement standard	ND standard	Improvement Totex	Output from Site Specific Optioneering	Ferric dosing (Pumps and tanks) - Front end	Ferric dosing (Pumps and tanks) - Back end	Alkalinity dosing (Pumps and Tanks)	Sludge storage	On-line monitoring (Total P and turbidity)	Auto desludge	New Primary Tanks	Trickling Filter	Secondary Tanks	Tertiary PS	DBF	NSAF	Roads & Paving, Pipework, Lighting etc	Comment
Aldin Grange	WFD_IMPg	Phosphorus			Phosphorus	0.7		£3,943,619	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Bishop Middleham	WFD_IMPg	Phosphorus			Phosphorus	1		£2,391,482.73	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks above existing capacity, so requires additional assets.
Bowburn	WFD_IMPm	Phosphorus			Phosphorus	0.25																	Assume no additional capital investment required. Continue meeting tighter P consent post AMP6 optimisation trial
Browney	WFD_IMPm	Phosphorus			Phosphorus	1		£175,717.16	Required (Y/N)	N	N	N	N	Y	N	N		N	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing already in place. Assume no additional assets required to meet tighter standard, but requires improved monitoring and control mechanism.
Carlton Redmarshall	WFD_IMPg	Phosphorus			Phosphorus	0.4		£4,019,178.28	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Chilton Lane	WFD_IMPg	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.25	0.74	£4,071,238.60	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Crookhall	WFD_IMPp	Phosphorus			Phosphorus	0.9		£1,747,993.47	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		N	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks but assets considered to be adequate. Additional sludge storage capacity required.
Dipton	WFD_IMPp	Phosphorus			Phosphorus	1		£2,476,194.28	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks above existing capacity, so requires additional assets.
Esth Winning	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.6	4.59																Assume no additional capital investment required. Continue meeting tighter P consent post AMP6 P removal trial
Fishburn	WFD_IMPg	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.3	0.95	£3,032,456.18	Required (Y/N)	Y	Y	Y	Y	Y	N	N		N	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement but assets considered to be adequate. Additional sludge storage capacity required.
Hutton Rudby	WFD_IMPg	Phosphorus	WFD_ND	Ammonia	Ammonia	16		£2,852,627.94	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Nitrification required to meet ammonia standard. Additional nitrification capacity included via tertiary nitrification process.
Kelloe	WFD_IMPg	Phosphorus			Phosphorus	0.3		£2,737,010.80	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	N	N	Y	Standard requires chemical dosing and tertiary solids removal. Optioneering proposed an additional filter to reduce the load on an existing NSAF and DBF and avoid the need for alternative tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks above existing capacity, so requires additional assets.
Kirkclevington STW	WFD_IMPg	Phosphorus			Phosphorus	0.3		£3,914,054.19	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Knitsley	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.3	4.24	£4,569,666.06	Required (Y/N)	Y	Y	Y	Y	Y	Y	N		N	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement. These assets considered to be adequate, but expect subsequent increased pressure on biological capacity and risk to ammonia compliance. Additional tertiary NSAF and additional sludge storage capacity required to manage increased solids handling loads and maintain current compliance.
Lanchester	WFD_IMPm	Phosphorus			Phosphorus	0.7		£5,458,321.44	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Longhorsley	WFD_IMPg	Phosphorus	WFD_ND	Phosphorus	Phosphorus	2.26		£915,538.86	Required (Y/N)	Y	N	Y	N	N	Y	N		N	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks but assets considered to be adequate. Front end dosing only considered adequate for the standard.
Longnewton	WFD_IMPg	Phosphorus			Phosphorus	0.3		£3,860,858.32	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
New Moors	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.4	5.23	£4,481,169.71	Required (Y/N)	Y	Y	Y	Y	Y	N	Y		N	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Pittington	WFD_IMPg	Phosphorus			Phosphorus	0.6		£3,844,905.34	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Pity Me	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.3	0.25	£2,232,356.00	Required (Y/N)	Y	Y	Y	Y	N	Y	Y		Y	N	N	N	Y	Standard requires tertiary solids removal, but this is included under the ammonia ND driver. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Pity Me	WFD_IMPm	Phosphorus	WFD_ND	Ammonia	Ammonia	1.5		£2,651,072.10	Required (Y/N)	N	N	N	N	N	N	N		N	Y	Y	Y	Y	Nitrification required to meet ammonia standard. Additional nitrification capacity included via tertiary nitrification process.
Plawsworth	WFD_IMPg	Phosphorus			Phosphorus	1		£3,905,803.53	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal as discharge is to a very low dilution watercourse. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Sacriston	WFD_IMPm	Phosphorus			Phosphorus	0.25		£5,049,678.19	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		N	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets. Also expect subsequent increased pressure on biological capacity and risk to ammonia compliance. Additional tertiary NSAF and additional sludge storage capacity required to manage increased solids handling loads and maintain current compliance.
Sedgefield	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.25	3.01	£4,497,116.22	Required (Y/N)	Y	Y	Y	Y	Y	Y	N		N	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets. Also expect subsequent increased pressure on biological capacity and risk to ammonia compliance. Additional tertiary NSAF and additional sludge storage capacity required to manage increased solids handling loads and maintain current compliance.
Sedgefield	WFD_IMPg	Ammonia	WFD_ND	Ammonia	Ammonia	5.00		£5,889,848.93	Required (Y/N)	N	N	N	N	N	N	N		N	Y	Y	Y	Y	NSAF and DBF included to meet tighter ammonia standard.
Sherburn	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.5	4.27	£4,226,011.57	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets.
Slaley - in combination effect with De Vere Hotel	WFD_IMPg	Phosphorus			Phosphorus	2		£2,277,583.60	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	N	N	N	Y	Standard does not require tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks above existing capacity, so requires additional assets.
Teeside Airport	WFD_IMPm	Phosphorus			Phosphorus	0.4		£4,900,504.89	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets. Also expect subsequent increased pressure on biological capacity and risk to ammonia compliance. Additional tertiary NSAF and additional sludge storage capacity required to manage increased solids handling loads and maintain current compliance.
3.3.6 WASTEWATER WINEP		Phosphorus			Phosphorus																		Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement above existing capacity, so requires additional assets. Also expect subsequent increased pressure on biological capacity and risk to ammonia compliance. Additional tertiary NSAF and additional sludge storage capacity required to manage increased solids handling loads and maintain current compliance.
Trindon	WFD_IMPm	Phosphorus	WFD_ND	Phosphorus	Phosphorus	0.3	4.27	£5,381,521.87	Required (Y/N)	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks but assets considered to be adequate.
Witton Gilbert	WFD_IMPg	Phosphorus			Phosphorus	0.7		£3,437,466.26	Required (Y/N)	Y	Y	Y	Y	Y	Y	N		N	Y	Y	N	Y	Standard requires tertiary solids removal. Chemical dosing increases capacity required in both primary and secondary settlement tanks but assets considered to be adequate. Additional sludge storage capacity required.



### 3.3.6 WASTEWATER WINEP

Further more detailed assessments were undertaken where possible to challenge the site specific costing principle and identify any significant omissions or overlaps with other drivers, including capturing overlaps with growth. The following scenarios were also considered for the WFD schemes:

- Do nothing
- Improvement to Good status
- Improvement to Moderate status
- Improvement to Poor status
- No deterioration

These alternative scenarios were costed in some cases as we weren't certain on the final targets / objectives that would be included in WINEP. Ultimately we chose the scenario that matched what was included in WINEP as the only option (end of pipe treatment) that would be guaranteed to meet the proposed permit.

Line 18 – Nutrients – P at activated sludge STWs - WFD IMPg,m or p - Nutrients P removal at activated sludge STWs ; Browney STW

P removal already in place (to meet 2 mg/l). We included for enhanced monitoring and control to meet a 1 mg/l consent.

Line 19 – Nutrients (P removal at filter bed STWs) - WFD IMPg, m or p - Nutrients P removal at filter bed STWs - Phosphorus removal to various concentrations between 0.25 and 1 mg/l (our preferred technology included for chemical dosing plus tertiary solids removal to meet tighter standards).

Line 20 – Reduction of sanitary parameters - WFD IMP g=good, m=moderate and p=poor - Additional nitrification capacity (assumed addition of NSAF and DBF) at three STW's to either prevent deterioration or meet a tighter consent.

Removal of Ammonia at : Sedgelych

WFD ND Ammonia at : Hutton Rudby and Pity Me

The preferred option for ammonia removal was to include additional nitrification capacity (assumed addition of NSAF and DBF) at three STW to either prevent deterioration or meet tighter consent to reduce impact.

For our WFD schemes, we will work to address Catchment Based Approach (CaBA) to invest in and manage the water environment with our Catchment Partnerships and engage with other sectors in order for improvements in WFD status to be achieved so that benefits can be delivered for our customers. We will take an integrated approach to delivering the WINEP, considering catchment and sustainable solutions where appropriate, and delivering multiple benefits to the environment wherever possible.

We initially identified 10 priority catchments to target for catchment approaches. This was later reduced to 8 catchments influenced by the areas in which our partners would like to see improvements delivered, or where we anticipate we can achieve greater improvements by taking a catchment approach and working with the Catchment Partnerships. In developing our plan, we have worked closely with our key partners to understand the potential for catchment approaches, and are supporting and initiating the development of local delivery partnerships in our priority catchments in anticipation of our WINEP investment and to address our 'fair share' in AMP7. <sup>7</sup>

We remain committed to looking at all suitable locations where an alternative catchment solution could be applied to the treatment solutions we have costed. We are very keen to apply this approach but it is proving challenging to provide options which give a guarantee of meeting the required standards and as time progresses with our study work more schemes move to an end of pipe treatment option as the only guaranteed solution.

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<sup>7</sup> Catchment and partnership thinking – Catchment management for phosphorus

### 3.3.6 WASTEWATER WINEP

There are 3 potential options with this approach:

- a) 3rd party incentivised reductions (farmers apply to be paid to reduce their artificial phosphate applications)
- b) rationalising of permits to deliver the same load reduction at a reduced number of locations i.e. a tight standard applied to one location and others on the same water body retain their existing permit
- c) discharge to a wetland area where there is a natural reduction in nutrients

If we consider each of these options in turn:

- a) could be quite limited as most of our locations are in upland areas where there is little intensified crop production i.e. we are the source of the P not agriculture.
- b) would mean that one location would receive an even tighter standard to that currently expected in the WINEP permit leaving little freeboard on any process applied.
- c) will be limited to lowland areas and there has to be a wetland close to one of our sites so again could be more limited. Both a) and c) could well require chemical treatment anyway to meet water quality objectives.

Due to these uncertainties we have currently concluded an end of pipe treatment solution may be most appropriate, however we remain committed to looking at alternative opportunities.

#### **WFD Chemicals Improvements**

**Including Drivers:** WFD IMP CHEM, WFD ND CHEM, WFD NDLS CHEM  
(WWS2 Line reference: 12)

The impact of each of these drivers and subsequent identification of schemes and solutions have been guided via discussion at:

- Chemicals Investigations Programme (CIP2) Steering Groups (specifically the Options Appraisal group);
- CIP2 Outputs and Conclusions;
- CIP2 Options Appraisal reports and costing exercise to meet provisional permit levels provided by the EA;
- Output of EA Economic Appraisal for Chemicals and subsequent Defra guidance;
- Water UK Chemicals T&F Group.

Site specific options appraisals were undertaken as part of the CIP2 deliverables for all sites meeting an agreed set of criteria. Completion of these reports formed part of the overall AMP6 NEP obligations and were submitted to the EA and to the overall UKWIR CIP2 final reporting<sup>8</sup>.

Removal schemes and costs are based on the technology trials undertaken as part of CIP2. Costs were developed via CIP2 outputs (using Atkins cost models). These were then validated by our cost assurance team (other than in cases where technologies are new to the Water Industry).

We will continue to work with the EA to investigate chemical source identification. In order to undertake investigations, the schemes may need to be supported by monitoring and catchment investigations. It may be that alternative source control can be adopted rather than permits.

Reliability of the technology and removal rates has been questioned and will continue to be debated as part of CIP3 ongoing investigations. This will be relevant for PR24 planning.

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<sup>8</sup> UKWIR NWG Site Specific Options appraisal reports

### 3.3.6 WASTEWATER WINEP

Costs have been provided to the EA for chemical removal schemes where levels in the effluent exceed the permit levels that would be required to meet EQS in the river. These were used in CBA assessment specific to chemicals by the EA.

#### WFD Chemicals Investigations

**Including Drivers:** WFD INV CHEM1-14, WFD MON CHEM  
(WWS2 Line reference: 13)

The impact of each of these drivers and subsequent identification of schemes and solutions have been guided via discussion at:

- Chemicals Investigations Programme (CIP2) Steering Groups;
- CIP2 Outputs and Conclusions;
- Water UK Chemicals T&F Group.

High level scoping of the chemical investigations programme has been undertaken as part of a Water UK Task and Finish group on chemicals, and will include a wide range of investigations including into microplastics and anti-microbial resistant bacteria (AMR), sludge, trend monitoring and optimisation of existing treatment solutions. These continue to be debated at the main CIP UKWIR Steering group which is now developing a detailed scope of the elements of the next phase of CIP3.

Costs have been developed against 14 CIP drivers included in WINEP based on the draft scoping document, laboratory cost estimations, sampling team costs and overheads and review and reporting time.

#### WINEP Investigations

**Including Drivers:** BWNDINV, UINV, WFDINV, HDINV, UINV2 and BWINV4  
(WWS2 Line reference: 16)

The impact of each of these drivers and subsequent identification of schemes and solutions have been guided via discussion at:

- Water UK Flow T&F Group (UINV2)
- Water UK Intermittents T&F Group (UINV).
- Completion of EDM tracking sheet and Flow drivers tables and implications to expected investment needs in AMP7 and beyond.

Investigations have been scoped and costed through discussion with the EA and through the outcome of the T&F groups. Optioneering possibilities have been constrained by guideline frameworks, and in general single options only have been considered for these drivers in order to meet the obligations stated in WINEP.

The drivers include the following:

BW\_NDIV (Investigations for waters failing their Baseline class)

Bathing Waters Investigations to prevent deterioration, including marine impact modelling (MIM) at:  
Marsden including:

- MARSDEN CSO COAST ROAD (A183) REDWELL LANE STY041
- SOUTH SHIELDS SPS REDWELL LANE

Redcar Granville including:

- NEWCOMEN TERRACE 51 CSO

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- GRANVILLE TERRACE CSO

U\_INV (UWWTR spill frequency reduction investigation and Cost Benefit appraisal). NWG has 127 high spilling CSOs on the PR19 EDM Supplementary Tracker.

HD INV – A Measures Specification has been agreed to include continued support to the Seal Sands Tees catchment partnership.

WFDINV – A Measures Specification has been agreed outlining the expected scope of the Big Waters investigations.

BW INV4 – A new measure to investigate what will be required (for investment in AMP8) for Bathing Waters to attain robust Good or Excellent classification.

The options appraisals and cost estimates for these investigations have been established based on information from the Environment Agency in support of each corresponding WINEP entry. All investigations have required the development of a 'Measures Specification' in agreement with the EA, however these have only been developed post submission, constrained by the EA's timeline for river basin management plans.

Line 16 of the Ofwat Enhancement Table WWS2 covers 'WINEP / NEP ~ Investigations'. The definition for this line is 'Capital / operating expenditure on investigations listed in the WINEP over and above that on investigations for which expenditure is required to be reported elsewhere in this table (principally WWS2 lines 13 and 14). This includes a number of drivers with fairly wide ranging criteria and materiality, as indicated in the following table:

	Business Plan March 2019 £M	Driver Description
<b>BWINDINV</b>	0.48	Investigations for waters failing their Baseline class (no deterioration)
<b>UINV</b>	4.72	UWWTR spill frequency reduction investigation and Cost Benefit appraisal
<b>WFDINV</b>	0.30	Investigations where further certainty is needed to be able to target cost-beneficial measures to be carried out by the water company in PR24.
<b>HDINV</b>	0.30	Investigation and/or options appraisal to determine impacts of Water Company activities, or permits or licence standards on the Natura 2000 or Ramsar site or to determine the costs and technical feasibility of achieving revised targets.
<b>UINV2</b>	1.49	Carry out a U_INV2 investigation in AMP7 to confirm if any existing front end flow monitor or the back end MCERTS flow monitor can be used to measure Pass forward flow (PFF).
<b>BWINV4</b>	0.88	New proposal for increased ambition for Bathing Waters to attain robust Good & Excellent classifications.
<b>Total</b>	<b>8.17</b>	

### 3.3.6 WASTEWATER WINEP

The two areas of most significance are (highlighted in red above). Other areas are of low materiality, and have been costed based on previous similar investigations.

Additional detail for these two higher cost items is provided as follows:

**UINV** - Investigations into intermittent high spilling CSO's, in accordance with Storm Overflow Assessment Framework (SOAF). This provides the framework on which to base the expected investigation requirements, and therefore does not need further optioneering beyond the framework guidance. The detail and number of these investigations has been assumed as they will be in response to data we are still collecting (spill frequency data).

We have 127 high spilling CSOs on the PR19 EDM Supplementary Tracker.

From the detailed estimate for SOAF the unit cost per site has been established as £25,489.81 per site.

TOTAL = 127 x 25,489.81 = £3,237,205.87

We also put forward additional investigations based on ~13% of overflows being high spillers and apply to this to the ~450 sites that we currently have no monitoring data for, this would mean 58 additional investigations. Therefore, 58 x 25,489.81 = £1,478,408.98.

Total included = £4.72M.

**UINV2** – Investigations at the inlet to sewage treatment works in order to identify an appropriate installation to measure full flow to treatment (flow measurement to be installed in AMP7). This driver is directly linked to Line 7 Flow monitoring at sewage treatment. The driver was created late in the planning stages as a result of discussion at the Flows Task and Finish Group and amendment to the EA PR19 Guidance V3. The methodology for costing was based on that developed to install measurement of, or a system to prove inlet overflow is operating as permitted (as per U\_MON4 driver).

Existing MCERTs flow diagrams were reviewed. The location of existing MCERTS kit and alternative non-MCERTs kit were recorded. In addition, the point of storm returns needed flagging and consideration. It should be noted that the configuration of meters for measurement of treated flow to river (already in place to MCERTs standards) can differ from those meters required to assess pass forward flow (PFF) at an inlet storm weir. To aid understanding costing requirements different set-ups were grouped to help this.

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### 3.3.6 WASTEWATER WINEP

Initial groupings are below for reference:	
<b>A</b>	MCERTS Front end now (MCERTS survey and certification costs only)
<b>A(2)</b>	MCERTS at front end with storm returns issue (MCERTS survey and certification costs and adjustments needed to remove storm return calculation)
<b>B</b>	Non MCERTS at front end now (MCERTS survey and certification costs, review of any kit costs and civils. If simple then certification costs only, if not defer investment to AMP8) expensive defer)
<b>C</b>	Rely on Back End monitor alone (MCERTS survey and certification costs, await an UKWIR method development, if expensive defer to AMP8)
<b>D</b>	Complex site cost front end monitor for AMP7
<b>D(2)</b>	Complex but PFF check indicates compliance comfortable (MCERTS survey and certification costs, await an UKWIR method development, if expensive defer to AMP8)
<b>Worst case costings:</b>	
<b>For all Non A</b>	Worst case inlet front end MCERTS flow measurement introduction)
<b>D(3)</b>	The EA have requested that all 'complex' are funded in AMP7. Need to agree not to fund on this basis.
<b>E</b>	Network assets (terminal PS overflow or network storm tank)

Depending on the level of information already known at each site, the above grouping enabled a listing of assets that either required investment in AMP7 (U\_MON4) or further investigations (U\_INV2) to apportion what specific investment requirements were required at each location.

Costing was based on the following unit costs collated to site specific requirements:

	Typical unit costs						
	Initial MCERTS Detailed Survey (SIRIS)	MCERTS Compliant FFT Flowmeter Installation	0.7 DWF Estimate	Associated Overpumping (1 week min. Hire)	Additional MCERTS Compliant Storm Return Flowmeter Installation (0.7 DWF)	MCERTS Certification (SIRIS) x2	System Integration - Software Only (FFT & EDM Link)
A	0	0			0	£667	0
A(2)	£4,000.00	£0.00	£74.67		£44,686.11	£1,333.33	£1,000.00
B	£4,000.00	£20,000.00	£18.43	£1,326.38		£1,333.33	£1,000.00
C	£4,000.00		£0.96			£1,333.33	£1,000.00
D	£4,000.00	£69,807.22	£810.13	£35,256.38	£54,261.86	£1,333.33	£1,000.00
D(2)	£4,000.00	£53,902.85	£181.77	£8,326.38	£46,222.78	£1,333.33	£1,000.00

### 3.3.6 WASTEWATER WINEP

#### Customer acceptability for delivering environmental outcomes

Whilst our WINEP obligations have been presented as separate business cases, our customer research has not been focussed on the individual water and wastewater WINEP schemes, but rather on considering customer support for environmental outcomes more generally. This is because the specific improvements delivered by different WINEP schemes can be quite complex and it is easier for customers to provide their overall view on investment in the environment.

WINEP enhancements derive from a statutory programme of work and are therefore obligatory, regardless of customer opinion. However, as it is important to understand our customer's views on all of our enhancement expenditure, we have carried out customer research to understand customer acceptance for NWG delivering improved environmental outcomes.

Focus group research (Explain, 2012) found that the vast majority of participants, when asked about 'spending more of customers' money across a number of environmental activities', generally supported this and agreed with NWG going above and beyond government requirements. 94% of respondents agreed that NWG should be working to reduce pesticides and chemicals from river water and 87% agreed on protecting wildlife and habitats (6 focus groups, 52 respondents). Further research called 'Defining the Conversation', carried out in 2016 and 2017 indicated that customers expect NWG to be speaking to and working with the Environment Agency and other expert environmental organisations on environmental issues and when considering how to manage our performance in the wider environment.

In March and April 2018, we conducted two phases of deliberative qualitative research with customers to explore their acceptability for a range of discretionary enhancement schemes. The schemes were presented in the context that in 2020, customers' bills would be reduced by 10% and that the schemes could be funded by making the 10% reduction smaller. When reviewing the results of the engagement, we considered customers' acceptability to be anything over 70%. This was based on CC Water's Threshold of Acceptability research that was carried out for PR14.

We conducted two phases of research. The second phase of research was conducted because in the first phase a relatively large number of customers stated that they did not know if they accepted the schemes. We discussed this with our Water Forums and agreed that we should carry out additional engagement to understand why this was, and what information we would need to provide to customers to allow them to answer the acceptability question.

The results from the acceptability engagement were discussed with our Water Forums, who welcomed the generally very high levels of customer support for the schemes.

All our enhancements were included in our overall acceptability research, where our plan was supported by 91% of customers.

#### Costing of options

We have assessed the costs for this and other enhancement claims through a structured and robust approach, involving benchmarking of cost estimates against alternatives.

All costs for Wastewater WINEP were provided and assured by the NWG Cost Assurance team whose methodology to costing the schemes was based on the following different approaches<sup>9</sup>:

- A full iMod cost estimate using business as usual processes;
- PR19 Costing Tool created from iMod base estimates;
- Traditional unit rates used to build up cost estimates;
- Assessment and forecasting of historical spend; and

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<sup>9</sup> For further detail on the cost estimation approach, please see separate document on cost assessment for enhancement schemes- NWG PR19 costing methodology

### 3.3.6 WASTEWATER WINEP

- Estimates from other data.

The assumed costs for Wastewater WINEP are £173.9M Capex and £0.0M Opex.

These costs were benchmarked and assured using a combination as follows: 8% Full iMOD estimate; 88% PR19 Costing Tool, and 4% Traditional unit rate.

The cost assurance process and associated costs generated for the wastewater enhancement schemes have been subject to third party assurance provided by Mott Macdonald in July 2018<sup>10</sup>. This review has assessed Wastewater WINEP costs as 99% Green. That is that NWG have followed an appropriate costing methodology and has evidenced that the costs we have used are robust and consistent with good industry practice.

In June 2019 NWG commissioned a shadow pricing exercise by our contractor partners and commercial consultants for the enhancement projects. The purpose of this exercise was to benchmark the costs produced by NWG's iMOD system against the market. The result of this exercise showed that NWG's cost estimates were on average 15% more efficient than the cost estimates returned by our contractor partners and 7% higher than the cost estimates returned by our commercial consultants Turner & Townsend.

This gives confidence that the cost estimates produce by the iMOD system for the enhancement projects are robust and efficient.

#### Cost-benefit analysis

We have assessed the costs of each of the WINEP schemes separately, as detailed in the 'Costing options' section in each of the business cases.

In terms of the benefits, ultimately the main benefit of our proposed investment is to improve environmental outcomes in line with government requirements. Improvements to the environment as a result of WINEP investment can take many forms, and the benefits are therefore multi-faceted. For example, investments will improve river and bathing water quality, reduce pesticides and chemicals in river water and protect wildlife and habitats. The environmental benefits are likely to lead to wider social and economic benefits such as wellbeing effects from the improved wildlife and habitats associated with improved river and bathing water quality. However, the benefits to customers from improving environmental outcomes are difficult to quantify. This is partly because it is difficult to describe to customers the precise nature of the benefits as not all improvements are easily observed.

In line with our approach to cost-benefit analysis (as set out in the Cost-Benefit Analysis Methodology annex), the direct approach to quantifying these benefits would be to estimate the environmental impacts that customers could avoid through the various wastewater WINEP schemes. However, estimating the monetary value of these environmental impacts and the value that our customers place on avoiding them is challenging.

Given these challenges, our approach to cost-benefit analysis is to consider two evidence sources:

- we first present the benefit-cost ratios estimated by the EA as part of its catchment-level economics appraisal
- we also consider the direct customer evidence in support of our WINEP schemes going above and beyond environmental regulatory requirements.

#### EA catchment economic appraisal

The EA undertook catchment economic appraisal for all water body objectives in the 2015 river basin management plans (which covered the period 2015-2021). These were considered legally binding, and no

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<sup>10</sup> Mott Macdonald, Oct 2018, PR19 Enhancement Programme Business Case Assurance Summary Report (Report available upon request)



## 3.3.6 WASTEWATER WINEP

further economic appraisal was required to justify PR19 measures designed to move towards achieving these objectives.

In some cases, it was considered appropriate to amend these catchment level appraisals where better information is now available, in order to ensure PR19 funding is used to achieve the best outcomes. Better information may include new or changed information, for example, a new measure which has been identified or an alternative measure proposed to one that was previously assessed in an appraisal. Other changes could include updated cost information or more certainty about the benefits of a scheme, all of which may make a case for amending an appraisal.

The EA published a guidance document 'Economic appraisal for Water Industry National Environment Programme (WINEP) schemes: guiding principles'<sup>11</sup>, which was designed to be applied to potential WINEP schemes expected to bring about an improvement in the status of water bodies. Investigations and schemes to prevent deterioration or achieve protected area objectives are not subject to economic appraisal.

We provided costs (CAPEX and annual OPEX) for the measures associated with the WFD drivers by the end of October 2017. This was used by the EA to run CBA at a catchment level.<sup>12</sup> A number of iterations were run with variable results depending on the benefits assumptions made.<sup>13</sup> We did not propose any alternatives to this CBA output. Although site-specific CBA would be more appropriate than catchment level, we have not challenged the methodology used and are supportive of the proposed schemes.

The environmental outcome identified in the AMP7 WINEP as a measure of the benefit of satisfying the obligations is 'km river length improved'.

The following improvements are being reported (Ofwat PR19 tables) based on the km length improved quoted for wastewater schemes in WINEP3 published 28/3/2018:

	2020-21	2021-22	2022-23	2023-24	2024-25	Total
<b>km river length improved</b>	0	0	13	142	32	<b>186</b>

**Table 3: Proposed improvements to be delivered under the WINEP3 wastewater schemes**

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<sup>11</sup> EA guidance document 'Economic appraisal for Water Industry National Environment Programme (WINEP) schemes: guiding principles.

<sup>12</sup> The EA CBA methodology and training sessions

<sup>13</sup> The EA CBA Outputs – provided by local EA

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### 3.3.6 WASTEWATER WINEP

Based on these appraisals, the catchment level benefit-cost ratios calculated by the EA are as follows:

Catchment area	Benefit-cost ratio
<b>Browney</b>	1.00
<b>Wear Middle</b>	1.07
<b>Wear Lower Estuary</b>	1.01
<b>Gaunless</b>	2.08
<b>Leven</b>	1.08
<b>Skerne</b>	1.03
<b>Tess Lower Estuary</b>	1.01
<b>Ain</b>	1.01
<b>Berwick to Almouth Coast</b>	1.89
<b>Pont</b>	1.00
<b>Wansbeck</b>	1.3

**Table 4: Catchment level benefit-cost ratios, as calculated by the EA as part of its economic appraisal**

The results show that, at the catchment level, our WINEP3 wastewater schemes are cost-beneficial.

#### Customer support for the proposed enhancement

In 2012, we commissioned Explain to conduct focus group research with our customers regarding their views on whether they supported an increase on their bills in order to support NWG's environmental activities meeting (and exceeding) government requirements. The acceptance levels were as follows:

- 94% of respondents agreed that NWG should be working to reduce pesticides and chemicals from river water
- 87% of respondents agreed on protecting wildlife and habitats.

These results show that customers are very supportive of these investments.

Using these customer research results, we have derived benefit-cost ratios for the enhancement programme.<sup>14</sup> These results are shown in the table below.

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<sup>14</sup> To do this, we assume that the 'demand curve' is linear and we consider price elasticities ranging from 0.5 (inelastic) to 2.0 (elastic). Further details of this approach and the calculation of the benefit cost ratio can be found in the Cost-Benefit Analysis Methodology Annex

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	Low	High
Reducing pesticides and chemicals from river water	1.23	1.94
Protecting wildlife and habitats	1.21	1.85

**Table 5: Benefit-cost ratio for improved environmental outcomes**

The table above shows our WINEP enhancement investment is cost-beneficial with cost-benefit ratios materially over 1.0.

However, given that the customer acceptability research asked if customers supported NWG going above and beyond the environmental regulatory requirements, we would expect the benefit cost ratios to be even higher if the WINEP schemes aim only to meet these requirements.

### Our preferred plan/option

#### Summary of totex

WINEP enhancement costs have been summarised by EA driver and as per the Ofwat Enhancement Tables.

Any overlaps with other enhancement drivers has been highlighted and removed.

Costing information has been summarised and provided to our cost estimation team for final cost assurance.

Where a number of options or scenarios were considered as part of optioneering, our preferred plan has ultimately been to include the solution that will deliver the obligation with least risk.

The breakdown of the totex enhancements (capex and opex) has been summarised in the Table: 'The wastewater enhancement tables – Summary data'.

The following Table is a summary of the Wastewater WINEP Drivers, and the delivery profile proposed in WINEP. It should be noted that we may need to agree (via change protocol with the EA) to deliver schemes within AMP7, but to a modified profile in order to enable the most efficient delivery of the overall capital plan. This would only be proposed if agreed by the EA, and where there was no detriment to the environment.

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## 3.3.6 WASTEWATER WINEP

WINEP 2 Summary			WINEP2 - September 2017		WINEP3 - March 2018		Delivery profile					
Directive / Regulation	Drivers (Grouped)	Brief Description	No. of WINEP lines	Level of certainty (as per WINEP2)	No. of WINEP lines	Level of certainty (as per WINEP2)	2021	2022	2023	2024	2025	
UWWTR	U IMP5	Increase to FFT	29	Red	16	4 Green and 12 Amber			4	5	7	
	U IMP6	Increase to Storm Tank capacity	106	Red	7	2 Green and 5 Amber			1	3	3	
	U INV	Spill frequency reduction – Investigation and Cost Benefit appraisal	129	Green	122	Green						
	U INV											
	U INV						22	25	21	23	24	
	U IMP4	Spill frequency improvement - not yet identified but estimated as output from SOAF	None			5	Green					
	U MON3	EDM on flow to storm	157	Green	153	Green	82	18	22	19	12	
	U MON1	EDM on flow to storm				4	Green	4				
	U MON2	EDM on flow to storm				54	Green	54				
	UINV2	New driver created where not enough information available to action UMON4				83	Green		83			
	U MON4 & U INV2	(UMON4 and UINV2) Mcerted flow monitoring of FFT (front end of works)	157	Red	70	Green		17		25	28	
	WFD Chemicals	WFD IMP CHEM	Hustledownx3, Windlestonx2, Tranche2 and Tranche3&4		Red and Purple for Tranche 3 & 4	2	Amber					
WFD INV CHEM1		Risk based extension to CIP plus monitoring on Team at East Tanfield	2	Red and Green	5	Green		5				
WFD INV CHEM2		TraC	1	Red	1	Green		1				
WFD INV CHEM3		AMR	1	Red	1	Green		1				
WFD INV CHEM4		Innovative pathway control	1	Red	0							
WFD INV CHEM5		Microplastics	1	Red	1	Green		1				
WFD INV CHEM6		Catchment Investigation	1	Red	3	Green		3				
WFD INV CHEM7		Sludge	1	Red	1	Green		1				
WFD INV CHEM8		Programme Management	1	Green	1	Green		1				
WFD INV CHEM9		Effluent monitoring for substance reduction	1	Red	0							
WFD INV CHEM10		AMP7 Chemicals Investigations: Effluent monitoring for substance reduction and environmental monitoring for compliance with EQS	1	Red	1	Green		1				
WFD INV CHEM11		Optimisation of new technologies				4	Green		1			
WFD INV CHEM12		Mechanism of chemical removal (national programme)				1	Green		1			
WFD INV CHEM13		Investigate source of Zn	0			1	Green		1			
WFD INV CHEM14		Monitoring emerging substances	0			3	Green		3			
WFD MON CHEM	Trend monitoring	1	Red	5	Green					5		
WFD ND Chemicals	WFD No det chemicals	3	1 Red 2 Purple	1	Green					1		
WFD NDLS Chemicals	WFD Load Standstill	10	9 Red and 1 Purple	5	Green		5					
WFD Sanitary Parameters	WFD IMP g	WFD Improvement schemes to Good	36	33 Red, 3 Green	13	Amber					13	
	WFD IMP m	WFD Improvement schemes to Moderate	2	Red	12	Amber					12	
	WFDIMP p	WFD Improvement schemes to Poor	0		2	Amber					2	
	WFD ND	WFD No deterioration (growth within consent that impacts status) P (20 lines), NH3 (9 lines) - chemicals included above WINEP3 reduced 12 sites (only 2 with no det only)	29	30 Red, 2 Purple	12	Green					12	
	WFD INV	Phosphorus Investigations (not clear on this yet) - includes Hawthorn Dean and Big Waters (Blyth) WINEP3 Big Waters only	2	Amber and Red	1	Green					1	
Bathing waters	BW ND INV	Investigation (Marsden and Redcar Granville)	1	Amber and Red	3	Green		3				
	BW MON	EDM on storm - impacting on BW	0		6	Green		6				
	BWINV4	Investigate potential to Excellent - New driver raising ambition	0		10	Amber		10				
	BW ND	Intermittent discharge (Redcar Granville)	1	Red	2	Green			2			
Fisheries, Biodiversity and Geomorphology	INNS ND	Biosecurity and Company strategy	1	Green	2	Green					2	
	INNS INV	Crayfish and INNS transfer	3	Green	3	Green		3				
	INNS MON	Companywide	1	Purple	1	Green		1				
	HD IMP	Wooler	3	Green	1	Green					1	
	HD INV	Cat cleugh and Kielder - Pearl mussels			1	Green			1			
	NERC IMP1	R. Rede scour			2	Green					2	
Water Quality - Others	Pearl mussels		1	Not completed	0							
	DrWPA INV	Till Fell Sandstone - Nitrates in Groundwater	1	Amber	1	Green		1				
	DrWPA ND	Catchment measures	4	4 Green and 2 red	4	Green					4	
	HD INV	SSI INV - Seal Sands (Tees catchment partnership)	6	Red	1	Seal Sands Green					1	
	MCZ INV	Aln and Coquet	2	Red	0							
	NERC INV1		1	Green	0							
	NERC IMP1	South Tyneside holistic water management			1	Green					1	
	SSI INV		1	Red	0							
	SSI ND		1	Red	0							
	WFDGW NDINVGW Q	Stonygate Nitrate	1	Red	1	Green		1				
Water Resources	EE IMP	Eel Screen	1	Amber	1	Amber					1	
	WFD IMP WRHMWB	4 Fish passages and 6 Sustainable change	10	Amber	12	Amber					12	
	WFD INV WRHMWB	Investigations and Options Appraisal	6	Green	4	Green		4				
	WFD ND INV WR Flow	Investigations and Options Appraisal	1	Green	0							
	WFD GW ND GWR	Sustainability change - Fell Sandstone	1	Green	1	Green					1	
	WFD GW ND INV GWR&GW Q	Investigations and Options Appraisal	1	Red	1	Green						
NERC INV1	Coquest estuary tidal weir	0		1	Green		1					

## 3.3.6 WASTEWATER WINEP

### Detail of AMP7 WINEP Commitments

WINEP3 was published March 28<sup>th</sup> 2018<sup>15</sup>.

We have broken down the WINEP requirements for wastewater services into five areas relating to key environmental objectives / drivers:

- Urban Wastewater Treatment Directive (UWWTD) and Bathing Water Directive;
- WFD Nutrients (Sanitary parameters);
- WFD Chemicals – Improvement;
- WFD Chemicals – Investigations;
- WINEP Investigations – Supporting information for PR24 planning.

These are described in the following sections together with provision of the breakdown of totex expenditure allocated to each line within Ofwat's table WWS2 Wholesale wastewater capital and operating expenditure<sup>1617</sup>.

### Urban Waste Water Treatment Directive (UWWTD) and Bathing Water Directive

We will invest £56.7M totex to meet our obligations to manage wastewater and reduce unwanted discharges under UWWTD drivers and prevent deterioration of bathing waters under the Bathing Waters Directive. This will allow us to provide increased capacity for storm water storage and treatment of flows at our STWs. It will also ensure we have robust measurement technologies and methodologies in place to manage flows at our STWs and within our network, including on our combined sewer overflows (CSOs). We will also address frequently spilling CSOs through the national Storm Overflow Assessment Framework (SOAF) including provision of increased storage in networks to prevent deterioration of Bathing waters (BWND storage schemes at Marsden, Redcar Granville and Tynemouth Cullercoats).

**Including drivers:** UMON1, UMON2, UMON3, BWMON (Line 6) UMON4 (Line 7), UIMP5 (Line 9), UIMP6 (Line 10), UIMP4 and BWND (Line 11).

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<sup>15</sup> WINEP 3 Publication

<sup>16</sup> Wastewater Enhancement tables – summary data.xls (summary table used to populate WWS2)

<sup>17</sup> WINEP Cost spreadsheets – basis for costing information provided for cost assurance

## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

Capex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
Line ref.	Enhancement expenditure by purpose – capital	£m	£m	£m	£m	£m	£m
6	WINEP / NEP ~ Event Duration Monitoring at intermittent discharges	0.32	0.22	0.22	0.22	0.22	1.22
7	WINEP / NEP ~ Flow monitoring at sewage treatment works	0.94	0.94	0.94	0.94	0.94	4.70
9	WINEP / NEP ~ Schemes to increase flow to full treatment	0.00	0.00	8.03	9.84	19.40	37.29
10	WINEP / NEP ~ Storage schemes at STWs to increase storm tank capacity	0.00	0.00	0.09	0.26	0.60	0.95
11	WINEP / NEP ~ Storage schemes in the network to reduce spill frequency at CSOs, etc	4.34	4.34	1.30	1.30	1.30	12.58
Totex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
A	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
6	WINEP / NEP ~ Event Duration Monitoring at intermittent discharges	0.32	0.22	0.22	0.22	0.22	1.22
7	WINEP / NEP ~ Flow monitoring at sewage treatment works	0.94	0.94	0.94	0.94	0.94	4.70
9	WINEP / NEP ~ Schemes to increase flow to full treatment	0.00	0.00	8.03	9.84	19.41	37.29
10	WINEP / NEP ~ Storage schemes at STWs to increase storm tank capacity	0.00	0.00	0.09	0.26	0.60	0.95
11	WINEP / NEP ~ Storage schemes in the network to reduce spill frequency at CSOs, etc	4.34	4.34	1.30	1.30	1.30	12.58
						<b>Total</b>	£56.7M

# DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

## 3.3.6 WASTEWATER WINEP

### Water Framework Directive (WFD) - Nutrients

We will invest £99.6M in WFD nutrient removal (ammonia and phosphate) in our NW operating area to include:

- Phosphate (P) removal from 27 STWs and ammonia removal from three STWs

**Including drivers:** WFDIMPg, m and p (Line 18 – P removal at activated sludge, Line 19 – P removal at filter beds, Line 20 – Reduction of sanitary parameters)

	Capex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m	£m
<b>18</b>	WINEP / NEP ~ Nutrients (P removal at activated sludge STWs)	0.28	0.10	0.10	0.10	0.10	0.10	0.68
<b>19</b>	WINEP / NEP ~ Nutrients (P removal at filter bed STWs)	1.00	12.80	18.86	32.03	25.50	90.18	
<b>20</b>	WINEP / NEP ~ Reduction of sanitary parameters	0.13	1.21	1.69	2.72	3.00	8.75	
	Totex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m	£m
<b>18</b>	WINEP / NEP ~ Nutrients (P removal at activated sludge STWs)	0.28	0.10	0.10	0.10	0.10	0.10	0.68
<b>19</b>	WINEP / NEP ~ Nutrients (P removal at filter bed STWs)	1.00	12.80	18.86	32.03	25.50	90.18	
<b>20</b>	WINEP / NEP ~ Reduction of sanitary parameters	0.13	1.21	1.69	2.72	3.00	8.75	
							<b>Total</b>	<b>£99.6M</b>

### WFD Chemicals Improvement

The EA will implement new permits for substances highlighted in previous chemical investigation programmes contributing to environmental quality standard failures in rivers downstream of STWs. These permits will include substances such as Nickel, Zinc, and Aluminium. These are either no deterioration permits, or, at one STW, improvements based on river needs.

## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

We will invest £7.5M totex on ensuring minimum risk of failure against these new permits. We will seek to investigate potential sources of these substances to understand whether removal at source can mitigate the risk to compliance rather than installing additional high energy treatment solutions.

**Including drivers:** WFD IMP CHEM, WFD ND CHEM, WFD NDLS CHEM – (Line 12)

Capex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
<b>12</b>	WINEP / NEP ~ Chemicals removal schemes	1.51	1.51	1.51	1.51	1.51	7.53
<b>Totex</b>							
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
<b>12</b>	WINEP / NEP ~ Chemicals removal schemes	1.51	1.51	1.51	1.51	1.51	7.53
<b>Total</b>							<b>£7.5M</b>

#### WFD Chemicals Investigations

We will continue to contribute along with other water and sewerage companies to the national Chemicals Investigation Programme (CIP) which will continue to run in AMP7 after two phases in AMP5 (£25m total) and AMP6 (£140m total).

High level scoping of the chemical investigations programme has been undertaken as part of a Water UK Task and Finish group on chemicals, and will include a wide range of investigations including into microplastics and anti-microbial resistant bacteria (AMR), sludge, trend monitoring and optimisation of existing treatment solutions.

We will invest £1.9M totex (assumed to be capex) to ensure we are able to fulfil obligations identified as part of the ongoing CIP3 investigations.



## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

**Including drivers:** WFD INV CHEM1-14, WFD MON CHEM - (Line 13)

Capex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
<b>13</b>	WINEP / NEP ~ Chemicals monitoring / investigations / options appraisals	1.00	0.90	0.00	0.00	0.00	1.90
<b>Totex</b>							
Totex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
<b>A</b>	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
<b>13</b>	WINEP / NEP ~ Chemicals monitoring / investigations / options appraisals	1.00	0.90	0.00	0.00	0.00	1.90
						<b>Total</b>	<b>£1.9M</b>

#### WINEP Investigations

We will invest £8.2M in a number of Investigations that will provide support to the nature and extent of investment required in AMP8 (PR24).

We will undertake investigations at Tynemouth Cullercoats, Marsden and Redcar Granville to ensure no deterioration occurs in seawater water quality and to understand the actions we can take to reduce our environmental impact further.

The Government have proposed that the water industry are more ambitious about improving and making Good and Excellent bathing waters more robust. Our final WINEP contains ten bathing waters for catchment-wide ambition investigations that were amber in terms of certainty. These were revised to green in the March 2019 WINEP update as a result of Ministerial decision. The cost of undertaking the investigations is included in the PR19 business plan. The 'ambition' investigations are at Redcar Gotham, Redcar Granville, Redcar Lifeboat Station, Redcar Stray, Saltburn, Seaham Hall, Seaton Carew Centre, Seaton Carew North, Spittal and Tynemouth Cullercoats.

**Including drivers:** BWNDINV, UINV, WFDINV, HDINV, UINV2 and BWINV4 (Line 16)

## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

Capex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
A	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
16	WINEP / NEP ~ Investigations	3.29	4.78	0.10	0.00	0.00	8.17
Totex		2020/21	2021/22	2022/23	2023/24	2024/25	Total
A	Enhancement expenditure by purpose - capital	£m	£m	£m	£m	£m	£m
16	WINEP / NEP ~ Investigations	3.29	4.78	0.10	0.00	0.00	8.17
<b>Total</b>							<b>£8.2M</b>

For the Business Plan, Northumbrian Water commissioned Economic Insight to forecast the Relative Price Effects adjustment for capex enhancements. This was assessed at around 1% pa over 2020-25. We separately set ourselves an annual efficiency target for capex enhancements of 1% pa.

#### Risks, uncertainties and further work

##### Managing Uncertainty

The timeline differences between the PR19 planning and the third cycle river basin management planning for WFD introduce an ongoing level of uncertainty.

The final determination date for PR19 is December 2019 and the provisional ministerial sign off date for the 2021 river basin management plans is December 2021. There is therefore a need to continue with the managing uncertainty approach adopted in PR14 to help manage these timeline differences and to evolve the approach based on the lessons learned.

The EA applied a traffic light system (red, amber, green) during development of the WINEP. The red, amber, green traffic lights system reflects the different levels of certainty associated with the development of measures, economic appraisal and ministerial decisions.

In the PR19 Final Methodology Ofwat has identified (section 9.4.3) that the anticipated (uncertain / amber) programme will be funded, as long as companies propose an appropriate cost adjustment mechanism to account for any potential discrepancy between the scale of the assumed and confirmed programmes. We have proposed a cost adjustment mechanism in order to ensure our customers are not paying for schemes and outcomes that have not been delivered. We expect Ofwat will use this to make an adjustment at the end of the control period (reference separate Appendix<sup>18</sup>).

Delivery of WINEP obligations will be logged by the EA using a 'Tracking' spreadsheet. This will be used to confirm sign off of delivered obligations, and to confirm that the outputs are satisfied or that change protocol is accepted if the output is changed. It will be used for annual reporting purposes as part of the Environmental Performance Assessment (EPA). Delayed or non-delivery of WINEP schemes will be managed via this mechanism. If the change cannot be agreed with the EA it would be recorded as a failure

<sup>18</sup> Ref. Document 'WINEP Enhancement cost adjustment mechanism – Appendix 3.9'

## 3.3.6 WASTEWATER WINEP

to comply with the obligation, and would subsequently impact on our EPA scoring. It may also lead to permit non-compliance which may contribute to a penalty against our discharge compliance performance commitment (PC).

### **Risk Management**

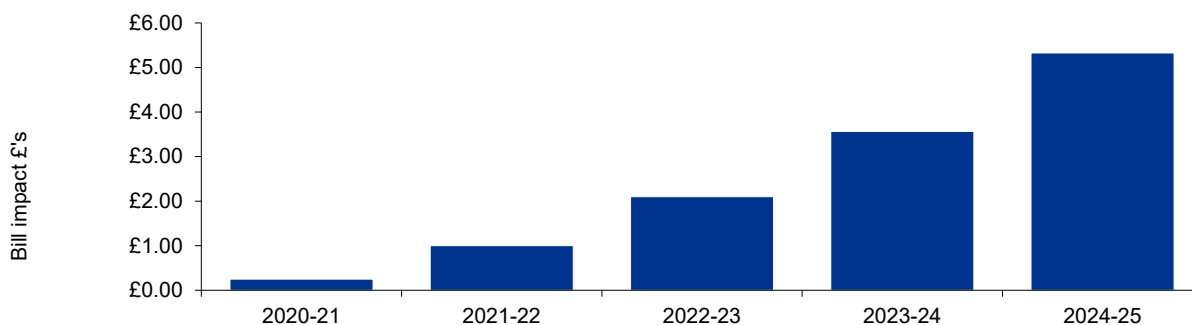
Risks and assumptions made during optioneering and costing are appropriate for the current stage of development and level of information available from the EA on the output required to satisfy the regulatory objectives. The EA are required to provide 'Measures specifications' for outcomes that do not include a change in permit. These were only partially completed at the time of the submission, and were only completed in full March 2019. Clarification of an output may also be dependent on the output of an investigation not yet completed. Optioneering has therefore been undertaken on the information available. Work will continue with the EA to clarify the scope where uncertainty remains in order to manage any associated risk, and any changes to scope will be managed via change protocol.

Opportunities may exist to adopt alternative mitigation measures involving, more efficient delivery mechanisms that deliver the same, or better environmental improvement. Any alternative proposals (such as delivery via catchment partnership projects) would need to be approved by the EA and logged via a formal change protocol procedure. This is regarded as an opportunity to maximize the benefit rather than a risk, and will be managed as such.

### **Affordability**

The impact of these enhancement investments on customer bills are shown below<sup>19</sup>.

**Figure 1: Bill impacts from wastewater WINEP enhancement scheme**



Overall the analysis shows that the bill impacts would be rising from £0.25 (year 1) to £5.33 (year 5) a year.

This is set within an overall bill drop of more than 14% (wastewater) in AMP7, including all enhancement investments, one of the largest across the sector. At an aggregate level recent changes in average earnings

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<sup>19</sup> Bill impacts were calculated using a simple ready reckoner based on profiles of opex and capex costs for the specific enhancement, asset lives and run-off rates consistent with overall price control specific rates consistent with App16 and using revenues and combined bill average values consistent with App7.

## DRAFT DETERMINATION - NORTHUMBRIAN WATER REPRESENTATION

### 3.3.6 WASTEWATER WINEP

have been positive and third party projections from the OBR for 2020-23 suggest that, at a national level, real earnings is predicted grow at between 0.8-1.2% per annum<sup>20</sup> driving significant improvements to average customer affordability.

The scheme proposed is material to the long-term stability and health of the customer service, and will contribute to a robust future network. This is in the context of an AMP7 plan which customers fully support.

Customers support these proposals and consider them to be affordable and the overall position in the plan will reduce bills considerably in AMP 7 at a time of expected real earnings increases. However, we recognise that affordability will remain a concern particularly for some low income customer groups. Our plan sets out detailed proposals and mechanisms to help our services remain affordable for our most vulnerable customers including specific proposals to eradicate water poverty by 2030<sup>21</sup> and to meet Ofwat's new sector specific PC on the number of customers on our Priority Services Register.

#### Alignment with stakeholder needs

##### Regulators and other stakeholders

The WINEP is a key part of the overall programme of measures to meet the requirements of the Environment Agency (EA)'s Water Industry Strategic Environmental Requirements (WISER) document. Our schemes in the WINEP have been agreed with the EA and therefore fully align with their needs as a stakeholder.

WINEP involves a number of key schemes in priority areas for our Catchment Partnerships. We intend to use our WINEP investment to deliver wider environment improvements through catchment and innovative approaches. Partnership delivery is a cornerstone of our PR19 plan for the environment.

The business case demonstrates how the WINEP enhancement schemes have been developed and agreed with the EA, and the level of support and engagement received by customers and water forum representatives. The business supports inclusion of **all** of the WINEP3 enhancement obligations (green **and** amber certainty categories) and will make allowance for their inclusion within the plan.

##### Customer protection

NWG are proposing appropriate mechanisms to incentivise delivery of our proposed enhancement schemes and protect customers between 2020 and 2025 in the event that schemes are not developed or delivery is delayed. We are proposing a cost adjustment mechanism for enhancement costs that will protect customers against late or non-delivery of those enhancement schemes. If delivery is late, or does not occur at all, a penalty (or return of funding) will be calculated based on the NPV of the difference in cash flows compared to on time delivery. Full details of our enhancements delivery incentive mechanisms are included in Chapter 4: Measuring and Incentivising Success of our final business plan. More detail specific to the cost adjustment mechanism proposed for WINEP schemes is also provided in Appendix 3.9.

#### Board assurance

The details of all our enhancement cases have been shared with and discussed by our PR19 Board Sub-group on 20 February, 8 March and 14 May 2018 and 12 February, 4 March and 21 March 2019 and by the full NWG Board on 18 July 2019. During these discussions the details of the enhancement proposals were

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<sup>20</sup> See: <https://obr.uk/efo/economic-fiscal-outlook-october-2018/> Table 1.1 difference between CPI and average earnings forecast

<sup>21</sup> See section 3.2 of our business plan, [https://www.nwl.co.uk/assets/documents/NWG\\_PR19\\_Interactive\\_FINAL\\_RS.pdf](https://www.nwl.co.uk/assets/documents/NWG_PR19_Interactive_FINAL_RS.pdf)

### 3.3.6 WASTEWATER WINEP

carefully reviewed and were challenged in a number of ways which have been taken into account in our final enhancement cases<sup>22</sup>.

The full Board approved a revised Board Assurance Statement at the full Board meeting on 29 March 2019, confirming that the Board has reviewed and has confidence in the enhancement cases. The Board has, accordingly, signed the Assurance Statement, confirming that "large investment proposals are robust and deliverable, that a proper assessment of options has taken place, and that the option proposed is the best one for customers<sup>23</sup>.

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<sup>22</sup> For further detail on how the Board has challenged our enhancement cases and the response from management please see our 'Board engagement on enhancement cases document'

<sup>23</sup> See Board Assurance Statement