PRICE CONTROL FOR WATER AND SEWERAGE SERVICES

PC28

Annex A
Approach to asset maintenance
5 September 2025

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Utility Regulator

About the Utility Regulator

The Utility Regulator is the independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water, and sewerage industries, to promote the short and long-term interests of consumers.

We are not a policy-making department of government, but we make sure that the energy and water utility industries in Northern Ireland are regulated and developed within ministerial policy as set out in our statutory duties.

We are governed by a Board of Directors and are accountable to the Northern Ireland Assembly through financial and annual reporting obligations.

We are based at Millenium House in the centre of Belfast. The Chief Executive and two Executive Directors lead teams in each of the main functional areas in the organisation: CEO Office; Price Controls, Networks and Energy Futures; and Markets and Consumer Protection. The staff team includes economists, engineers, accountants, utility specialists, legal advisors, and administration professionals.

ABSTRACT

Asset maintenance investment is the investment necessary to replace assets which have reached the end of their useful life or to provide alternative means to support continued service delivery. This document sets out the Utility Regulator's approach to the determination of asset maintenance investment for the next water and sewerage services price control (PC28), which will determine outputs and funding over the period. In this document we review the main techniques which NI Water might use to assess future asset maintenance investment and we describe how we will use this information to determine a reasonable value of asset maintenance investment over the PC28 period. It is for the company to decide how it can best apply these and any other techniques it considers appropriate to assess asset maintenance needs taking account of its systems, data, and capability.

AUDIENCE

The approach we are taking to PC28 is of particular relevance to stakeholders across the water sector in Northern Ireland, including consumers and those with responsibilities or interests in water regulation. Our objective is to ensure inclusive engagement and transparency throughout the process.

CONSUMER IMPACT

Through the PC28 Price Control we will determine an efficient, consumer focused package of outputs and funding for NI Water for the price control period. This will include the revenue and investment necessary to maintain the assets and the level of service they deliver. To set this work in context, the PC21 determination included £715 million over 6 years in 2018/19 prices for asset maintenance investment. This was almost 30% of the revenue determined for NI Water in PC21.

CONSULTATION

This is a draft of the approach document which is published for the purposes of consultation. The views of all interested stakeholders are

sought on all aspects of the draft, in particular (but not only) on those on which questions have been identified in the text. UR will have regard to all responses received before publishing a final version of its approach, which will then guide development of the PC28 price control. UR will also give further consideration to its approach while this document is being consulted upon, and reserves the right to make refinements to it in the final version.

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1. Introduction

1.1 Asset maintenance investment (sometimes referred to as base maintenance or capital maintenance) is the investment necessary to replace assets which have reached the end of their useful life, or to provide alternative means to support continued service delivery. In this document we review the main techniques which NI Water might use to assess future asset maintenance needs, and we describe how we will use this information to determine a reasonable value of asset maintenance investment over the PC28 period.

1.2 We first issued an approach to asset maintenance as part of our preparation for PC15. PC21 was a continuation of the process of long-term planning necessary to deliver the aims and objective of the Long Term Water Strategy which began in the PC15 Price Control. In PC21 we made minimal changes to reflect wider industry approaches and to suit NI Water's level of maturity. We have reviewed our previous approach to asset maintenance in this context and concluded that much of it remains valid. As a result, we have only made minimal changes which reflect wider industry changes and the development of asset maintenance techniques by NI Water to date.

1.3 Similar to PC21 we require NI Water within its PC28 business plan to:

a) Submit an asset inventory. Over recent years, the company has worked to improve its asset inventory. This improving information should allow an assessment to be made of potential long-term trends in asset maintenance investment which may signal future changes in investment need and inform our determination of medium-term investment in PC28.

b) Use actionable data arising from improved asset knowledge and improved linkages between asset failure, service failure and consumer experience to better target asset maintenance investment and improve service to consumers.

c) Consider any other techniques appropriate to assess asset maintenance needs taking account of its systems, data, and capability. Techniques may include an asset health assessment and/or a bottom-up assessment of base needs.

1.4 While our approach reviews the main techniques which NI Water might use to assess future asset maintenance investment, it is for the company to decide how it can best apply these and any other techniques it considers appropriate to assess asset maintenance needs. We expect the company to continue to build its plans on the work it has undertaken to

develop asset information systems and its asset maintenance planning capability as part of an overall commitment to deliver excellence in asset management for the long-term benefits of its consumers.

Asset maintenance approach

1.5 The delivery of water and sewerage services is an asset intensive process which requires:

a) Substantial impounding reservoirs to store raw water.

b) Complex water treatment works to treat raw water abstracted from rivers, loughs, boreholes, and impounding reservoirs to meet exacting drinking water quality standards.

c) An extensive system of pipes, pumping stations and service reservoirs to distribute water to consumers. NI Water operates over 27,200 km of water mains –almost 30 m of water main for every connected property.

d) A network of sewers and pumping stations to collect wastewater and surface water run-off and convey it to treatment works. NI Water operates over 16,700 km of sewers – more than 20 m for every connected property – plus sewer laterals connecting properties to the main sewer.

e) Wastewater treatment works, including simple and complex plant, which treat wastewater to meet environmental consent standards before it is discharged to rivers, estuaries, or the sea: together with the associated sludge treatment and disposal facilities incorporating bioresources recovery (as appropriate). NI Water operates over 1,000 wastewater treatment works, many of which are small works serving rural communities.

1.6 NI Water has estimated that the gross replacement value of the assets used to deliver water and sewerage services at March 2025 was £5.7bn[1]. In PC21 NI Water planned to invest approximately £137m[2] per annum to maintain existing assets and the services they deliver, which was approximately 30% of the revenue[3] determined in the final determination. Because this investment maintains current services, it is paid for by current consumers through direct charges to non-domestic consumers, a subsidy to NI Water from the Department for Infrastructure (DfI) in lieu of

[1] This value is significantly different from PC21 (£10.6bn) due to changing from UKGAAP to IFRS accounting rules

[2] PC21 Final Determination average base maintenance allowance in 2024/25 prices using PC21 Final Determination inflation assumptions

[3] Base maintenance accounts for approximately 40% of the entire capex allowance set for PC21

domestic customer charges, and a payment by DfI Roads for road drainage.

1.7 The complex mix of assets requires a robust assessment to establish the 'right' level of asset maintenance in the medium-term and long-term. If investment is made too early, we lose the opportunity to either reduce charges or invest in other service improvements. If investment is made too late, service may deteriorate until an adequate level of investment is restored.

1.8 For our first Price Control (PC10)[4], NI Water was not able to provide a robust assessment of asset maintenance investment based on risk to service. In the absence of this assessment, we estimated a reasonable allowance by using an econometric comparison with asset maintenance investment by water service providers in England and Wales. We carried this approach forward into PC13[5] for a short (two year) duration price control.

1.9 However, since its inception in 2007 (and before), NI Water has been investing in asset maintenance systems and data which should allow it to develop a forward looking, risk-based approach to asset maintenance. A better understanding of its assets might allow the company to better target interventions, reducing or delaying asset maintenance investment. Alternatively, a better understanding might show that higher levels of asset maintenance investment are necessary in the medium-term to long-term.

1.10 In PC15[6], we developed our approach to asset maintenance investment and challenged the company to deliver a robust plan for asset maintenance investment in a practical way based on improving information quality.

1.11 Our approach for PC21[7] built on the approach we adopted in PC15, allowing NI Water to develop its long-term plans within a consistent regulatory context. It aimed at allowing NI Water both to make the case for the 'right' level of asset maintenance investment in PC21, and plan for longer term investment, within an overall context of excellence in asset management.

1.12 Our approach to PC28 is to build on the asset maintenance approach that was used for PC21.

[4] PC10 covered the 3 year period 2010-13
[5] PC13 covered the 2 year period 2013-15
[6] PC15 covered the 6 year period 2015-21
[7] PC21 covers the 6 year period 2021-27, with a subsequent 1-year extension

1.13 In the remaining chapters of this approach document we:

Chapter 2	Summarise the scope of a Plan for Asset Maintenance which the company should submit in its PC28 Business Plan. Further detailed requirements for this Plan will be included in the PC28 Information Requirements.
Chapter 3	Consider the broad range of asset maintenance techniques which might be applied to assess future asset maintenance investment. We have outlined how we would apply each of these techniques to determine the level of asset maintenance investment in PC28. Where appropriate, we have identified specific information we have asked the company to provide to support our assessment.
Chapter 4	Describe how asset maintenance investment is currently funded and consider the impact that this might have on long-term financial sustainability and equity between todays and future consumers.
Annex 1	Provide a brief description of each generic asset maintenance technique considered in Chapter 3. We summarise key strengths and weaknesses and note how we will use each technique to develop our determination.

2. Plan for Asset Maintenance

2.1 We first asked the company to prepare a plan for asset maintenance as part of its PC15 Business Plan submission, and this was developed further for PC21. The company's PC28 Business Plan submission should also include a plan for asset maintenance which sets out its approach to asset maintenance planning and explains how it has assessed the changes in operational practice and investment required to maintain or enhance serviceability to consumers during PC28. This plan should build on the on-going work of improving information on assets and service impact and the ways in which this information can be collated, then mapped and analysed. It should reflect the practical development of the company's asset maintenance planning methodologies and capability in PC21 and demonstrate how the PC28 plan for asset maintenance is part of an on-going process which reflects existing practice and builds on it.

2.2 Within its plan for asset maintenance, we expect the company to:

a) Describe how its asset maintenance approach has built on its PC21 plan for asset maintenance and how lessons learnt from work undertaken in PC21 has informed future plans.

b) Assess and report on its asset maintenance planning capability.

c) Provide historical information on asset maintenance expenditure and explanatory data to allow us to use econometric, unit cost and time series analyses to predict the level of asset maintenance investment.

d) Provide an assessment of serviceability.

e) Provide an asset inventory including the age profile of its assets.

f) Set out its assessment of future asset maintenance needs.

2.3 In the subsequent sections of this approach, we have set out some of the main techniques available for assessing asset maintenance investment requirements and for developing a plan for asset maintenance. We also identify the information we would expect the company to provide when it applies these techniques. In broad terms these techniques either:

- Establish a base line for the development of the asset maintenance plan.
- Play a part in assessing the investment necessary to at least maintain serviceability in the future.

2.4 It is for the company to decide how it can best apply these and other techniques to prepare its plan for asset maintenance taking account of its systems, data, and capability. We expect the company's plan to:

- Explain the overall approach undertaken and how systems and processes are used to inform asset maintenance planning.
- Set out clearly and concisely how it has assessed the changes in operational practice, levels of investment and activities necessary to maintain services.
- Explain how the company's proposals link to historic cost and serviceability assessments and the outcome of any consumer engagement.
- Justify proposed changes to current levels of service or expenditure.
- Explain the approach adopted for each area of service and the factors that influenced the type of assessment adopted.
- Explain how the assessments undertaken for individual areas have been combined to determine the overall assessment.
- Identify any areas where asset maintenance system and data issues limit its ability to adopt a forward-looking risk-based approach and its plans, including any associated investment requirements, for addressing these issues.

2.5 The company should demonstrate how it has taken account of the views of consumers in its plan for asset maintenance. In particular, the company should:

- Show how actionable data derived from consumer contact systems and the regular consumer call back service, consumer surveys and other regular consumer engagement has informed its plans.
- Show how lessons learnt from previous incidents and events has informed its plans.
- Explain how any results of any consumer engagement for PC28, or previous price controls, have informed the planned service levels and the identification, assessment and prioritisation of the interventions proposed to deliver and maintain these service levels.
- Demonstrate how any factors, weightings or rankings used in its analysis have been derived from the results of any consumer engagement.

- Outline if the proposals in the PC28 Business Plan have been tested with consumers to assess their acceptance of the plan and, if so, demonstrate how.

2.6 In PC15, we asked the company to structure its assessment of asset maintenance investment around the activities set out in the Capital Maintenance Planning Common Framework (CMPCF) (UKWIR report 02/RG/05/3).

2.7 In PC21, NI Water completed an Asset Management Capability Maturity Assessment against the 39 elements of the Global Forum for Maintenance and Asset Management (GFMAM) Asset Management Landscape and developed a roadmap for ISO55001 compliance. We believe this approach remains valid, but we will consider representations from the company in respect of the structure of the submission which better reflects its internal processes and the procedures, if necessary.

3. Asset Maintenance Techniques

Overview

3.1 In this chapter of our approach, we consider the broad range of asset maintenance techniques which might be applied to assess future asset maintenance investment.

3.2 Eight generic asset maintenance techniques are identified and reviewed:

Asset planning capability

a) A structured assessment which demonstrates that the company has the capability to make a robust assessment of future asset maintenance needs and identifies further improvements which can be made in asset maintenance, data, and processes to support long-term planning.

Top-down expenditure analysis

b) The projection of historical expenditure by the company using time series as well as unit cost techniques.

c) An econometric analysis of historical expenditure by other companies to enable expenditure predictions.

d) A depreciation approach based on a modern equivalent asset valuation.

Asset maintenance outcomes

e) An assessment of historical trends in asset 'serviceability.' Linked to business outcomes ensuring line of sights between investment made and outcomes achieved.

f) An assessment of historical trends encompassing asset reliability, resilience, availability, condition, and performance of the assets.

Asset maintenance plans

g) Specific asset maintenance plans setting out specific outputs and expenditure.

h) A forward-looking risk-based approach which takes account of how asset serviceability deteriorates over time and analyses the cost of running or replacing the asset to arrive at a cost effective or cost beneficial asset maintenance plan.

3.3 Annex 1 provides a summary description of each technique. It identifies key strengths and weaknesses and summarises how we will incorporate these techniques into our overall approach.

3.4 Different techniques are appropriate for different types of assets and their criticality to the system. The application depends on the quality of the data, systems and processes applied by the company. As a result, we will employ the range of techniques available to triangulate to a reasonable determination of asset maintenance investment for PC28. The weight we give to each technique in arriving at our determination will depend on the type and quality of information provided by the company in its business plan submission.

3.5 In line with the principles set out in our approach to PC28, we expect the company to develop the data necessary to support a robust assessment of expenditure and outputs. Where there is insufficient data to support more robust analysis, we will adopt an approach to setting revenue allowance which is prudent but conservative, until the company can provide robust information based on sound data and analysis.

Asset maintenance planning capability assessment

3.6 An assessment of the company's asset maintenance planning capability allows the company to demonstrate that it has the ability to make a robust assessment of future asset maintenance needs. It provides a framework for identifying further improvements which can be made in asset maintenance, data, and processes to support long-term planning.

3.7 Building on the progress made in PC21, we expect the company to provide a structured assessment of its asset maintenance planning capability as part of its PC28 Business Plan submission. The company should show that it has adequate data, systems, and processes in place to support its plan for asset maintenance in PC28 and demonstrate how it has addressed any gaps in data systems and processes in its plan.

3.8 There are a range of standard processes available to assess asset planning capability. For example:

- The Asset Management Planning Assessment Process (AMPAP). AMPAP is a self-assessment methodology and tool for evaluating asset maintenance competencies developed for the UK water industry by UKWIR (ref 07/RG/05/19).
- The Asset Management Maturity Assessment (AMMA). AMMA was co-created by Ofwat and companies and allowed them to align their thinking in relation to asset health, asset management and their links to resilience.

- Asset Management Landscape (AML). AML was developed by The Global Forum on Maintenance and Asset Management (GFMAM) and outlines the subjects and fundamentals that define asset management excellence.

- ISO asset management standards - ISO 55000/55001/55002 is an international standard which replaced PAS55 as a widely adopted industry standard. ISO 9001 is an international standard for quality management systems.

3.9 These systems are broadly similar in that they ask set questions covering aspects of effective asset management such as stakeholder engagement, management, data, processes, and systems. As well as establishing current capability, they allow a company to undertake a gap analysis and plan and prioritise activities to close any gaps identified.

3.10 There may be some benefits in comparing asset management capability across the utilities regulated by the Utility Regulator, or in comparing NI Water with other water service providers. However, at this time, we have concluded that we should not dictate the methodology the company should adopt, although we see advantages in adopting a water industry approach. We expect the company to adopt a recognised methodology which it considers to be relevant and useful. We expect the company to advise us of its preferred methodology for our consideration. The company should describe how its preferred methodology will inform both the development of asset maintenance planning and its PC28 Business Plan.

3.11 The company should use its capability assessment to identify gaps in its asset management planning capability. In its business plan submission, the company should set out its plan for closing the gaps identified including the benefits, timescale, and cost of doing so.

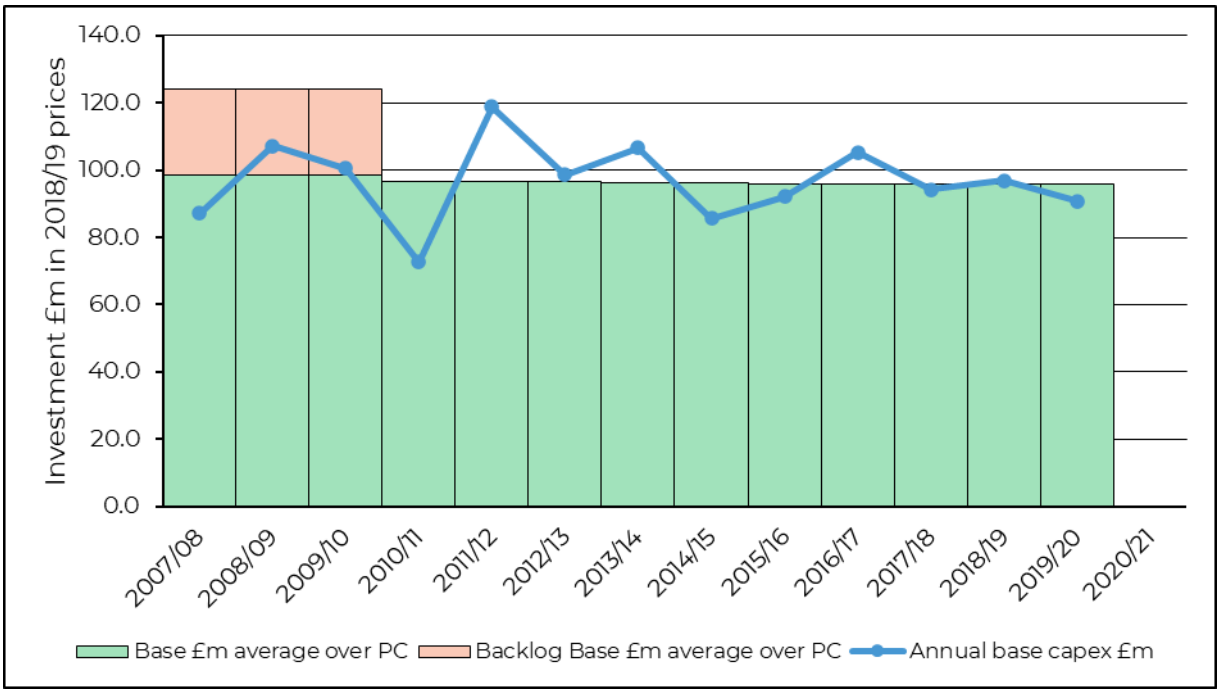
3.12 We will rely on the company's assessment of its asset maintenance planning capability assessment when determining the relative confidence, we can place on the various techniques the company has used to prepare its plan for asset maintenance. In view of this, this assessment should be accompanied by a report from an independent expert. This report should set out their views on the company's assessment and make recommendations of any more detailed work required to fully assess the company's current asset management capability and its plans to improve its asset management capability.

3.13 The company should submit a draft of its asset maintenance capability assessment as part of its outline capital submission, including a final version as part of its business plan submission.

Projection of historical expenditure

3.14 In the PC21 final determination we used the analysis of historical expenditure as a key component in calculating the appropriate level of investment alongside econometric modelling and assessing consequential base. The PC21 analysis of historical expenditure to 2019/20 is reproduced in Figure 3.1 below.

Figure 3.1: Historical base expenditure analysis (2018/19 price base)



3.15 The projection of historical expenditure provides a basic methodology for assessing medium-term asset maintenance investment. It assumes, but cannot demonstrate, that:

- The level of investment required to maintain a mixed portfolio of assets will be broadly constant in the medium-term.
- Historical asset maintenance investment has been adequate and delivered efficiently.
- The company has been free to decide the right level of investment in the past and has not been constrained by external events, including previous funding limits.

3.16 It is possible to address some of these concerns. For example:

- Comparing historical investment with historical serviceability trends can help establish whether investment has been adequate.

- Comparative efficiency assessment can determine whether investment has been delivered at efficient unit costs - although it does not determine whether it has been targeted effectively.

3.17 Despite these limitations the analysis of historical investment and serviceability trends provides a baseline against which future estimates of asset maintenance can be judged. We would expect the company to include an assessment of historical asset maintenance investment in its business plan submission and be capable of demonstrating why planned levels of investment are different from historical investment.

3.18 We will ask the company to submit historical cost information in its business plan submission based on the breakdown of asset maintenance expenditure by sub-service and selected asset type as detailed in Table 32 of the annual information return. We will also consider any further breakdown of historical investment which the company may offer to support its assessment of future asset maintenance investment for individual asset groups.

3.19 Where possible, we will consider the unit cost efficiency of asset maintenance investment alongside historical investment trends in our analysis. Our approach to efficiency is contained within the Approach Consultation for PC28 and this approach will be further developed through the Cost Assessment Working Group.

Econometric analysis of historical expenditure by other companies

3.20 Econometric modelling analyses the historical expenditure of companies delivering a similar service using explanatory variables to develop comparative expenditure models. The models are used to estimate the level of asset maintenance investment with further adjustments made to account for special factors or the relative efficiency of the company.

3.21 In PC10, PC13, and PC15, we used econometric analysis as the primary method for assessing asset maintenance investment. In PC21 we used econometric analysis in combination with historical base expenditure as the primary methods for setting the baseline level of asset maintenance investment.

3.22 We intend to continue with the use of econometric analysis as one of several means of assessing asset maintenance investment in PC28. We will use information from England and Wales companies collected by Ofwat as a primary data source in our analysis. To do so, we will consider the way which Ofwat has collected data in recent years to reflect changes

in the way the water industry in England and Wales is regulated including:

- Separation of cost reporting for wholesale and retail elements of the businesses.
- Separation of cost reporting for specific service areas being opened up to competition such as biosolids management and water resources.
- The move to total cost reporting and efficiency benchmarking.

3.23 We will ask NI Water to submit cost and explanatory data to support econometric and bottom-up analysis of asset maintenance investment. We will take account of the separation of cost reporting in England and Wales to ensure that we collect consistent data for the purpose of benchmarking. This will be addressed in our PC28 Information Requirements which will be published in November 2025.

3.24 As well as modelling base maintenance, we may consider the range of totex (opex and capex) as well as botex (base maintenance and opex) approaches which Ofwat has developed for the regulation of water and sewerage services in England and Wales and how these might inform our determination for PC28.

3.25 We will continue to adopt a triangulated approach, recognising that no single econometric model can provide a point estimate of asset maintenance requirements. We will consider using a variety of econometric and bottom-up analyses to derive the 'right' quantum of asset maintenance to at least sustain delivery of service to consumers in PC28 and beyond.

3.26 We will continue to adjust the output from the econometric models for regional price differentials[8], special factors and frontier shift. We will account for local circumstances such as PPP plant (taking into account the end of PPP contracts and their return to NI Water ownership within the PC28 period) alongside commitments to deliver specific outputs.

3.27 In our determination, we will consider the impact of the timing of enhancement investment (by NI Water compared to England and Wales) on the econometric models used to assess future asset maintenance needs.

3.28 Econometric modelling provides an independent benchmark for the efficiency and effectiveness of asset maintenance investment. However, it

[8] Otherwise referred to as our Regional Price Adjustment (RPA) as developed previously in PC15 and PC21

relies on historical expenditure information and therefore can be thought of as backward looking. Historical and expected future variation in asset maintenance investment is only captured by the models to the extent that the cost drivers used in the models can explain this variation.

3.29 It assumes that asset maintenance investment will continue at broadly constant levels[9] in line with historical expenditure and does not allow for possible waves of asset replacement which are not reflected in historical investment levels. For econometric modelling to be able to estimate the underlying relationship between costs and cost drivers, the historical expenditure data used for NI Water and the England and Wales companies needs to be on a 'like for like' basis.

3.30 In PC21, special factor adjustments were made to caveat the econometric modelling outputs for NI Water, mitigating the differences between NI Water and England and Wales water companies.

3.31 The challenges associated with econometric benchmarking in conjunction with the funding constraints faced by NI Water may suggest that more detailed, bottom-up approaches described below are needed to assess whether the medium-term and long-term future investment need is different from the past, however UR is still open to using the econometric modelling as an input to determine efficient capital base need.

3.32 We used a bottom-up assessment of consequential base in PC21 to account for a step change in capital expenditure primarily due to the Living with Water Programme.

3.33 We will consider the implications of the challenges noted above in our assessment of the reliance we place on econometrics within the price control.

Depreciation approach based on modern equivalent asset valuation (MEAV)

3.34 This technique assumes that the level of asset maintenance in the medium-term to long-term must reflect the replacement costs of assets as they reach the end of their useful life. It is based on an assessment of the residual life of each asset and the cost of replacing the assets as necessary to maintain the service provided. A key advantage of this approach is the ability to assess the impact of historical waves of investment on future asset maintenance.

[9] Unless explanatory variables are included to account for specific trends

3.35 Up to PC21, the data used is the same data used to estimate the current cost depreciation of the assets. For a stable asset base, the estimate of asset maintenance investment and current cost depreciation should be broadly equivalent over the medium-term to long-term. For PC28, reference should be made to the PC28 Approach on how we plan to estimate current cost depreciation.

3.36 The replacement cost of the assets should be assessed on a modern equivalent asset basis. The 'modern equivalent asset' is the asset which would be installed today to deliver the same service and takes account of new technologies, new materials, and current design standards.

3.37 The residual life of the asset used in the analysis is often based on one of the following: the installation date of the asset and a nominal asset life; expert judgement following site surveys; or it is inferred from other observations such as condition and performance grades. A key weakness is that there may be little supporting evidence to justify the asset life used in the analysis. In particular, the assessment is of limited value for long life assets (such as sewers, water-mains, and impounding reservoirs) where there is still insufficient experience of assets reaching the end of life to allow a reliable assessment of asset life to be made.

3.38 A robust asset valuation and current cost depreciation estimate on a 'modern equivalent asset' (replacement) basis can address issues raised about the perception of average replacement age (current value divided by annual expenditure) and potential future increases in asset maintenance by making a high-level estimate of need over the long-term. The valuation brings together asset information (type, size, and age of the assets) with cost data for construction or replacement of the assets. Both are core information sets which we would expect the company to maintain to allow it to manage its assets effectively. The quality of an asset valuation is only as good as the quality of the asset inventory and costing data available.

3.39 At this stage we have concluded that the company's business plan submission should include an updated asset inventory including age profile and assessment of residual life. We expect that it will be consistent in methodology with PC21, but we will engage with the company to determine the level of granularity in which the asset inventory is developed and summarised so that:

- The level of granularity is proportional to the service risk of the need.
- It is based on the information collected by the company to manage its business.

- It has a level of granularity which can be used to apply cost curves to support an asset valuation.
- It reflects the information used to develop the plan for asset maintenance for PC28.
- It distinguishes between data which is known and data which is estimated, setting out how estimated data has been in-filled to provide a complete picture.

3.40 We will consider whether there is advantage in including an asset revaluation in the PC28 Business Plan to inform future trajectories of asset maintenance expenditure, which would inform the current cost depreciation estimate. **We are seeking the views of NI Water and other stakeholders on the merits of an asset revaluation.**

3.41 If NI Water offers a modern equivalent asset valuation in its PC28 Business Plan to support asset maintenance investment, we will critically assess the underlying asset data, costing systems and residual life estimate and decide whether the information is of sufficient quality to inform our determination of asset maintenance. To give confidence in this type of analysis we would expect the company to show how it has used relevant and robust asset observations to assess the residual life of the asset.

3.42 Given that the conclusion in PC21 was that a modern equivalent asset valuation would be highly burdensome and limited by the company's relative lack of maturity (in comparison to other UK water companies), UR is of the opinion that the MEAV technique is highly unlikely to be used by NI Water for PC28.

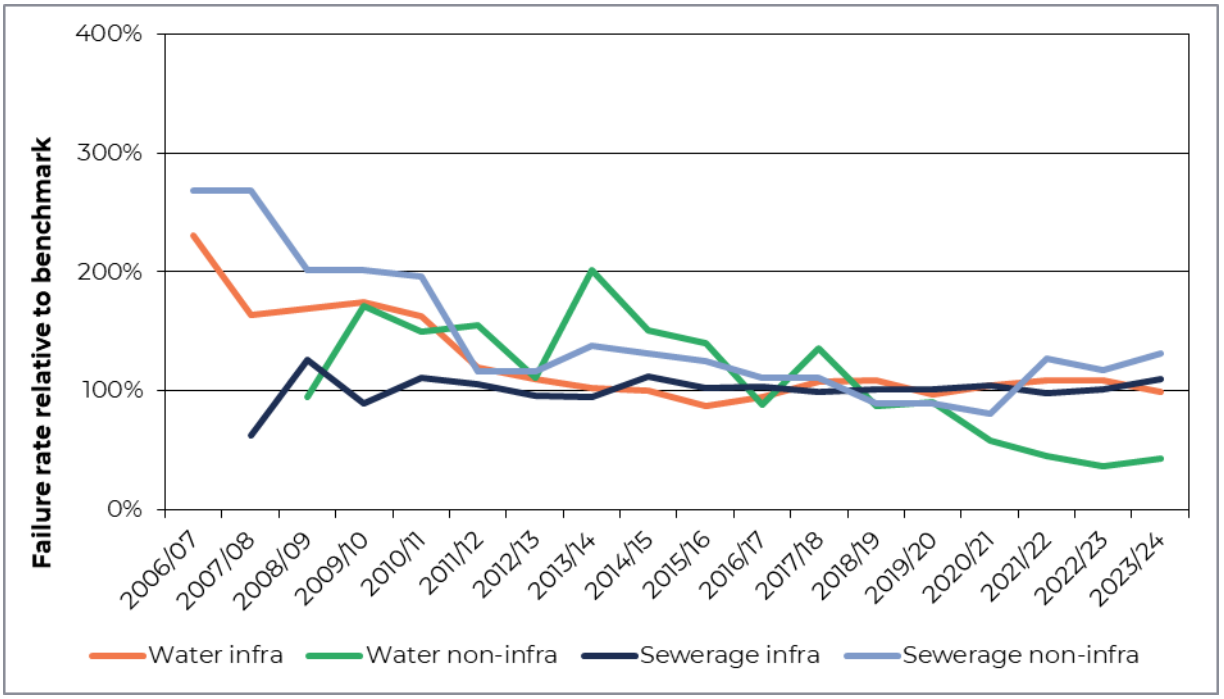
Assessment of historical serviceability trends

3.43 'Serviceability' is a measure of the capability of an asset to provide a service. In practice it is assessed by trending a series of defined asset performance indicators (such as the frequency of pipe bursts) and service indicators (such as the frequency of interruption to supply). Data trends are considered in the round to determine whether asset serviceability is stable, improving, deteriorating or marginal. The approach focuses attention on how the asset delivers service to consumers.

3.44 During PC13 we introduced serviceability reporting following consultation with NI Water and stakeholders. A defined suite of serviceability measures were established and processes developed for setting serviceability benchmarks and tramlines and assessing whether serviceability is being maintained, is deteriorating or improving. In the PC21 Final Determination we set serviceability benchmarks and tramlines based on the information

available at AIR20. In the PC21 Mid-Term Review we updated the data trends to include AIR24 figures as shown in Figure 3.2 and found that the primary indicators largely remained within the control limits set in the PC21 Final Determination and that the reference levels remained broadly reflective of performance. We concluded that there was no need to alter them at the mid-term review.

Figure 3.2: Primary serviceability indicator trends 2023/24



3.45 For PC28, we will continue to use serviceability trends as our primary means of determining asset maintenance outcomes. We will use historical trends in serviceability to assess whether historical levels of asset maintenance investment were adequate. We will update the benchmarks and tramlines for individual service indicators based on the latest information available at AIR25, AIR26 and AIR27[10].

3.46 We expect the company to include an assessment of historical serviceability trends in its business plan submission and consider the relationship between historical expenditure and serviceability in its assessment of investment need. We expect the company to justify future asset maintenance investment in terms of the impact on serviceability measures, both individually and collectively.

3.47 We continue to encourage NI Water to propose additional and/or alternative serviceability indicators and alternative methodologies for assessing trends where it believes that they would improve on the current

[10] AIR25, AIR26 and AIR27 cover the reporting periods 2024/25, 2025/26 and 2026/27

service indicators and provide a better assessment of historical trends and future investment needs. In general, we would expect the company to consider the current serviceability indicators in any assessment of asset maintenance trends before explaining why the alternative measures of performance provide a better indication of serviceability.

Assessment of asset condition and performance

3.48 In the past, asset condition and performance grading has been used as a primary asset observation in the water industry to assess asset maintenance outcomes and inform future asset maintenance investment.

3.49 Standard definitions of condition and performance grades were established by Ofwat for the regulation of water service providers in England and Wales. Companies undertook extensive surveys to assess the condition and performance of assets against these criteria and the quantity and value of assets in each condition and performance grade were assessed.

3.50 Condition and performance grades are composite measures which combine asset characteristics relating to probability of failure, consequence of failure and operational efficiency. Combining these different characteristics requires a degree of expert judgement and generates grades with different meanings for different assets.

3.51 In the past, attempts have been made to link condition and performance grade to residual asset life. In practice, this can become complex and lacks the confidence which comes from an analysis of direct asset observations. Experience has shown that it is difficult to replicate condition and performance grading over time to establish trends and link these to the timing of asset maintenance interventions. Material changes in grading between price reviews have often been attributed to changes in methodology, changes in the sample surveys and changes in staff employed in the surveys. Because the surveys can be difficult to replicate the results cannot be used with any confidence.

3.52 A broader range of measures could be used beyond asset condition and performance in order to have a more holistic view of asset health as per Table 3.1 below and considered with asset criticality to inform investment need.

Table 3.1: Asset health risk assessment inputs

Condition	Quality of Maintenance	Asset Utilisation	Age	Reliability	Location / Environment	Detectability
Weighting 0.1 - 1.0	Weighting 0.1 - 1.0	Weighting 0.1 - 1.0	Weighting 0.1 - 1.0	Weighting 0.1 - 1.0	Weighting 0.1 - 1.0	Weighting 0.1 - 1.0
Scoring 1 - 5	Scoring 1 - 5	Scoring 1 - 5	Scoring 1 - 5	Scoring 1 - 5	Scoring 1 - 5	Scoring 1 - 5

3.53 We are aware of the Roadmap for Enhancing Asset Health Understanding in the Water Sector[11] emerging from PR24 and anticipate this work will address some of these concerns for future price controls through provision of more detailed methodology and metrics.

3.54 Due to the current maturity of asset health assessment as it evolves from condition and performance, we will not ask NI Water to undertake a defined condition and performance assessment for PC28. Instead, we will continue to rely on serviceability as our primary measure of asset investment outcomes. We expect the company to base its asset maintenance assessment on relevant asset observations which it uses to assess asset maintenance requirements. Key asset observations can be incorporated in future serviceability assessments where they provide a useful insight into the trends in asset serviceability.

3.55 We will consider any asset health assessment provided by the company as part of its asset maintenance plan. We would expect the company to demonstrate how this has been used to assess the residual life of the assets. We would expect the company to highlight where any asset health assessment is used, and is useful, in its current asset maintenance assessments. We would also expect the company to highlight where any asset health assessment can be applied consistently in future asset maintenance assessments.

Specific asset maintenance plans

3.56 The company may opt to prepare specific asset maintenance plans which address current issues and use expert judgement to assess future asset maintenance needs.

3.57 The advantage of this approach is that it identifies specific asset maintenance outputs. However, while current issues can be identified, it is more difficult to identify the timing of future interventions for assets which are currently serviceable. The use of expert judgement to fill this

[11] Slide 17 https://www.ofwat.gov.uk/wp-content/uploads/2025/01/PR24-final-determinations-webinar-slides.pdf

gap can only provide limited confidence on the estimates of residual life and the timing of future interventions.

3.58 We will assess any specific asset maintenance plans which the company submits in its business plan to support future asset maintenance investment. We recognise that it may be necessary for the company to continue to use expert judgement where existing data is insufficient to support a more rational analysis of asset maintenance needs. If this is the case, the company should demonstrate how asset observations have been used to inform expert judgement on residual asset lives. The company should demonstrate the steps it will take and the timescale required to move to a forward-looking risk-based approach to provide an economic assessment of asset maintenance investment.

3.59 The interventions identified through specific asset maintenance plans are often assumed to be in addition to the historical level of investment. In the absence of other evidence, we would expect the company to prioritise specific investment plans within the overall asset maintenance budget derived from historical trends or econometric analysis.

3.60 We will assess the unit cost efficiency of costings included in specific asset maintenance plans.

3.61 When considering the use of specific asset maintenance plans, we would expect the company to use actionable data and methodology developed in recent price controls to undertake targeted analysis which can inform investment and targets for PC28. For example:

- How does the level of deterioration of water mains as informed by emerging issues in the water mains prioritisation programme inform future asset maintenance needs.
- How does information on reactive maintenance inform plans to increase proactive maintenance.
- Can information linking interruption to supply to pipe type, location etc. inform plans for a managed reduction in interruptions to supply.
- How has the delivery of previous price control development objectives informed better targeting of interventions in PC28.

3.62 Where we accept specific asset maintenance plans, we will consider including specific outputs in the determination to monitor delivery and manage any subsequent changes.

Forward-looking risk-based assessment

3.63 A forward-looking risk-based assessment of asset maintenance investment is a rational, evidence-based assessment taking account of:

- Asset failure rates and rates of deterioration.
- The on-going cost of repairs.
- The escalation of operating cost with age (for example reducing energy efficiency).
- The probability of service failure following asset failure.
- The consequential cost of service failure, including direct costs to the company and wider social costs such as environmental impact, traffic disruption or reputational damage.
- The costs of the potential interventions available to improve asset serviceability.
- Whether consumers support any additional costs of avoiding service failure.

3.64 The approach provides a rational basis for establishing the residual life of the assets which balances the costs of continuing to operate the existing assets with the costs and benefits of replacing the asset or maintaining the service by other means. The purpose of maintaining the assets is to maintain the service provided to consumers. The company should focus its assessment on the maintenance of service.

3.65 We are aware that implementation has sometimes led to the use of theoretical 'black-box' models which cannot be supported by the available data. This type of approach can provide misleading answers dictated by poor quality data. We expect the company to use practical, targeted, and transparent methodologies which can be tested and developed as information improves over time. For example:

a) The methodology should be able to generate answers at a range of summary levels and generate sample calculations which provide a facility to drill down into the answer, confirm that it has been implemented correctly and allow the impact of material assumptions and data to be identified.

b) Asset information should be analysed at a reasonable level of granularity accounting for the criticality of the asset, allowing the analysis of discrete assets (or cohorts of assets of similar type), failure modes and service impact.

c) The methodology should define individual assets at an appropriate level of granularity to ensure that different failure modes and a range of potential interventions can be considered. For example, a pump comprises a motor, an impeller, a casing, a bearing and seal, instrumentation, and valving. An effective analysis will consider failure modes and interventions for these components as opposed to grouping them as a single asset with a single 'replace pump' intervention.

d) There is a risk that the analysis of limited data or the use of external data will generate spurious asset failure rates, service failure rates and deterioration rates. The information used to analyse asset and service failure should be calibrated against current and emerging asset service failure rates to confirm that it is robust.

e) Repair costs and repair times used in the analysis should be assessed carefully to ensure that there is sufficient data recorded accurately in the works management system to generate robust parameters. Data should be used in a way which is consistent with the underlying records and analysis used to generate it. For example, time to repair assessed from works management systems should take account of the time taken to open and close work orders.

f) Repair costs, operating costs and consequential costs should be a realistic assessment of the marginal cost saving which would be achieved if an intervention is applied. Other costs and benefits should be included where they have a material bearing on the analysis and have the support of stakeholders.

g) Where a stepped change in asset maintenance is proposed to reduce operational costs (for example bringing forward pump replacement to improve energy efficiency) the company should identify the operational savings as 'OPEX from CAPEX.'

h) The analysis should take account of the criticality of the asset and its likely impact on service. This would include taking account of time to repair, the time from asset failure to service failure, the provision of stand-by plant and the availability of critical spares either in-house or through the supply chain. For non-critical assets, a reactive maintenance policy based on run-to-failure may be the appropriate response. Management interventions to reduce asset criticality, including work order management, spares management and asset monitoring should be considered as part of the asset management plan.

i) The analysis should include the opportunity to identify and replace the worst performing assets first to reflect the detailed assessment of interventions which will be carried out in practice. Conversely the assessment should consider how interventions assumed in the asset maintenance plan will be identified in practice. Where necessary the frequency and cost of interventions should allow for the investigation, trial excavations and testing required to identify interventions.

j) A wide range of capex and opex solutions should be assessed to reflect the range of solutions which are considered in practice. If the analysis favours a particular outcome which does not reflect the balance of work normally carried out, this should be questioned and the reason the analysis suggests a change in practice should be established and tested.

k) The analysis should take account of the residual economic value of the asset including potential reuse or resale. This may be significantly different from the residual book value. If the analysis demonstrates that the cost-effective plan is to replace assets with a significant residual book value or allow assets to continue in service well beyond their nominal asset lives, the company should advise what adjustments it might need to make to its depreciation accounts to reflect its asset maintenance plan.

l) The company should be able to demonstrate that the analysis for the PC28 Business Plan has direct links to asset management delivery. An approach which is used and useful has the advantage of being credible and provides a basis for feedback and learning which will ensure continuous improvement of asset management techniques and inform future asset maintenance plans.

3.66 A forward looking, risk-based asset maintenance plan can be prepared as:

- A cost-effective plan to maintain or achieve a pre-defined level of service.
- A cost benefit plan which considers consumer views and establishes the economic justification for the planned level of service.

3.67 We would expect the company to develop a cost-effective plan which will maintain current levels of service in the short-term to medium-term. The company should draw on the outcome of any consumer engagement to support the level of service it intends to deliver. The company should also consider how its asset maintenance planning techniques should be developed to incorporate a full cost benefit analysis. As part of a

cost-effective plan, the company should assess the marginal cost of service improvement to inform stakeholders and consumers on the cost of improving service from the current levels of serviceability.

4. Financing Asset Maintenance

Our approach to financing asset maintenance

4.1 The approach to financing asset maintenance used in PC21 was set in our final determination for PC10. We continued this approach for PC13, and PC15. It followed the established regulatory practice in the water industry, relying on a combination of infrastructure renewals accounting and current cost depreciation, moderated by a broad equivalence test, to determine a reasonable level of revenue.

4.2 We applied the general approach in a pragmatic way. We placed greater reliance on econometric estimates of expenditure than the company's asset valuation and its estimates of current cost depreciation and infrastructure renewals charge. Our determinations included sufficient revenue to cover the company's expenditure in the price control period. Our approach approximates to a cash-based approach, and this aligns well with the public expenditure regime which NI Water is subject to.

4.3 A cash-based approach means that we are providing within the allowances the amount that NI Water is spending at that moment in time. The alternative would be to provide less or more within the allowances, based on our assessment of the requirement for PC28. This cash-based approach is distinctly different from the Cash In Cash Out (CICO) option outlined in Chapter 3 (Financial Framework) of the Approach Consultation for PC28. CICO is about assembling and presenting our financial building blocks in a way which resembles the realities of how NI Water operates (e.g. not calculating cost of capital as NI Water has no private borrowing or equity).

Sustainable financing of asset maintenance

4.4 Getting the right balance between revenue and debt funding of asset investment is a key part of ensuring equity between todays and tomorrows consumers. Our approach to asset maintenance will provide a framework for resolving key issues, in particular:

- The development of a forward-looking risk-based approach to better inform the 'right' level of asset maintenance expenditure in the short to medium term.
- The review of current cost depreciation, including the use of asset lives informed by asset maintenance assessments.

- An assessment of the medium to long-term investment required in water mains and sewers (and other infrastructure assets) to identify whether we should begin to plan for an increase in investment as groups of similar assets come to the end of their useful life.

4.5 Until this work is complete, we are minded to continue with the 'cash-based' approach to asset maintenance investment. In the meantime, we will engage with the water industry principal stakeholders on the approach to funding and consider representations on the balance of revenue and debt funding of capital works.

Annex 1 - Asset maintenance techniques

In this Annex we provide a one-page summary of the asset maintenance techniques we have considered when developing our approach for PC28 as follows:

Asset planning capability

a) A structured assessment which demonstrates that the company has the capability to make a robust assessment of future asset maintenance needs and identifies further improvements which can be made in asset maintenance, data, and processes to support long-term planning.

Top down expenditure analysis

b) The projection of historical expenditure by the company using time series as well as unit cost techniques.

c) An econometric analysis of historical expenditure by other companies to enable expenditure predictions.

d) A depreciation approach based on a modern equivalent asset valuation.

Asset maintenance outcomes

e) An assessment of historical trends in asset 'serviceability.'

f) An assessment of historical trends in condition and performance of the assets.

Asset maintenance plans

g) A specific asset maintenance plan setting out specific outputs and expenditure.

h) A forward-looking risk-based approach which takes account of how asset serviceability deteriorates over time and analyses the cost of running or replacing the asset to arrive at a cost effective or cost beneficial asset management plan.

The summary of each technique includes:

- A brief description of the technique.

- A summary of key strengths and weaknesses.
- A summary of our approach in respect of each technique.

Technique a – Asset maintenance planning capability assessment	
Description	• The company prepares a structured, critical assessment of its capability to develop asset maintenance plans. • The assessment must cover a wide range of topics including stakeholder engagement; leadership policy and strategy; management; people; processes; systems; data; analysis and reporting. • The assessment of capability is used to moderate the company's assessment of asset maintenance investment. Where the company demonstrates its capability is strong, the outcome of its asset maintenance plan has credibility. The assessment can identify areas of weaknesses in asset maintenance planning and the company should set out a plan to address these weaknesses.
Key strengths	• Allows a company and regulators to understand and challenge the company's asset maintenance planning capability and take account of this when determining a prudent level of capital maintenance. • Allows a company to assess its asset maintenance planning capability and plan to improve areas of weakness. • Allows improvements in asset maintenance planning capability to be tracked. • Provides a basis for comparative assessment of capability and the opportunity to explore and learn from other organisations using similar techniques.
Key weaknesses	• Risks creating a focus on process and presentation rather than outcome – the assessment becomes an end in itself rather than a vehicle for critically challenging current capability and supporting the effective development of capability. • The assessment is prepared for regulators only and is separate from the development of asset maintenance capability within the company.
Our approach	• We will ask NI Water to prepare and submit an asset maintenance capability assessment to support its asset maintenance investment plans for PC28. • We will not dictate which methodology the company adopts to assess its asset maintenance capability provided the methodology adopted by the company is a recognised methodology of which we approve. • We will critically challenge the company's view of asset maintenance capability to moderate proposed investment in asset maintenance for the price control and determine future investment to develop asset maintenance capability. • We may rely on the company's assessment of its asset maintenance planning capability assessment when determining the relative confidence, we can place on the various techniques the company has used to prepare its plan for asset maintenance. In view of this, this assessment should be accompanied by a report from an independent expert which sets out their views on the company's assessment and make recommendations of any more detailed work required to fully assess the company's current asset management capability and its plans to improve its asset management capability. • We will consider the development of asset maintenance planning capability through PC21 to determine the level of confidence we can take from delivery of the company's plans and the use of proven techniques to prepare PC28.

Technique b – Projection of historical expenditure	
Description	• Historical asset maintenance costs are collated in total, by service and by groups of assets to establish medium to long-term trends. • Costs are trended and compared with serviceability trends (see Technique e) to demonstrate that the level of expenditure has, or has not, been sufficient to maintain serviceability.
Key strengths	• Historical cost projection provides firm information on past expenditure which provides a baseline for future expenditure. • Comparing expenditure with serviceability trends demonstrates whether or not the historical level of expenditure has maintained serviceability. • In the absence of other information to demonstrate that the future will be different from the past, it provides an indication of the level of expenditure the company has considered adequate in the medium-term.
Key weaknesses	• It provides no information on the future expenditure unless we assume that the future is similar to the past. • It requires historical information to be collected in a standard format. This is available for NI Water but the allocation of costs prior to 2008-09 is incomplete. • It may be self-fulfilling by reflecting prior determinations rather than medium-term need. • It assumes that historical expenditure has been efficient and effective. It is possible that an efficient company would have delivered the same benefit at lower cost.
Our approach	• We expect the company to consider historical expenditure in its assessment. The company should be able to demonstrate why the future is different from the past. • We will ask the company to submit historical cost information, much of which will be drawn from Table 32 of the AIR which includes a breakdown of expenditure by sub-service area and selected asset type. • We will use projections of historical expenditure trends to provide a baseline for future investment, considering both average and time series projections. • We will continue to collect structured asset maintenance expenditure data through PC28 to build medium-term trends.

Technique c – Econometric analysis of historical expenditure by other companies	
Description	• Historical expenditure by similar companies is analysed against appropriate explanatory factors to develop comparative expenditure models. Econometric models may be developed for total expenditure, by service and by groups of asset groups. • The econometric model(s) are applied to estimate an appropriate level of asset maintenance. • Adjustments can be made for special factors relevant to the company including commitments to deliver specific outputs. If necessary, the econometric estimate is adjusted to reflect the capex efficiency position of the company.
Key strengths	• Econometric modelling provides an independent assessment or validation of the company's proposed expenditure against other similar companies. • It combines a unit cost and scope challenge in a single benchmark. • Where we draw on comparative data from England and Wales, the comparative expenditure data takes account of a more advanced investment cycle, embedding the potential increase in asset maintenance from a recent increase in non-infrastructure investment and the use of shorter life assets.
Key weaknesses	• Econometric analysis is based on historical data which might not reflect changes driven by historical waves of investment or changes in the types of asset created at different times. • We use data collected by Ofwat from water and sewerage service providers in England and Wales in our analysis. Changes in the approach to regulation means that consistency of data in the analysis will be an important consideration. • The analysis is based on data from companies whose historical expenditure might have been constrained by its price control determinations and not reveal a true cost of asset maintenance.
Our approach	• We will ask NI Water to submit the data necessary to refresh the econometric analysis previously carried out. • We will consider new, alternative econometric models where these offer robust predictions for use at PC28. • We will consider whether an average or the upper quartile performing company's expenditure level is appropriate for PC28 • We will continue to adjust the output from the econometric models for regional price differentials, special factors, and frontier shift. • We will account for local circumstances such as PPP plant alongside commitments to deliver specific outputs.

Technique d – Depreciation approach based on modern equivalent asset valuation	
Description	• An asset inventory is prepared to establish the quantity, size, age, life-span and residual life of the company's assets. • The value of the assets is estimated on a 'modern equivalent asset' basis to reflect the cost of the 'modern equivalent' asset which would be used to continue to provide the service. The time of replacement and cost of replacement is estimated and the profile of replacement costs provides a short-, medium- and long-term estimate of asset maintenance expenditure.
Key strengths	• A depreciation approach based on modern equivalent asset valuation can provide a robust medium-term to long-term assessment of asset maintenance investment without recourse to detailed assessment of asset observations. • The source data is the same data used to calculate the current cost depreciation and this aligns medium-term asset maintenance investment with the current cost depreciation and company revenue. This can contribute to stable funding and customer charges in the medium-term. • It allows for changes in the level of historical investment to be identified and reflected in medium-term funding for asset maintenance investment.
Key weaknesses	• It requires an assessment to be made on residual life. These are often based on industry 'norms' for which there is little or no supporting evidence. • It is unreliable for long life assets (such as sewers and water-mains) for which there is little reliable data on asset life. • The analysis assumes that an asset is replaced in its entirety at the end of its assumed life. It does not take account of partial replacement or other interventions that might extend the life of the asset. • It requires good quality asset inventory and cost data at sufficient granularity to prepare a robust replacement plan. In practice the granularity of the data can be poor, relying heavily on a limited number of low quality cost functions.
Our approach	• We will ask the company to prepare an asset inventory for PC28 to inform an understanding of long-term trends in asset maintenance. • We will ask the company to assess gaps in its asset inventory and cost data and to set out proposals to close any gaps in the data necessary to inform asset maintenance planning. • If the company offers a MEAV assessment to support asset maintenance investment projections in PC28, we will assess the reliability of the underlying asset data, costing systems and residual life assessment and decide whether the information is of sufficient quality to be incorporated in our assessment. • We will consult stakeholders on the need for an updated asset valuation before asking for this to be produced. **Following initial consideration of MEAV for PC21, it was later discounted due to its complexity in relation to NI Water's level of maturity and the considerable burden involved. Whilst the option of undertaking a MEAV still exits we do not expect NI Water to propose submitting a MEAV for PC28 for similar reasons.**

Technique e – Assessment of historical serviceability trends	
Description	• 'Serviceability' is a measure of the capability of an asset to provide a service. In practice it is measured by trending a series of defined asset performance indicators (such as the frequency of pipe burst) and service indicators (such as the frequency of interruption to supply). • Asset performance and service indicators are defined and historical data collected to establish serviceability trends. Serviceability trends are assessed as either stable, improving, deteriorating or marginal. • The trend in serviceability is compared to historical levels of expenditure to assess whether this has been sufficient.
Key strengths	• It focuses attention on investment to maintain serviceability to consumers rather than the maintenance of the condition or performance of the asset base. • It uses datasets which are recognised by the principal stakeholders to assess the outcome of asset maintenance investment. • It provides a framework for monitoring the sufficiency of asset maintenance investment in PC28. • Company specific serviceability measures can be used, allowing individual companies to select measures relevant to its asset maintenance processes.
Key weaknesses	• The assessment is backward-looking. • Short-term targeted interventions to maintain serviceability might mask the need for investment to maintain serviceability in the long-term. • The methodology used to assess trends (particularly in the short-term) requires a degree of judgement as well as analysis. • Higher than necessary levels of investment might have limited impact on serviceability measures in the short-term but suggest that the high level of asset maintenance investment continues to be necessary. • A medium to long period of reliable records is required to establish robust trends. • If a limited period of records exist, exceptional events and the most recent data point can have a significant impact on the perception of trends.
Our approach	• We will continue to use serviceability reporting and compare historical investment and serviceability trends to show whether past investment has been adequate. • We will ask the company to propose any additional parameters it believes useful for the assessment of serviceability in the longer term. • We will publish our assessment of serviceability trends and consider the implications in our draft determination. • We will use updated information from AIR27 in our final determination for PC28 including revising tramlines where appropriate.

Technique f – Assessment of asset condition and performance	
Description	• Defined condition and performance criteria are established for different types of assets. • A detailed, or statistical representative sample of assets are surveyed to establish condition and performance grades. • The survey is repeated at intervals to determine trends in condition and performance grades for the assets over time. • The trend in condition and performance grade is compared to historical levels of investment to assess whether investment has been sufficient.
Key strengths	• Changes in condition and performance grades can provide an indication of overall asset deterioration which might result in a future deterioration in serviceability.
Key weaknesses	• Condition and performance grading requires wide ranging and expensive surveys of the assets. • It suggests a commitment to investment is necessary to maintain condition and performance of assets which remain serviceable. • Condition and performance criteria are often defined by regulators and may not necessarily be useful to a company when developing its asset maintenance plan. • The assessment for key assets requires judgement which is not necessarily repeatable. Evidence from water service providers in England and Wales shows that changes in condition and performance grading over time is often attributed changes in staff and methodology rather than a change in the asset base. • There is little relationship between condition or performance grade and residual life, although this is sometimes inferred in asset maintenance analysis. • The condition and performance grades are aggregate measures which mask or lose the discrete asset observations required for effective asset maintenance.
Our approach	• We will not require the company to carry out a defined condition or performance grading assessment. Instead, we will rely on serviceability as our primary asset measure and expect the company to use targeted asset observations to develop an asset maintenance plan. • We will consider any asset health assessment provided by the company as part of its asset maintenance plan. We would expect the company to demonstrate how this has been used to assess the residual life of the assets. We would expect the company to demonstrate that any asset health assessment is used and useful in its current asset maintenance assessments and can be applied consistently in future asset maintenance assessments.

Technique g – Specific asset maintenance plans	
Description	• The company makes a specific assessment of asset maintenance need, taking account of current issues and using expert judgement to determine future asset maintenance needs.
Key strengths	• The plan identifies specific asset maintenance outputs.
Key weaknesses	• While current issues can be identified, the approach does not offer a robust assessment of future asset maintenance needs. • The use of expert judgement to identify residual asset lives and time of replacement often lacks robust evidence. • The technique tends to be used to justify additional expenditure on specific items over and above historical levels of asset maintenance investment. It might not assess whether the specific activities identified can be addressed by prioritisation within existing levels of investment.
Our approach	• We will review specific asset maintenance plans prepare by the company. • We would expect the company to provide information to support expert judgement on replacement times and demonstrate that the specific activities identified cannot be accommodated by prioritising within existing expenditure levels. • Where supporting evidence is not available, we will take a prudent but conservative approach to any proposed increase in funding.

Technique h – A forward-looking risk-based assessment	
Description	• A detailed assessment of current and future asset performance is made, leading to an economic decision on asset replacement which takes account of: ♦ Asset failure rates and the rate of deterioration. ♦ On-going cost of repairs. ♦ Operating consequential cost of service failure. ♦ Cost escalation with age (e.g. reducing energy efficiency). ♦ Probability of service failure following asset failure. ♦ Whether consumers support any additional costs of avoiding service failure. ♦ The cost of a wide range of capital or operational interventions to maintain asset performance. • The assessment can be based on a cost-effective plan to maintain a defined level of service or a cost benefit plan to provide economic justification for the planned level of service. If a cost-effective plan is adopted the analysis can be used to demonstrate the marginal cost of the current level of service.
Key strengths	• A forward-looking risk-based approach provides a rational economic basis for decisions on the timing of asset investment based on service. • The analysis uses asset observations (including serviceability measures) to establish residual asset life. • The supporting analysis promotes learning and development which leads to more effective asset planning and investment.
Key weaknesses	• Sound medium-term data on asset performance deterioration and potential interventions may not be available. • May result in complex systems of analysis which mask material assumptions, are not well understood by the user and do not reflect the day-to-day investment decisions made by the company. • Interventions must be defined in sufficient granularity to develop a well targeted effective plan. • The available data may be weaker than the theoretical analysis requires, resulting in a misleading or unreliable outcome.
Our approach	• We expect the company to develop targeted forward-looking risk-based analysis to support proposals for asset maintenance investment. • We have highlighted the risk of theoretical 'black-box' models which require data which is not yet available and can generate misleading answers. We expect the company to address these weaknesses and develop targeted, transparent, economic assessments of future asset maintenance investment. • We will assess and challenge the company's analysis to ensure that there is a comprehensive robust case before committing to any increase in asset maintenance investment. • We expect the company to develop a plan to acquire the data it requires to develop future asset maintenance plans.