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ASSET HEALTH INVESTMENT CASE – GRAVITY SEWERS

1. EXECUTIVE SUMMARY

1. In our PR24 business plan, we set out our concern that there is insufficient investment in asset maintenance and replacement across the sector[1]. We also recognised that this was a complex problem and that there was a clear need to understand the issues and challenges better and consistently at a sector level through a common framework for assessing and independently verifying levels of asset health. At PR24, we put forward investment proposals focused on "no regrets" activities where we did not think we could wait for that new framework to be in place.

2. Since 2024, Ofwat has taken steps to gain greater insight about asset condition in the water sector – to identify priority assets and to deliver a robust asset condition and workload dataset for these priority assets. Ofwat has discussed the findings and solutions with the sector and has proposed an in-period adjustment process to reflect the need for greater investment in the AMP8 period. This document contains our evidence for that process.

3. We acknowledge that this complex problem has not yet been solved, and that doing so also requires some of the changes recommended in the Independent Water Commission report on asset health (such as asset health standards and forward-looking metrics). We welcome the roadmap process as an important first step and we understand why this is limited to the priority asset groups in 2026. However, we also welcome the commitment from Ofwat to consult on the inclusion of wider asset classes and how these might be funded.

4. For the 2026 process, we have put forward all investments that meet two criteria:

   - Investments that were already identified as priorities in our PR24 business plan; and
   - Investments that are limited to those priority assets in Ofwat's roadmap process (and therefore are eligible for the 2026 process).

5. In addition to this, our programme of gravity sewers has historically been much higher than other companies in the sector (at an average 0.19% since 2012, compared to a sector average of 0.07%). This has brought benefits for reducing pollution incidents, sewer flooding, and infiltration. We consider that there is a need to invest at this level – and higher – in future, both to deliver benefits to the environment and customers in reducing pollutions and sewer flooding risks, but also to prevent further deterioration in condition. This is (mostly) not funded within base models at PR24.

6. We agree with Ofwat's concerns that there is not yet a well-developed metric to determine what the right forward-looking replacement rate should be, but we can show clear benefits from our historical level of investment, and this should continue. We also support Ofwat's proposals for increased inspections of sewers during AMP8, and include our plan and costs separately in "NES – Asset Health Investment Case – Gravity Sewer Inspections".

[1] A3-21 Asset health investment – enhancement case (NES35)

7. This means that we are proposing four programmes of work:

- A £95.5m programme for replacing **service reservoirs** and refurbishing **water towers** (as set out in our DD24 representations in NES35A);
- An £84.2m programme for replacing and refurbishing **specific civil assets at wastewater treatment works** (as set out in our PR24 business plan in NES35);
- A £53.9m programme for replacing and refurbishing **boreholes**; and
- A £146.3m programme for rehabilitating and replacing **gravity sewers** (new in this case).

8. In this document, we set out the business case for this expenditure for gravity sewers, including: why this is needed; how we have identified the right options; how we know our costs are robust and efficient; how customers will be protected; and how this will be delivered.

2. NEED FOR STEP CHANGE IN INVESTMENT

9. In this section, we demonstrate the need for a step change in investment in the rehabilitation of gravity sewers. During Ofwat's prioritisation exercise on the Enhancing Asset Health Roadmap, gravity sewers were identified as a priority asset by seven out of eleven water and wastewater companies (Northumbrian Water, Dŵr Cymru, Severn Trent Water, Hafren Dyfrdwy, Southern Water, Anglian Water and South West Water)[2]. The reasons that companies proposed these as priority assets demonstrate that there has been a history of low renewal rates and the assets are exceeding their remaining useful life, this is entirely consistent with the rationale Ofwat has put forward for additional investment in water mains renewal during PR24. This unsustainably low rate of investment, combined with:

- The fact that these assets are highly critical,
- Failure of the assets can directly impact on service to customers and/or the environment, and
- While climate change and population growth place additional pressures on the network, the need for a step change in investment is driven solely by the deteriorating health, condition and under investment of existing network.

10. In recent environmental performance reports, the Environment Agency has identified that there has been a significant lack of investment over long periods and an increase in serious pollution incidents[3]. In 2024 alone there was a 60% increase in serious pollution incidents across the sector. They highlight "long-standing issues with underinvestment" as one of the key factors that contributed to that increase. In contrast, Northumbrian Water recorded no such incidents during the same period due to a sustained, preventative action plan implemented in 2016. The implementation of this plan was to address the root causes of pollution across our network. Since 2016,

[2] https://www.ofwat.gov.uk/wp-content/uploads/2025/06/Workshop-slides-from-3-June-2025-2.pdf
[3] https://www.gov.uk/government/publications/water-and-sewerage-companies-in-england-environmental-performance-report-2024/water-and-sewerage-companies-in-england-environmental-performance-report-for-2024

we progressed from reactive incident response to proactive, anticipatory control through extensive real-time monitoring, high levels of self-reporting, and the deployment of Smart Sewer technology and predictive analytics, enabling emerging risks such as blockages, power failures or storm-related overloads to be identified and mitigated before escalation. This was reinforced by targeted sewer maintenance, enhanced power resilience at pumping stations, and the use of stormwater storage solutions to manage peak flows. These operational measures are embedded within robust governance arrangements, including systematic root-cause analysis and long-term drainage and wastewater planning, ensuring investment is prioritised where it delivers the greatest environmental benefit. Collectively, this integrated approach improved system resilience and intervention timeliness, preventing incidents from developing into serious pollution events during 2024.

11. In Section 2.1, we describe our historical investment – which is much higher than other wastewater companies. We explain the improvement we have seen for pollution incidents and sewer flooding (among other benefits) as a result, and how we use monitoring to target both performance failures and assess condition. In Section 2.2, we explore what base buys, using the asset health dataset shared by Ofwat.

12. In Section 2.3, we discuss the current risks from the sewers we intend to rehabilitate in AMP8, using the information from our sewer prioritisation tool. We also explore the risks of pitch fibre sewers and explain why these are a priority for rehabilitation. In Section 2.4, we explain the expected change in condition grade over time, and how we have used this to select the 'no regrets' length of sewer rehabilitation rate.

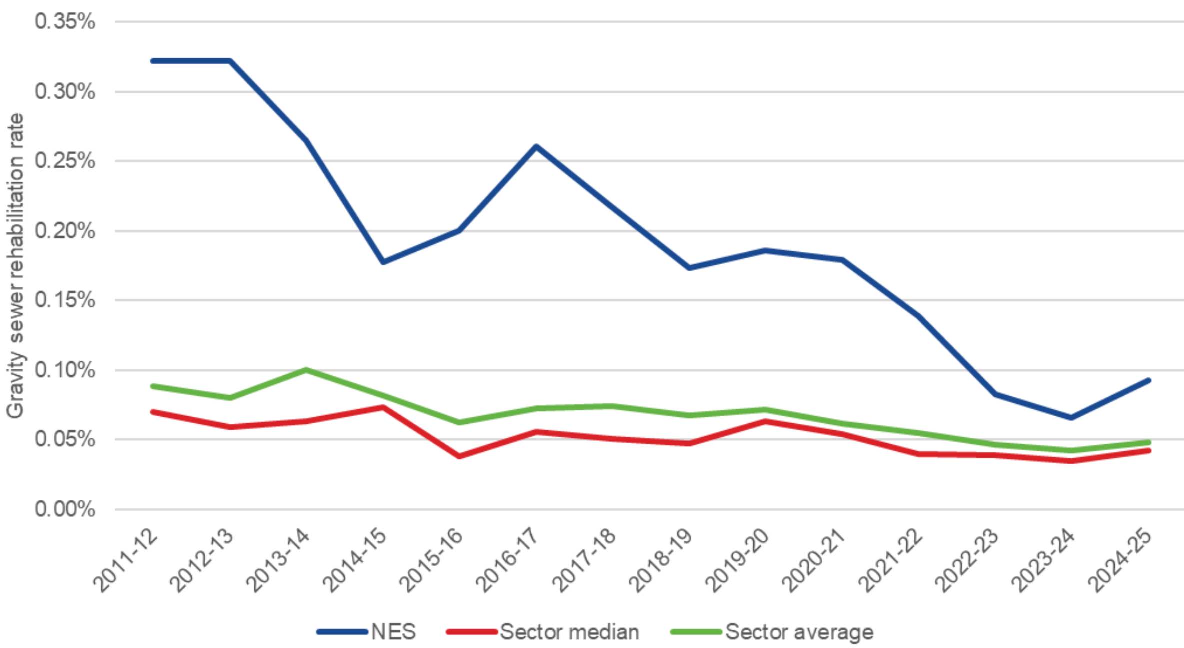
13. In Section 2.5 and 2.6, we explain how this is linked to our long-term asset class strategy and the engagement we have had with stakeholders and customers. In its final determinations on water mains, Ofwat said that the justification for stretching the sector to increase the rate at which water mains are replaced was to make the network more resilient for current and future generations.[4] The same approach should be taken with gravity sewers.

2.1. HISTORICAL INVESTMENT AND CHANGE OVER TIME

14. We have historically delivered a high level of gravity sewer rehabilitations. Between 2012 and 2025 (the length of the asset health dataset) we delivered 0.19% of our network, compared to 0.07% for the sector as a whole. Figure 1 shows our rehabilitation rate has been consistently above the sector.

[4] UK-Government-priorities-and-our-2024-price-review-final-determinations.pdf

FIGURE 1 - GRAVITY SEWER REHABILITATION RATE OVER TIME



Source: NWL analysis of workload and expenditure dataset.

15. This is because we have historically considered this important to maintain service levels – focusing on reducing blockages, collapses, and pollution incidents. We have targeted specific issues such as tree roots.

16. In AMP7, this reduced to 0.11% (compared to 0.05% for the sector as a whole). We observed a similar pattern for water mains replacement at PR24, which we attributed to growing pressures on capital maintenance budgets creating a "squeeze" in AMP8 as well as additional investment to meet PCL targets. In its PD, the CMA concluded that the low mains renewal rate across the industry in AMP7 was driven by temporary factors; but the new evidence from across all asset classes (which was not available to the CMA at the time) suggests that that there is a longer-term squeeze over time.

17. However, there is a simpler explanation for at least part of this decrease in AMP7 – the methodology for sewer rehabilitation changed, so that rather than reporting the "length between manholes" for sewer rehabilitations (even if only a short length was rehabilitated), all companies now reported the length of rehabilitation directly. This reduced the length of sewer rehabilitated under this measure. It is not possible to retrospectively calculate how much impact this had, but it is clear that at least some companies (including Northumbrian Water) switched methodologies when this definition was introduced from 2020/21.

18. We created a "ready reckoner" to estimate the impact of this methodology change, based on a sample of rehabilitated sewers. The rehabilitated length was an average of 70.3% of the total sewer length. This varies between sewers replaced with different drivers – for example, only 60% of the total length of sewers were

rehabilitated due to flooding; but this was 85.3% for those where the driver was pollution incidents. We have used this "ready reckoner" for our own estimates (see 2.4) but this could be different for other companies.

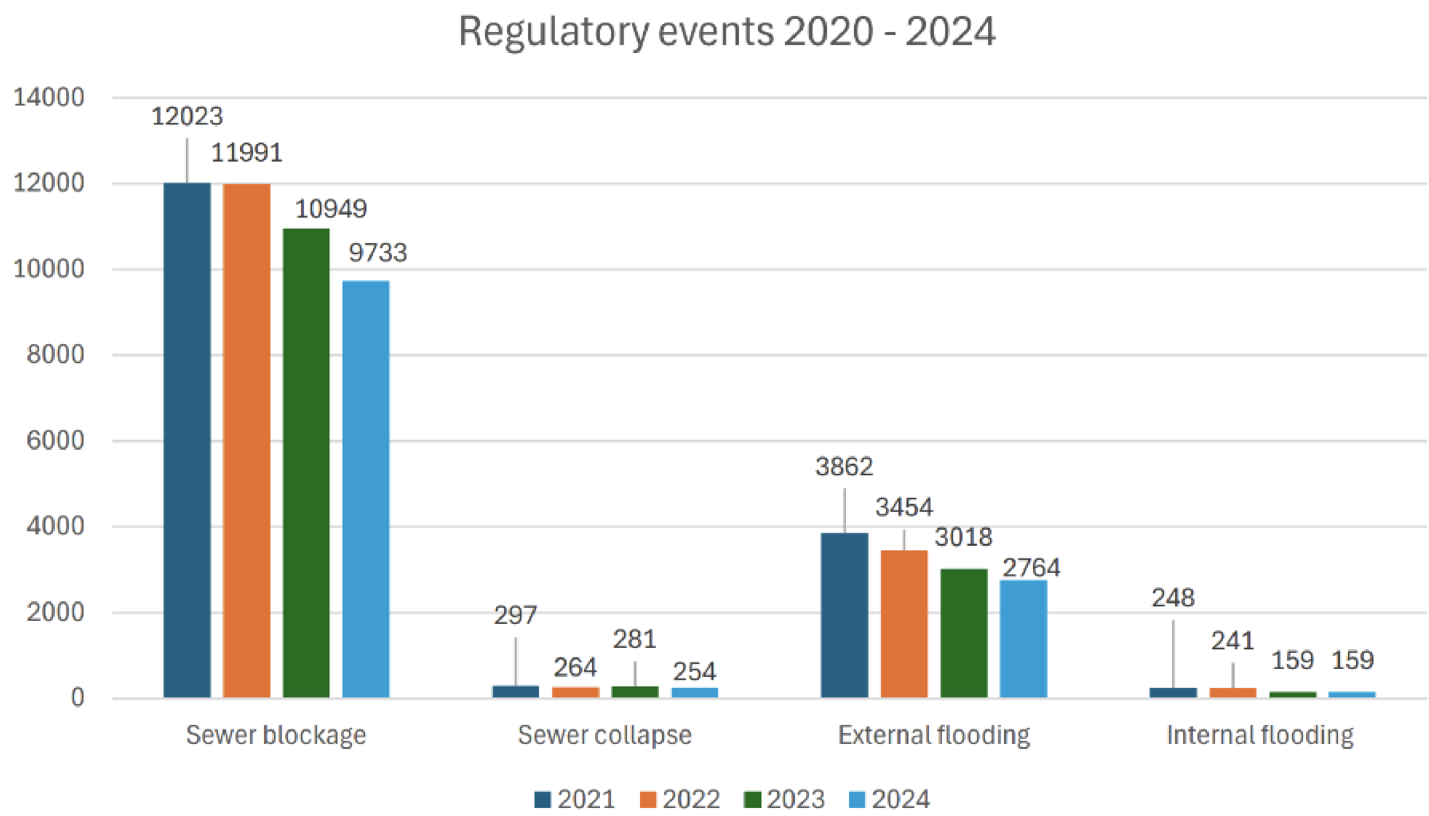
2.1.1. Historical investment in gravity sewers

19. Our historical investment in gravity sewers has focused on reducing blockages, collapses, and flooding of sewers (as well as pollution incidents). We use our incident data and operational model tools to identify critical areas of the sewerage system or critical assets, and integrate these into planned maintenance programmes with the aim to reduce numbers of performance impacting events. We use our knowledge of failure mechanisms to improve performance through proactive maintenance – particularly CCTV, cleaning, and root cutting (especially in sewers near watercourses). We have reduced flooding risk by increasing numbers of sewer level monitoring locations. Our award winning customer awareness programme (including the "Bin the Wipe" campaign), has helped to reduce blockage risks.

20. This has been successful at increasing performance in recent years, as Figure 2 shows. In 2024-25, we exceeded our performance targets on each of these measures by some margin, including beating our internal sewer flooding target by 23% and being rated a "top performer" in Ofwat's annual performance report[5].

[5] See: PowerPoint Presentation p.9 and p.30

FIGURE 2 - REGULATORY EVENTS, 2020-2024



21. Our asset maintenance is a risk-based strategy which aims to address issues before they impact customers and the environment. This comprises two approaches and delivery vehicles:

- **Planned maintenance** (PM) – for assets with critical impact risk, we aim to intervene at the right time. This is largely delivered by third party contractors.
- **Reactive maintenance** (RM) – responding to reports of operational problems, e.g. sewer blockage resulting in flooding. This is largely delivered by in-house operational staff.

22. This approach means that: assets at greater risk receive more frequent inspection/maintenance; we can more easily protect critical assets; and we can maintain and improve on our performance but the overall levels of activity can still be constrained by the funding allowances we have.

23. Our risk-based approach to allocating planning maintenance is enabled by data-led decision-making, incorporating observational data from inspections; outputs from a range of decision support tools; and collaborative planning sessions to predict potential issues and enable timely interventions before significant problems occur. We use monitoring tools to reduce the frequency of maintenance activities and enable intervention when the risk breaches a predetermined threshold, as well as exploring more mass data acquisition methods to drive more targeted planned

maintenance (for example, using planned CCTV and pipe bridge inspection programmes to closely monitor risk over time). One of the key tools in this approach is our Hotspots Model, which provides information into known areas of increased flooding due to blockage risk. This allows us to define programme for appropriate interventions to reduce risk.

24. In 2024/25, this resulted in improvements to 270km of sewers (not all rehabilitation), with a substantial investment of £6.5m more than our tactical plan. We review the performance of our sewer improvements annually, to determine the extent of investment that is needed above our base target level.

25. Our commitment to improvements in these areas can also be seen in our capital maintenance spend on gravity sewers. The expenditure and workload dataset shows that we spent an average of £33.7m per year on capital maintenance in this asset class from 2011-12 to 2024-25, compared to an estimated implicit allowance in AMP8 of £7.5m per year.

26. Although we have rehabilitated significantly more gravity sewers in recent years than some other water companies, we will show that this is not sufficient to meet either the rate of asset health deterioration or to prevent performance issues. We understand that Ofwat might consider that we have a lower need to rehabiliate gravity sewers than other companies because of this historical investment, but it is still clear that this investment needs to increase further. We note that we have not been funded more than other companies in base to make these investments, and we should not be penalised for investing more historically.

2.1.2. Monitoring and identifying asset condition investments

27. We increasingly use network monitoring to alert our operations teams to increasing risk of performance failure. These devices are installed in sewer manholes and defined as either Customer Sewer Alarms (CSA) or Sewer Level Monitors (SLM) depending on the function of the monitor and risk impact at the location.

- **Customer service alarms** – we have used a trial programme with 20 CSAs on key and vulnerable manholes to target reductions in “flooding other causes” incidents. These monitors track sewer flow levels and alert the team where there is a risk of sewer flooding, allowing us to investigate and resolve operational issues before flooding occurs. This approach has helped us to reduce repeat sewer flooding incidents, which directly impact on customers and are a key area of focus for us (we had a bespoke PC in AMP7, and have committed to continue reporting on this in AMP8). We plan to expand this programme during AMP8.
- **Sewer level monitors** – these are installed at high-risk storm overflow locations and some flooding hotspots to provide early warning of issues and to allow attendances of crews and support in managing incidents. We can also analyse this further ahead of potential severe weather events. Under this approach, we carry out predictive analysis to enable targeted proactive measures to reduce flood risk.

28. We are using other technologies, such as cutting-edge below-ground drone technology, to revolutionise the inspection of our wastewater infrastructure. This allows us to collect comprehensive data without requiring human entry into confined spaces.

29. All of this information supports our operational interventions – but also our targeting of asset condition interventions. We analyse data from incidents and planned condition inspections/maintenance, performance monitoring, and risk assessments through a series of modelling tools. These assess both general and specific asset condition performance categories and generate maintenance and capex interventions to address asset needs. We can use outputs from one tool as inputs to the next – and this cyclical relationship between the models helps to generate asset intelligence and risk awareness.

FIGURE 3 - OUR MODELLING TOOLS

Modelling Tool	Asset Group	Purpose
Enterprise Decision Analytics (EDA):sewer deterioration and performance model	Outfall, Rising Main, Sewer, SO, WW Network Storage	Models and forecasts long term deterioration and performance to identify long term investment needs and best management strategy
Vulnerable Manhole Model	Sewer	Identifies locations of manholes with highest risk from farming activities to prioritise inspection programmes
ALFA Strategic Sewers Crossings	Sewer, Pipe Bridge, Syphon	Derives asset deterioration over time for assets with limited failure information and informs maintenance programme/other prioritisation models
Rolling Ball consequence model	Sewer	Predicts flow paths of water from flooding manholes based on topographical information and informs other risk models
Sewer Rehab Prioritise Model	Sewer	Prioritises Sewer Rehab, Flooding Other Cause (FOC) and CCTV grade 5 jobs to determine intervention criticality for sewer rehabilitation programme
Updated Blockage Hotspots Model + Blockage Hotspot Model	Sewer, Rising Main, WW Network Storage	Identifies risk areas based on previous history of known blockages and defines locations for proactive sewer inspection and cleaning
Sewer Infiltration Risk tool	Sewer	Identifies further investigations for catchments at risk of infiltration and when used with other models assesses overall catchment risk
Fat, Oil and Grease (FOG) and Wipes Risk Map Models	Sewer	Identifies sewers at risk of FOG build up to prioritise proactive sewer inspection and cleaning and informs targeted corporate campaigns
CCTV Prioritisation Model	Rising Main, Sewer, SO, WW Network Storage	Prioritises CCTV surveys of both strategic and nonstrategic sewers to enable efficient sewer rehabilitation or planned maintenance delivery
Sewers Near Watercourses model	Sewer, Rising Main, WW Network Storage	Prioritises pollution risk from sewers in proximity to a watercourse to enable efficient programming of sewer inspection and cleaning.
High Risk Collectors	Sewer, Interceptor, Rising Main, WW Network Storage	Predicts the probability of sewer Internal or Flooding Other Cause (FOC) incidents, outputs to support various pipe maintenance activities
H2S Risk	Sewer, Rising Main, WW Network Storage	Identifies sewers at highest risk of H2S corrosion to feed into proactive CCTV programme
Roots Risk Map	Outfall, Rising Main, Sewer, SO, WW Network Storage	Identifies sewers at highest risk of root ingress with output used to target areas for maintenance

2.1.3. Modelling asset condition

30. One indicator of asset health of gravity-fed sewers can be defined by CCTV inspections and the standard British standard coding system, namely BS EN 13508-2:2003+A1:2011. Our **sewer condition grade model** focuses on the structural grade produced by such inspections.

31. We use several models to enable us to produce a snapshot of structural condition of the wastewater network - this is necessary due to multiple types of data incompleteness. We do not have inspections on all sewers within a similar time frame as this would be infeasible on a network of this size.

32. Historically, we used inspections informatively and so focused on high-risk assets that may be high-risk due to repeated failure or high impact of failure. This method of data collection leads to a pessimistic sampling bias (compared to a random sample, as now proposed by Ofwat).

33. To advance existing inspections we use a statistical model that leverages non homogenous Markov Chains, as proposed in Le Gat (2008)[6]. This methodology splits our assets into groups by material and then learns deterioration rates based on diameter and system zone.

34. Our model is trained on over 300,000 CCTV inspections ranging between 1985 and 2025 which allows deterioration rates to be estimated from data spanning a substantial portion of asset life for existing gravity-sewers.

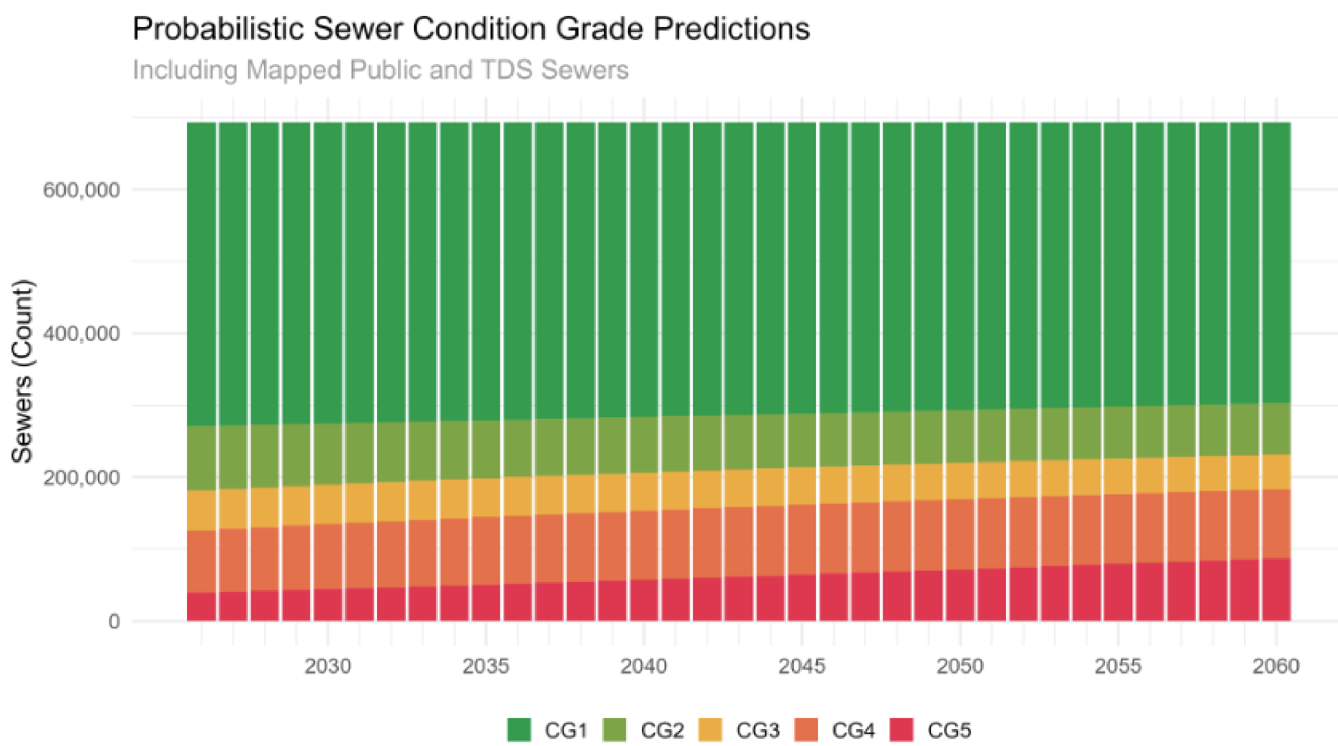
35. For the second component of this model (estimating missing inspections), we use machine learning to understand trends in sewers that have similar characteristics (Age, Material, Diameter, Node depth (maximum depth and gradient)) or similar network role and location (Property density, Network usage (combined, storm or foul), System zone, Proportion of overlap with road, Bespoke soil feature (represents ground movement relative to soil type)).

36. We can produce condition grade probabilistic predictions at a sewer level for current day and at a strategic horizon. The following visualisations (Figure 4 and Figure 5) show how these outputs can be used for prioritisation at an asset level and for whole-life asset planning.

37. The model performance was adequately verified using cross-validation where the predictions of the condition of an unseen dataset were compared with their actual observed condition.

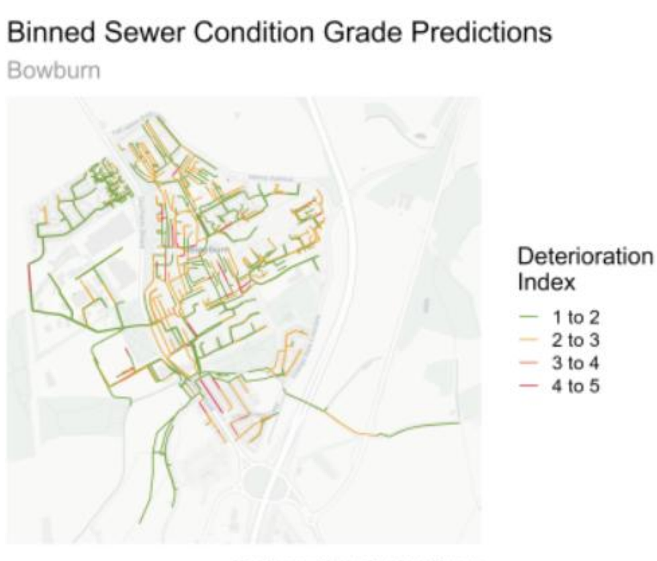
[6] https://doi.org/10.1080/15730620801939398

FIGURE 4 - ILLUSTRATIVE OUTPUT FROM SEWER CONDITION GRADE MODELLING



38. The final predictions are probabilistic, providing a probability for each condition grade, CG1 to CG5, where CG5 are the most deteriorated sewers.

FIGURE 5 - EXAMPLE SPATIAL VIEW



2.2. WHAT BASE BUYS

2.2.1. Expected level of investment during 2025-30

39. Our business plan for PR24 indicated that we would seek to rehabilitate 40km per year – this is based on the five-year historical average replacement rate (from 2019-20 to 2023-24). This is not possible from the base allowances set at PR24, which reduced our base expenditure from £3.90bn in our business plan to £3.61bn at FD24 (before frontier shift and RPEs)[7]. In March 2026, the CMA reduced base modelled allowances by a further £71m[8]. Our current plan is to deliver just under 26km per year from base expenditure. This is a higher percentage reduction for gravity sewers than the reduction in base expenditure, because there are other programmes in base that cannot be reduced (for example, where these would not allow us to meet statutory duties, or where these would create unacceptable risks to service or safety).

40. While this is a reduction from the levels we had originally intended, it is much higher than the sector average – over the last 5 years the (mean) average rate of sewer rehabilitation across the sector is 0.05% per year which would be equivalent to 15km per year for Northumbrian Water[9]. So, we already plan to rehabilitate much more sewers than the sector average. We see this as an important investment for performance, as well as asset health.

41. We note that in our proposed PCD (section 5) we intend to include *all* gravity sewer rehabilitations, including those delivered from base expenditure.

2.2.2. Estimating what base buys

42. We can estimate "what base buys" based on the sector wide asset health dataset and using the similar method that Ofwat used at PR24 for water mains replacements. This used a historical average for "percentage of mains replaced" and assumed that this could be delivered from base expenditure in AMP8 by all companies.

43. The sector wide dataset shows that the (mean) average for the sector over 2021-2025 was **0.051%** and the median was **0.037%** of sewers rehabilitated (this was 0.068% and 0.047% respectively for the 2012-2025 period, but as discussed in Section 2.1 this difference seems to be explained by a change in methodology in 2021).

44. In our other asset health cases, we have explored a range of methods for "what base buys", particularly focusing on the two approaches in Ofwat's asset health guidance. This includes both removing historical costs using PR24 econometric benchmarking models, and adjusting historical capital maintenance expenditure for AMP8 allowances. For gravity sewers, we think that the most appropriate metric of what base buys is the percentage of total sewer length rehabilitated rather than a percentage of base spend. This is comparable across companies in the same way

[7] 9.-PR24-final-determinations-Expenditure-allowances.pdf, Table 1
[8] Final decision summary and volume 1, Table 4.1
[9] We explain in 2.2.2 why we haven't used this simple mean for estimating "what base buys", but include this here for illustration. The equivalent number for "what base buys", using the average of mean and median, is 0.044% per year or 13.4km.

as mains renewal, and is a transparent and clear way to talk about rehabilitation rates. This is also broadly linked to the "length of mains" cost driver in wastewater network plus, which is likely to be the key driver for sewer rehabilitation costs.

45. Under this approach, we considered two possible choices:

- Should we use the long-term average or median, or a different time period? As we discuss in 2.1, there was a change in methodology for some companies in 2021 – including Northumbrian Water – which means that the data before 2021 is not directly comparable between companies. We concluded that for this asset class, the short-term time period is more appropriate because of this methodology change. We note that the short-term average is around 70% of the long-term average; this is similar to our estimated impact of the methodology change for Northumbrian Water (we don't know this information for other companies).
- Should we use the sector median, or the mean? We have used the average of the sector mean and sector median, consistent with Ofwat's preferred option in the asset health guidance. While the mean aligns with the approach that was used for water mains renewal, we think the median has merit also. In particular, using the mean does not address outliers well – for example, if we removed Northumbrian Water, the mean would reduce from 0.07% to 0.05% (long-term mean); or 0.05% to 0.04% (short-term mean). We therefore think the median is more representative of what the notional company has delivered as there will always be half the sector above and below that figure.

46. We think that the short-term time period is more appropriate as it ensures that comparable data is being used across the sector. However, between the mean and median, we think both have merits and therefore propose to use the average of the 2 measures – this gives a "what base buys" assumption of 0.044% per year which is not dissimilar to either measure in any event.

47. This assumption of 0.044% per year means that base expenditure funds 13.4km of rehabilitations per year (or 67km in AMP8). We have used this for our "base wastewater model funded rehabilitations" number throughout the case, including in our PCD (which includes this base funded 67km too).

48. This means that of our 26km per year that we have already planned to deliver, some of this – 12.6km per year – is included in this asset health case for funding. This is consistent with the approach Ofwat has taken to asset health cases for the cost change process, by estimating base expenditure using the historical levels of activity. It is also consistent with the approach Ofwat took for water mains replacement at PR24 (and as used by the CMA in its redeterminations too).

49. It would not be reasonable to assume that 26km per year is funded from base expenditure, simply because this is our current plan. To achieve this, we are already planning to overspend our base allowances in this area in order to continue driving high performance and to manage the long-term risk – and this is efficient (as our unit costs show in section 4). If Ofwat were to assume that 26km per year were funded from base expenditure, this would penalise

companies who had invested over and above base expenditure allowances in the past – and reward those companies who had instead deferred this expenditure. So, there should be a consistent method for determining what customers have paid for across companies – we estimate this at 0.044% per year.

50. As Ofwat did for the water mains replacement case, we would expect Ofwat to determine this level for the sector and adjust the investment case accordingly.

2.3. CURRENT RISKS

2.3.1. Condition grade

51. The UK sewer industry uses the Manual of Sewer Condition Classification 5th edition (MSCC5) and Sewer Risk Management (SRM) grading scale to classify structural and service condition on a 1 to 5 scale, where 1 is best and 5 is worst. MSCC5 defines this scale as running from "Acceptable" (Grade 1) to "Immediate attention required" (Grade 5). The guidance shows that structural failure modes include deformation, collapse, delamination, cracks, and root ingress - all of which are strongly associated with Grades 4 and 5.

Grade 4 — Poor Condition (High Risk)

52. A Grade 4 pipe has severe structural or service defects that are highly likely to lead to failure if left untreated. Typical characteristics include:

- Significant deformation, cracking, joint displacement or root intrusion.
- Reduced hydraulic capacity (slows flow, increases blockages).
- Clear evidence that deterioration is active and progressing.

Risks at Grade 4:

- Escalation to Grade 5 (full structural failure).
- Blockages and service interruptions due to loss of cross-section.
- Infiltration/exfiltration, creating pollution risks.
- Increased likelihood of collapse under external loads (traffic, soil pressure).

Grade 5 — Very Poor / Immediate Attention (Critical Risk)

53. A Grade 5 pipe contains critical, failure-level defects requiring urgent intervention. MSCC5 explicitly defines Grade 5 as "Immediate", indicating immediate action is necessary. Typical characteristics include:

- Advanced deformation, collapse, or delamination.
- Severe infiltration/exfiltration.
- Structural instability presenting imminent risk of failure.

- Major root penetration or large fractures.

Risks at Grade 5:

- **Imminent collapse**, potentially causing sewer flooding or sinkholes.
- **Frequent and severe blockages**, causing repeated customer service failures.
- **Environmental harm**, including pollution events.
- **High emergency repair costs**, significantly exceeding planned rehabilitation effort.

54. Based on our known risk profile from inspections, and aligned with our forecasting across the network, we have identified **4,158 km** of sewer that are in poor condition. This includes 2,807 km assessed as condition grade 4 and 1,351 km assessed as condition grade 5. Together, these lengths represent approximately 20% of our network.

55. However, condition-based metrics do not necessarily capture long-term system challenges. Existing resilience indicators—such as sewer collapses or repair rates tend to be short-term and backward-looking. They offer limited insight into emerging pressures including climate impacts, population growth, and wider system stresses.

56. Condition grade alone also fails to consider service consequences or asset criticality. Two sewers with identical condition grades can pose significantly different levels of risk depending on their location, function, and the potential impact of failure.

2.3.2. Highest priority sewers

57. We maintain a register of sewers that need investment in our prioritiser (see 2.1). All sewers within this model have had CCTV surveys carried out to provide these higher risk sewers with a condition grade score. The model records the historical performance of sewers, and uses the impact from these to prioritise which sewers we should invest in. We have looked at the current prioritiser with a total sewer length of 1,247.9km by examining the historical flooding, blockages and pollutions performance of these sewers for the last ten years, and historical collapses for the last 5 years, as shown in Figure 6. By the very nature of the prioritiser, we have fewer high-priority events in the latter parts of the prioritiser which impacts the rates.

FIGURE 6 - HISTORICAL PERFORMANCE, TOP PRIORITY SEWERS

Metric	Total	Rate (per year)	Unit rate (per year, per km)
Flooding (internal)	384	38.4	0.03
Flooding (curtilage)	3,138	313.8	0.25
Flooding (highway)	669	66.9	0.05
Flooding (other)	204	20.4	0.02
Blockages	4,399	439.9	0.35
Pollutions	535	53.5	0.04
Collapses (AMP7 only)	134	26.8	0.02

Source: Sewer Prioritiser, NWL

58. These “potential investment” gravity sewers in the prioritiser do not cover all performance related issues and instead present historical performance as a prioritisation mechanism rather than a forecast of improvements, if these sewers are rehabilitated, – the equivalent totals for 2024/25 were: 136 internal flooding incidents; 2,431 external sewer flooding incidents; 9,020 sewer blockages; 117 pollution incidents; 222 sewer collapses. We also note that “pollutions” in Figure 5 includes Category 4 pollution incidents too; we estimate that around 40% to 50% of the pollutions that we have traced to sewers are Category 3, and the rest are Category 4.

59. However, this shows that there are likely to be significant risks to customers and the environment from not rehabilitating these sewers. Some of these risks are already mitigated temporarily by operational activities such as cleaning, and we would expect these sewers to be rehabilitated eventually from base expenditure (though, at a rate of 13.4km per year implied by base expenditure in section 2.2, this would take until beyond 2040). As we explain in section 2.4, we expect this list to grow by 71.9km per year – this could be equivalent to an additional 14 pollution incidents and 10 internal sewer flooding incidents each year if these risks remained entirely unmitigated.

2.3.3. Pitch fibre sewers

60. In our analysis of gravity sewers, we also identified that risks can depend on the materials that sewers are made from. We do not think there are particular risks arising from clay, concrete or plastic sewers. However, there are specific risks arising from pitch fibre sewers.

61. Pitch fibre sewers are made from wood cellulose and coal tar – and sometimes contain asbestos too. These were commonly used for sewer and drainage systems between the 1940s and 1970s and are a significant high-risk issue for the water sector. These were a cheap alternative to clay pipes but have a shorter lifespan. These sewers fail either by delamination (that is, inner layers peeling and creating obstructions); deformation (losing their round shape, leading to blockages and eventual collapse); or root ingress (deteriorating and brittle pipes are easily penetrated by tree roots). According to evidence referenced by Defra[10], pitch fibre design life is estimated to be approximately 40 years. This limited lifespan is primarily due to the pipes' non-rigid behavior, the effects of long-term creep, and their susceptibility to blistering and delamination, especially when exposed to wet conditions.

62. All remaining pitch fibre drainage assets now surpass their expected design life. While short-term management strategies can be applied to reduce immediate risks, pitch fibre pipes should be regarded as assets requiring replacement.

63. Pitch fibre sewers, due to inherent material deterioration and limited asset life, have historically driven significant reactive issues such as odour, blockages, collapses and flooding within parts of Northumbrian Water’s network. These failures resulted in sustained repeat customer contacts, pressure on performance metrics, increased service

[10] Defra 2003 review of existing private sewers and drains in England and Wales, consultation paper, DEFRA and Welsh Assembly Go vernment

failures and inefficient use of operational resources. Targeted intervention has therefore been necessary to maintain regulatory compliance, protect performance outcomes and improve customer experience.

64. At Kenilworth, Great Lumley, where the street was entirely served by pitch fibre sewers, 45 incidents were recorded during 2021–2022. Following sewer re-rounding and relining works completed in 2023, incidents reduced to a single occurrence, which was linked to an un-remediated section. This represents a 97.8% reduction in incidents.

65. Similarly, at Buckland Close, Houghton le Spring, 51 pitch fibre related incidents were recorded between 2019 and 2025. Following targeted investment completed in 2025, no further incidents have been reported, delivering a 100% reduction and preventing escalation to a Stage 2 complaint.

66. These outcomes demonstrate the effectiveness of targeted investment in addressing repeat failure locations, improving network resilience, and reducing customer impact. Pitch fibre sewer deterioration is a recognised, sector-wide issue, with other water companies, including Southern Water and Welsh Water reporting comparable challenges and similarly positive outcomes following proactive intervention.

67. The shorter life of these assets and the period when they were installed means that many of these assets are approaching the end of their life. This means that the likelihood of failure is higher. In addition to this, the material can lead to repeat blockages and high-pressure jetting (a good temporary solution for other materials) can potentially damage these pipes further.

68. We have identified 46.1km of pitch fibre sewers (measured manhole-to-manhole) in our network. There are likely to be other sewers made of this material that have not yet been identified. Most of these (31.8km) are public sewers that we have identified from our GIS dataset in February 2025.

69. These sewers currently have a lower priority than those described in Section 2.3.2 – based on historical performance alone. Figure 7 illustrates the lower unit rates for benefits that we could seek in replacing these sewers.

FIGURE 7 - HISTORICAL PERFORMANCE, PITCH FIBRE SEWERS

Metric	Total	Rate (per year)	Unit rate (per year, per km)
Flooding (internal)	19	1.9	0.04
Flooding (curtilage)	190	19.0	0.41
Flooding (highway)	34	3.4	0.07
Flooding (other)	12	1.2	0.03
Blockages	353	35.3	0.77
Pollutions	-	-	-
Collapses	6	1.2	0.03

Source: Sewer Prioritiser, NWL

70. Although there seem to be fewer benefits in rehabilitating these sewers (based on historical performance), the pitch fibre material means that these assets have a shorter expected life and a higher likelihood of failure. We do not think the historical performance is a good guide to potential risk – which is much higher.

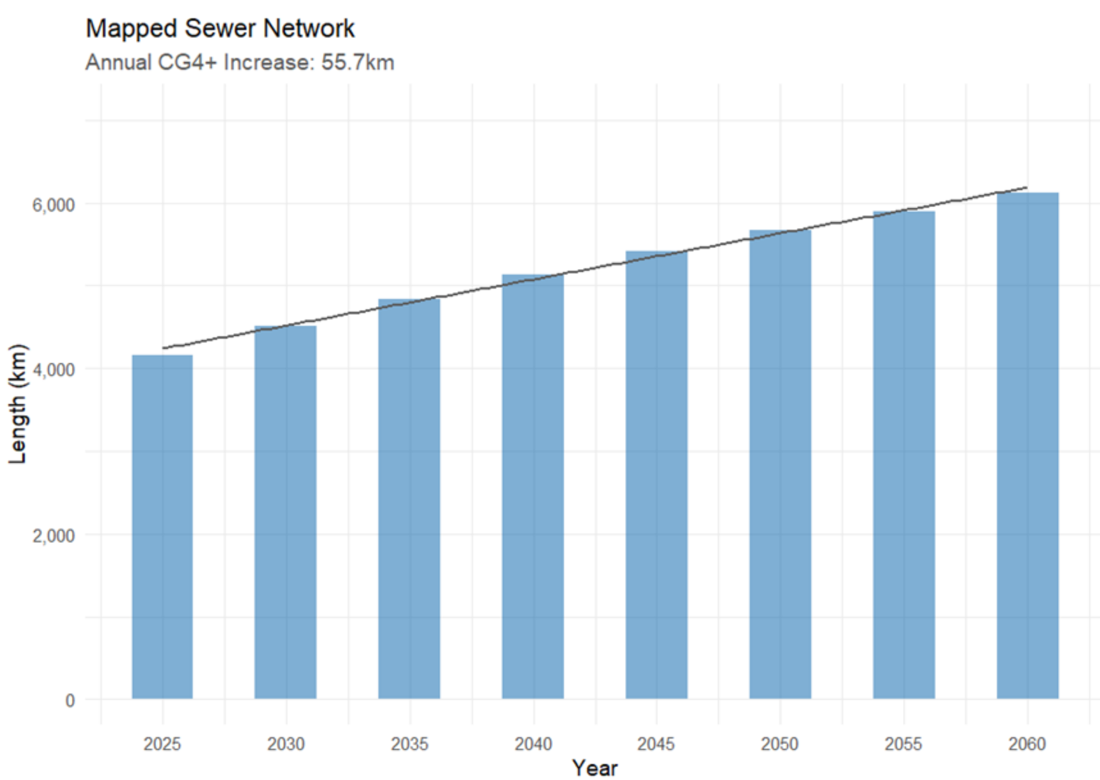
71. Unlike the highest priority sewers described in 2.3.2, for these sewers we would expect to replace the entire sewer from manhole-to-manhole (rather than rehabilitating just the relevant part of the sewer). This is because the risk here comes from the materials used, which applies to the whole length.

2.4. FORECAST OF FUTURE ASSET HEALTH AND RISKS

72. We have used our asset deterioration model to provide a forward view of risk for gravity sewers. This uses the current modelled deterioration rates to estimate a forward-looking view of the expected lengths of CG4 and CG5 sewers at the start of each AMP cycle.

73. This shows that we expect an **average annual increase of 55.7km** of sewers moving into CG4 or CG5 (see Figure 8).

FIGURE 8 - MODELLED DETERIORATION RATE FOR GRAVITY SEWERS



74. This analysis is based on our mapped assets[11] (that is, public sewers and transferred drains and sewers in our GIS database); around two-thirds of our total network. We derive structural condition grades (CG) from CCTV inspections across the sewer network. Our Sewer Condition Grade model then provides a forecast of network condition for any selected year by:

- **Projecting forward** the deterioration of assets previously inspected or repaired; and
- **Estimating condition** for sewers with no historical inspections through model-based extrapolation.

75. Under this approach, each sewer receives a probabilistic condition profile, enabling an aggregate view of expected condition across the network. This allows us to estimate how many assets would fall within each grade if the entire cohort were inspected. We carried out modelling using a combination of a machine learning method and a non-homogenous Markov Chains model, allowing mixed multi-state deterioration modelling.

76. However, this model is based on the mapped network – that is, around 61.7% of the full gravity sewer network. If we extrapolate this deterioration rate to the full network to account for unmapped sewers, we would estimate 90.3km per year.

77. Further to this, we note that our modelling uses the "manhole to manhole" length (as each length of sewer is represented as a single unit). To convert this to a "rehabilitated length", as per the post-2021 definition of sewer rehabilitation, we would multiply this by 70.3% (see section 2.1 for our ready reckoner). This gives a total of **71.9km per year** to maintain asset health in the long-term – that is, to prevent further deterioration.

78. This is equivalent to around 0.24% of the gravity sewer network (c. 71.9 km) being rehabilitated each year. This intervention rate has been explicitly sized to mitigate the forecast emergence of Condition Grade 4 and 5 sewers as predicted by our deterioration model, rather than to achieve an overall condition improvement.

79. At this intervention rate the plan is expected to stabilise the length of sewers in poor condition, offsetting the inflow of assets deteriorating into CG4 and CG5. However, this level of investment will not prevent the gradual ageing of the wider network with an estimated 24,000 km of sewers currently in CG1–CG3 that will continue to deteriorate over time, nor will it immediately resolve the existing backlog of CG4 and CG5 sewers.

80. Even if the rate integrates significant differences between hazard exposure and materials such as pitch fibre reaching their end of life, the strategy represents a containment position rather than an overall stabilisation of the deterioration of our gravity sewers.

81. Condition grade alone does not indicate risk. The programme therefore targets sewers where rehabilitation delivers the greatest benefit, taking account of consequence and service risk rather than condition alone. The proposed

[11] "Mapped assets" has a specific definition in our modelling – that is, it includes those assets in our GIS "sewer" layer, where we have more complete data. We also have some assets in our "inferred_sewer" layer in GIS where we would describe these as "mapped" because we have information about location – but not all the data required for modelling condition.

programme therefore represents a minimum, 'no regrets' investment, sufficient to stabilise CG4 and CG5 overall, while accepting that rehabilitation rates will need to increase as higher risk assets reach end of life.

2.5. SUMMARY OF LONG-TERM ASSET CLASS STRATEGY

82. We describe our approach to gravity sewer rehabilitation in section 2.1 – that is, our strategy is to focus on service improvements (such as pollutions and sewer flooding) by prioritising sewers which have previously had these issues (as well as those in the worst condition grades). At PR24, we explained that one of our key priorities for resilience was to "make sure that we have a programme of replacement assets sufficient to maintain asset health in the long-term".[12]

83. Our current rehabilitation rate is not achieving this objective. As we explain in section 2.4, our deterioration models suggest that around 0.24% (71.9km) of our gravity sewer network would need to be replaced each year in order to meet our long-term objective.

84. We do not expect that this will be the optimal long-term rehabilitation rate. We know that there are likely to be benefits in improving asset health for sewers, and we know that there are some future uncertainties such as climate change and the impact of other investments (such as storm overflows). In setting out our AMP8 plan in this case, we propose a rehabilitation rate which will have benefits in *any* climate change scenario and allows us to make a step change before we can work together to understand the optimal long-term rate in the future – including through Ofwat's proposed sample inspection across the sector, as well as potential resilience standards. Our DWMP, which uses climate change and other scenarios, will also help to identify a sustainable long-term rate in more detail.

2.6. ENGAGEMENT WITH STAKEHOLDERS AND CUSTOMERS

85. Since the Water (Special Measures) Act (2025), we are now required to produce and deliver Pollution Incident Reduction Plans (PIRPs). We had already done this on a voluntary basis for some time, with our **most recent update in July 2025**. This describes the expectations from stakeholders and customers in this area:

- Our customers consider reducing pollution incidents to be one of the most important indicators of our performance, and continued pollution reduction received the largest support of any service area through our PR24 customer engagement work.
- Our performance commitment for pollution incidents (set by Ofwat at PR24) requires an 18% improvement from current performance.
- The EA and Natural England set out environmental performance requirements in their jointly published Water Industry Strategic Environment Requirements (WISER) This includes at least a 30% reduction of all pollution

[12] **nes09.pdf**, p28

incidents by 2030 on current 2025 targets. To achieve this, Northumbrian Water (and other companies with relatively few pollution incidents) will need to further push the frontier for the sector.

- The Water Forum noted that our 30% reduction in pollution incidents would be a substantial challenge because NWL was the most efficient company and has good performance in this area. They considered if greater levels of ambition could be achieved without further driving bills up – and concluded that it could not without further investment raiding customer bills.[13]
- Our Catchment Partners and Blueprint for Water continue to challenge us to become more ambitious and stop all pollutions of our waters by addressing issues at its source.

86. Similarly, there are high expectations from customers and regulators in addressing sewer flooding:

- Ofwat and CCW say that "being flooding with sewage is one of the most distressing things that can happen to you in your home"[14] – and we strongly agree. Although we are among the best performers in the sector on responding to this issue[15], there are still improvements we can make. One action that was identified in the 2022 review was to make sure that "the cause of sewer flooding is fixed as quickly and efficiently as possible".[16]
- Our Water Forum noted that "operational teams appeared to have a good understanding of and confidence in the interventions needed and that could be delivered within base expenditure allowances [as estimated at the time of the business plan]… achieving these targets will be challenging as they require a very substantial improvement over AMP8, particularly over AMP8".[17]
- We asked customers about their long-term ambition for sewer flooding as part of our long-term delivery strategy. The majority of customers in this research wanted more ambitious targets on eradicating internal sewer flooding[18], with customers noting the "just horrible" impacts of sewer flooding as well as the realism of completely eliminating sewer flooding and the cost of replacing the old sewage network. Following this research, we set out target to reduce internal and external sewer flooding by 60% by 2050.
- The National Infrastructure Commission's report "**Reducing the risk of surface water flooding**" highlighted the importance of a national approach to tackle flooding, and the costs and challenges of eliminating sewer flooding.

87. From this evidence, it is clear that customers and stakeholders want us to take steps to further reduce pollution incidents and sewer flooding. Targeting sewer rehabilitations which could support improvements in these indicators would be consistent with these preferences. We note that for this submission, we carried out specific engagement

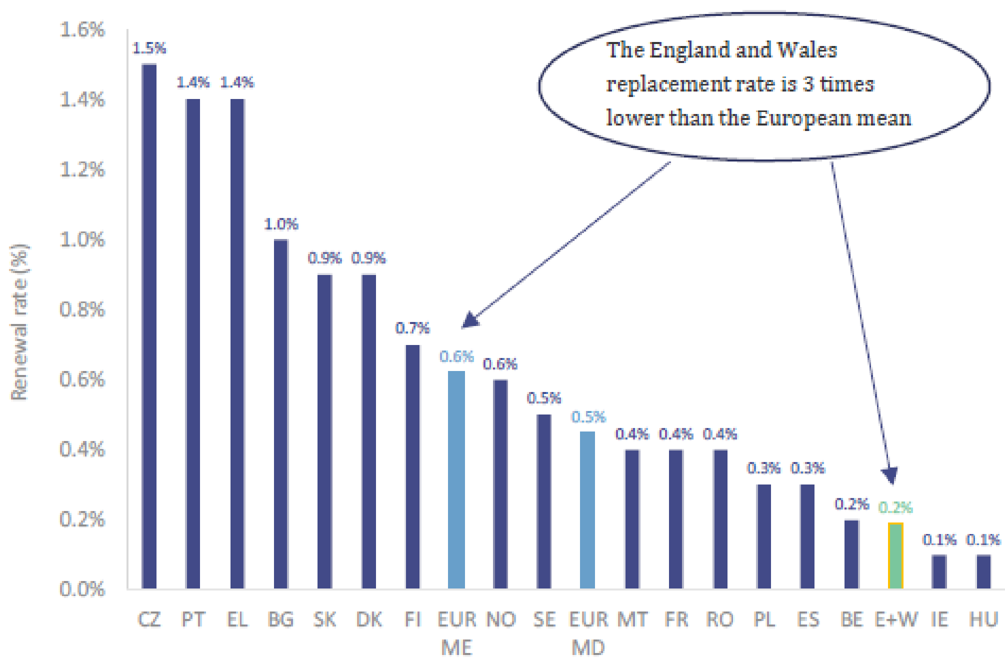
[13] nes47.pdf, p17
[14] customer-experiences-of-sewer-flooding-a-joint-report-by-ccw-and-ofwat.pdf
[15] Sewer-flooding-customer-care-review-12-Feb-2026.pdf, p52
[16] customer-experiences-of-sewer-flooding-a-joint-report-by-ccw-and-ofwat.pdf, p13
[17] nes48.pdf, p40
[18] nesltds6.pdf, p7

with customers to understand their preferences and if they supported bill rises to increase the rate of gravity sewer rehabilitation and replacement – we explain the results of this in section 3.6.

88. We asked the EA for its view and to provide a letter for support for this submission. Although the EA indicated they were content with us proposing future investment, they noted that it is not their role to endorse individual cases or comment on specifics. The Regional Flood & Coastal Committee (RFCC) has said that they will write to Ofwat separately.

89. We know that asset health has been discussed extensively through recent water sector reviews – and we do not repeat this discussion here. However, we note that the rate of replacement of wastewater rising mains (not an identical comparison, but indicative) is three times lower than the European mean (see Figure 9).

FIGURE 9 - ANALYSIS OF WASTEWATER REPLACEMENT RATES (2021)



Sources: Economic Insight analysis of the following data sources: (i) 'Europe's Water in Figures.' EurEau (2021); and (ii) 2021 Annual Performance Reports.
Notes: The renewal rate of wastewater assets for England and Wales is calculated as the 'Total length of rising mains replaced or structurally refurbished' in 2020-21 divided by the 'Total length of rising mains' at the start of the 2020-21 reporting year. European data relates to average asset renewal rate for wastewater infrastructure for periods 2017-2019 (depending on the country), while the data for England and Wales relates to 2021.

Source: Economic Insight analysis of European and England and Wales replacement rates

3. BEST OPTION FOR CUSTOMERS

90. We propose the following levels of gravity sewer rehabilitations – based on “Option C” from the sections below:

FIGURE 10 - PROPOSED REHABILITATION LENGTHS (KM)

Proposed programme (cumulative)	Unit	2025/26	2026/27	2027/28	2028/2029	2029/30
Base wastewater model funded rehabilitation	km	13.4	26.8	40.2	53.6	67
Asset health base adjustment rehabilitation	km	12.2	24.4	55.5	118.0	186.9
Pitch fibre replacements	km	-	-	6.9	25.4	46.1
Total	km	**25.6**	**51.2**	**102.6**	**197**	**300**

91. We explain our optioneering and decision making in the following sections.

92. For our PR24 enhancement cases, including NES35, we applied our full optioneering framework. This involved generating an unconstrained long list of potential interventions, filtering these options using site-specific constraints, and then applying our established cost–benefit methodology to evaluate the refined shortlist.

93. However, while this methodology is effective for discrete assets with multiple intervention pathways, it is not well-suited to gravity sewers. This is due to several inherent characteristics of the asset class:

- The need is network-wide rather than site-specific. Gravity sewer deterioration is expressed as a percentage of the network requiring intervention, based on optimising benefits or mitigating asset health risks. As there are no discrete “sites” associated with the need, traditional site-level optioneering cannot be carried out.
- Intervention options are binary and dependent on in-situ condition. For any given sewer, the feasible interventions are limited to rehabilitation or replacement. The precise requirement can only be confirmed once work begins and a further inspection is undertaken. Costs and designs cannot be pre-specified because they vary depending on the unique characteristics of each sewer and location, although all works follow established engineering standards and material specifications.

94. Given these constraints, we instead focused our optioneering on how the programme should be targeted and paced, rather than on detailed site-specific options. To develop this, we engaged extensively with subject matter experts and internal asset specialists, drawing on evidence of current and future risks (as set out in sections 2.1, 2.3, and 2.4) and considering practical deliverability.

95. Through this process, we explored a range of strategic questions, including:

- Which benefits should drive prioritisation? For example, whether selection should be based primarily on condition, service performance, or a combination of both – and what thresholds are most appropriate. We discuss this in section 3.2.
- Which specific risks warrant targeted consideration? This includes risks linked to particular materials, locations, or environmental sensitivities. We explain how we targeted pitch fibre sewers in particular in section 3.2.
- What constitutes a sustainable long-term pace of rehabilitation? We examined the rate of deterioration, historical delivery throughput, and supply chain capacity to determine the optimal programme trajectory. We provide our evidence for the rate of deterioration in 3.2.

96. This structured, risk-based approach allows us to refine the intervention strategy for gravity sewers in a way that reflects both engineering reality and the constraints of the asset class, while still providing a transparent and evidence-led justification for the scale and timing of investment.

3.1. OPTIONS DEVELOPMENT

97. We evaluated several sewer-rehabilitation rate scenarios to understand how increased investment would affect structural performance and overall network asset health. We then applied these scenarios within our sewer prioritisation tool to quantify the resulting impacts on service-level performance. The options we considered are described in Figure 11. We set a plausible range for these scenarios based on expected sewer life – which we might expect to be between 70 and 140 years (which implies a plausible range of the current 0.05% per year up to about 0.71% per year).

98. We note that these options were assessed using an assumption of 0.05% mean sector average (or 75km) implicit allowance (rather than the 67km implicit allowance we subsequently calculated in section 2.2 using a weighted approach). This does not change the outcome of the optioneering.

FIGURE 11 - DESCRIPTION OF MODELLED OPTIONS

Option	Description	Length of sewer to be rehabilitated in AMP8 from Base (km)	Additional length of sewer to be rehabilitated in AMP8 above base (km)	Total length of sewer to be rehabilitated in AMP8 (km)
A	Do nothing. A modelled scenario of undertaking no sewer rehabilitation in AMP8	0	0	0
B	Do minimum. A modelled scenario of undertaking a constant 0.05% of sewer rehabilitation i.e. assumed to be funded through in base.	75	0	75

Option	Description	Length of sewer to be rehabilitated in AMP8 from Base (km)	Additional length of sewer to be rehabilitated in AMP8 above base (km)	Total length of sewer to be rehabilitated in AMP8 (km)
C	Rehabilitation rate of 0.25% per annum from 27/28. A modelled scenario of returning CG4 and CG5 to a neutral forecasted position from 27/28-29/30 (i.e. no deterioration in the three year reopener period) and replacing high risk pitch fibre sewers	75	172	247
D	Rehabilitation rate of 0.37% from 27/28. A modelled scenario of returning CG4 and CG5 to a neutral forecasted position from 25/26-29/30 (i.e. no deterioration from a 25/26 baseline) and replacing high risk pitch fibre sewers	75	283.9	358.9
E	Rehabilitation rate of 0.56% from 27/28. and replacing high risk pitch fibre sewers	75	455.6	530.6

99. We selected these scenarios to represent a range of possible options. These range from stopping all planned and reactive sewer rehabilitation (Option A) to increasing our planned rehabilitation rate to more than 0.55% of the network per year (Option E), which would represent approximately a 5.5-fold increase in the length we currently deliver annually.

100. Option B reflects a rehabilitation rate consistent with the historic implicit allowance for sewer renewal (that is, assuming the “base funded” rate).

101. Options C and D go further, improving the long-term health of the network by reducing the proportion of assets in condition grades 4 and 5 in line with their forecast deterioration. These represent more sustainable and deliverable long-term strategies for managing asset risk. In particular, we have targeted “no deterioration” over a three-year period (as described in section 2.4) in Option C and a five-year period (that is, restoring to the 2025/26 baseline) in Option D.

102. We have then modelled each scenario to understand the associated benefits across the sewerage network, as well as the long-term impact on the asset health of our gravity sewers.

3.2. SEWER REHABILITATION OPTIONS APPRAISAL

103. We have quantified the costs and benefits of the options under consideration to demonstrate the appropriateness of the sewer rehabilitation levels proposed from 2027/2028 onwards. To support this assessment, we have evaluated the following benefits across each scenario:

- **Structural performance benefits**, including:
  - Improvements to assets in structural condition grades 4 and 5
  - Enhanced condition and asset health of Pitch Fibre sewers
- **Service performance benefits**, specifically reductions in:
  - Internal and external flooding risk
  - Pollution risk reduction
  - Sewer collapse risk reduction
  - Sewer blockage risk reduction

104. **Identifying assets with flooding and pollution risk:** Flooding and pollution risk is assessed through our Sewer Rehab Prioritiser Model. Information on all sewer rehab and FOC jobs that have been raised by the Sewerage Operations Teams in the last 10 years but have not been completed are collated into a database. Alongside this, CCTV data is analysed to pick out any sewers that are currently classified as a condition grade 5 but have had no repair undertaken.

105. Flooding risk is assessed by identifying sewers with a high condition grade that have an increased number of flooding incidents over the previous 10-year period. Pollution risk is assessed using data from a variety of sources, such as the proximity of the sewer to a watercourse, pollution history, repair history, proximity to bathing water and planned preventative maintenance history. Not all of these factors have a direct impact on prioritisation, but they are included in the model as they influence the planning process for rehabilitation.

106. **Identifying assets with blockage risk:** Blockage risk is assessed in the same way as flooding risk with a refocus on blockage events over flooding events, over the previous 10 year period.

107. **Identifying assets with collapse risk:** Collapse risk is identified through operational observation and our sewer collapse model. Identified assets are raised as potential proactive rehabilitations that will become sewer collapses in the form of reactive rehabilitations. The sewer collapse model uses AMP7 collapses and ancillary data, including sewer characteristics, sewer usage, environmental and geodemographic data, to predict the likelihood of AMP8 collapses under the definition introduced at the start of AMP7.

108. **Identifying assets with structural performance risk:** The proposed length of rehab required was defined through analysis of deterioration models (this excludes inferred transferred drains and sewer data and is based on the distance between manholes, adjustments will be made to allow for these in the subsequent paragraphs). The model advances existing data from CCTV inspections and estimates missing data and provides a predictive forward -looking view of the expected lengths of sewers that will deteriorate to condition grade 4 or 5 at the start of each AMP. Based on the current modelled deterioration rates, we anticipate that there will be an average annual increase of 55.7km sewers to condition grade 4 or above.

109. The modelled impact on service for each of the scenarios is set out in Figure 12. This shows the annual rate of incidents per 10,000km of sewers that might be expected from the historical performance of the 1,247.9km in our prioritiser, based on the last ten years of data.

FIGURE 12 – FORECASTED ANNUALISED SERVICE RISK PER MODELLED OPTION

Option	Internal flooding	External flooding	Pollution incidents	Sewer blockages	Sewer collapse
A	30.8	251.5	53.5	352.5	13.5
B	23	235.1	30.2	344.1	13.5
C	1	43	1	307.1	11.3
D	1	6	1	13.1	10.7
E	1	6	1	13.1	10.7

110. The information presented in Figure 12 shows the annualised performance risk associated with each scenario. These figures are derived from our CCTV Prioritiser Tactical Model and are based on historical incident data linked to the sewer lengths that would be targeted for rehabilitation under each option. While past performance does not directly predict future performance risk, it provides a reasonable basis for estimating the likely service improvements that could be achieved through these rehabilitation activities.

111. Our prioritiser outputs show that the benefits assigned to each sewer begin to plateau at a rehabilitation rate of around 0.25% per annum (Option C). This does not mean that undertaking rehabilitation above this rate will fail to improve service performance. Instead, it reflects that, within the three-year assessment window for this option, the known issues already identified through CCTV inspection and their associated annualised performance risk begin to reduce as we progress further down the prioritised list of assets. As additional CCTV inspections are completed, the size of our work basket will grow, allowing us to further refine targeting and improve the expected benefits identified through the CCTV Prioritiser in future years.

112. This suggests that there would be benefits gained from an increase up to Option C, with limited benefits beyond this (for now). This would likely address most future pollution incidents and flooding incidents *from these specific sewers* – we do not necessarily expect that there would be incidents here during AMP8 (these sewers have, in general, had relatively recent operational interventions or inspections).

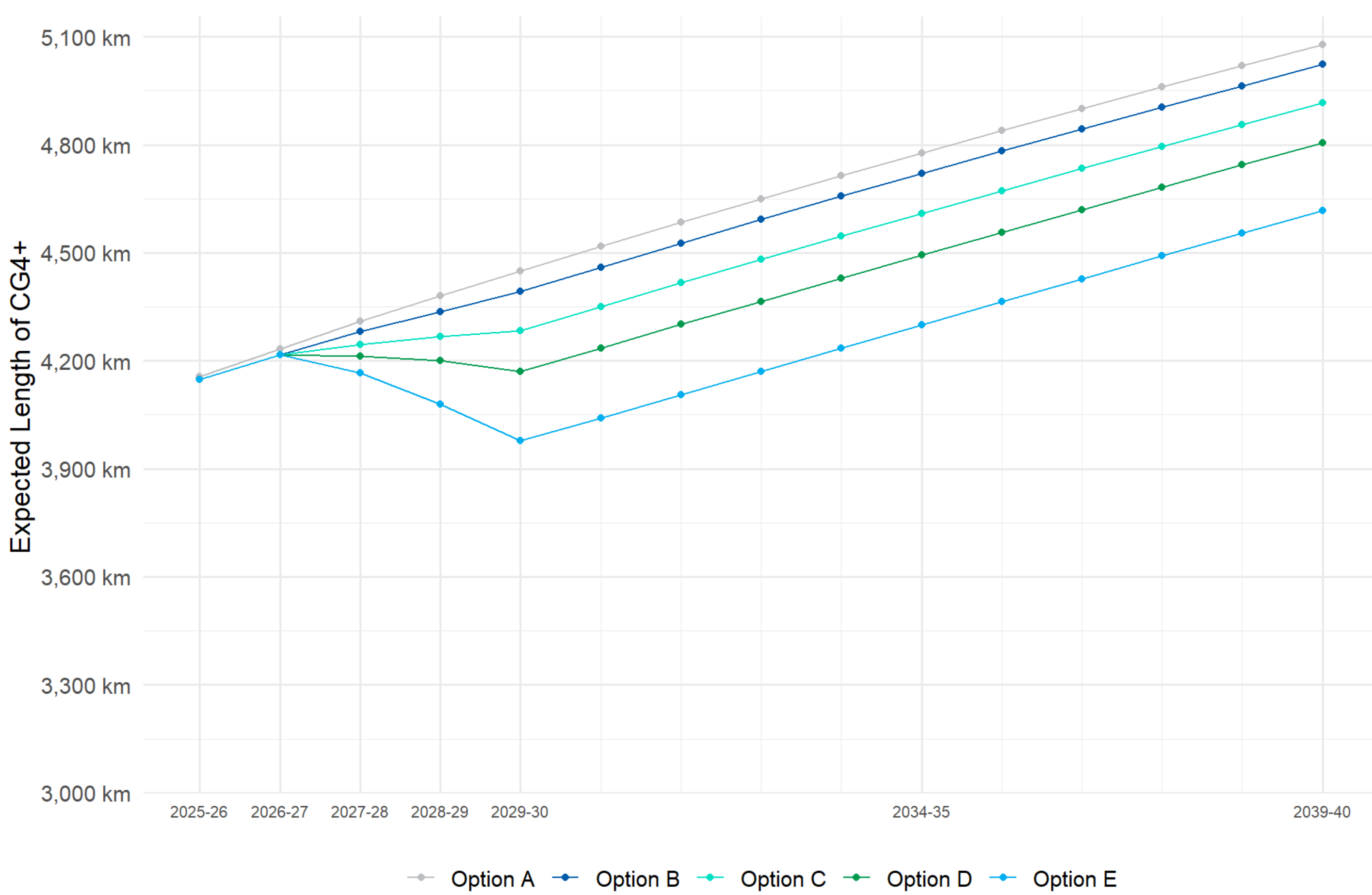
113. Figure 13 illustrates the forecasted impact on condition grade across all scenarios by showing the expected length of volume of gravity sewers that we would expect to fall into condition grade 4 or higher over the period under the different investment options considered. Option A, the baseline do nothing scenario, shows asset condition worsening throughout 2025–30 and continuing to deteriorate over the longer term. Option B, which reflects maintaining rehabilitation at historic base allowance levels, demonstrates that this rate of activity is insufficient to prevent continued decline in overall condition.

114. In contrast, Options C and D increase annual rehabilitation to a level that starts to outpace the forecast rate of deterioration and deliver a risk reduction for customers and the environment. These options not only appear to better stabilise the condition of the sewer network but deliver a net improvement over time, representing both a sustainable investment profile and a deliverable programme of rehabilitation interventions. Option E further enhances rehabilitation volumes to levels significantly higher than any previously achieved, illustrating the theoretical upper bound of what enhanced intervention could deliver.

115. The forecasted performance across these scenarios also makes clear that this investment cannot be a one-off programme. After 2030, the model reverts to a do nothing / do minimum position, and the projections show that assets not rehabilitated during the investment window continue to deteriorate. This results in growing lengths of sewers falling into condition grades 4 and 5—exceeding the levels seen under all scenarios at 2030.

116. However, for Options C–E, the forecasted lengths of grade 4 and 5 sewers in 2040 remain significantly lower than those projected under the do nothing or do minimum scenarios, demonstrating that sustained investment is essential to maintain long term asset health.

FIGURE 13 – FORECASTED STRUCTURAL CONDITION IMPROVEMENTS PER MODELLED OPTION



117. **Pitch Fibre Sewers:** We have identified approximately 46.1 km of sewer network constructed from pitch-fibre material. These assets, typically 50–70 years old, are inherently vulnerable to tree root ingress, deformation under pressure, and moisture-related deterioration. Given the known failure modes and age profile, we have assumed that full-length rehabilitation is required for each pitch-fibre asset to effectively mitigate material-specific risks. Accordingly, the proposed investment includes replacing the entire 46.1 km of confirmed pitch-fibre sewer network.

118. A review of the historical performance of the 46.1km manhole to manhole length of pitch fibre sewers demonstrates the risk and impact to customers and the environment of these assets.

FIGURE 14 - ANALYSIS OF HISTORICAL PERFORMANCE OF PITCH FIBRE SEWERS

Metric	Total	Rate (per year)	Unit Rate (per year, per km)[2]
Flooding (Internal)	19	1.9	0.04
Flooding (Curtilage)	190	19.0	0.41
Flooding (Highway)	34	3.4	0.07
Flooding (Other)	12	1.2	0.03
Blockages	353	35.3	0.77
Pollutions	-	-	-
Collapses	6	1.2	0.03

119. Industry experience across the UK strongly reinforces our approach to targeting all known pitch-fibre sewers for renewal. Pitch-fibre pipework, installed widely between the 1940s and late 1970s, is now recognised as one of the most failure-prone materials in the wastewater network. Industry specialists report that the material's typical lifespan is only around 40 years, meaning most assets have already exceeded their serviceable life and are now showing accelerating structural deterioration.

120. Multiple drainage authorities and specialist contractors consistently identify deformation, blistering/delamination, collapse, and root ingress as common and predictable failure modes of pitch-fibre pipes. These defects arise from the material's vulnerability to moisture, heat, soil pressure, and chemical exposure, causing pipes to soften, deform, or split as they age.

121. Industry experience also shows that pitch-fibre systems account for a disproportionately high number of recurring blockages, collapses, and emergency interventions, with some estimates indicating that tens of thousands of UK properties are affected each year. This aligns with broader market assessments that pitch-fibre drainage has now become one of the most frequent sources of operational failure within ageing networks (we explore this more in section 2.3.3).

122. The assumption that full-length rehabilitation is required on all known pitch-fibre sewers is consistent with industry best practice. Sector guidance and contractor expertise emphasise that once deterioration begins, the material

typically continues to degrade along the entire pipeline, making partial refurbishment ineffective in managing long-term service and collapse risk.

123. In line with this evidence, including the full 46.1 km of known pitch-fibre sewer within our investment proposals represents a proactive, risk-based, and industry-validated approach to safeguarding serviceability, reducing unplanned failures, and improving long-term network resilience.

124. Figure 15 presents the additional costs for each option, beyond the allowances included within the base model. These values are calculated using the relevant unit cost rates, with further explanation provided in Section 4.

FIGURE 15 – COSTS OF EACH OPTION CONSIDERED

Option	Additional cost sewer rehabilitation £m (2022/23 prices)
A	0
B	0
C	111.5
D	184.0
E	295.2

125. Option C is the preferred option because it best meets our primary objective of preventing further deterioration in sewer performance while ensuring the service remains resilient over the long term. It delivers a balanced and sustainable level of rehabilitation that directly addresses the emerging risks of asset degradation.

126. Crucially, Option C aligns strongly with our long-term strategic approach, supporting a steady and proactive investment profile rather than relying on reactive or short-term interventions. This ensures that performance risk is managed effectively and avoids the build-up of future liabilities.

127. Option C is also the point at which the historic risk identified through our CCTV Prioritiser begins to plateau. At this stage, we would undertake further CCTV inspections to refresh our dataset and re-run the risk model, enabling us to identify and target additional sewer lengths for rehabilitation beyond this rate.

128. In contrast, the alternative options either do not deliver the required level of performance improvement or fail to provide a realistic or deliverable pathway to maintain asset health over time. Some options fall short of mitigating deterioration, while others exceed practical delivery constraints or financial efficiency.

129. Option C is the best option because it provides a sustainable, strategically aligned level of rehabilitation that prevents further deterioration, manages performance risk effectively, and remains realistic and deliverable over the long term.

3.3. SEWER REHABILITATION REHABILATION - METHODS

130. We have considered the following options for carrying out the rehabilitation of sewers (that is, the specific methods we would use). These align with the interventions outlined in Ofwat's Gravity Sewers Investment Guidance:

- Pipe rehabilitation - relining
- Pipe rehabilitation – re-rounding/other
- Replacement – excavation
- Replacement - trenchless (cured in place (CIPP))
- Localised repairs (manhole sealing, patch repair)

131. Based on our experience of delivering planned sewer rehabilitation over several years, we would typically expect to use no-dig solutions, such as re-lining and trenchless replacement, wherever possible. These approaches help reduce delivery risks associated with rehabilitation works and offer a number of advantages over traditional open-cut repairs including:

- **Reduced health and safety risks** - by avoiding large numbers of excavations, risks to both the workforce and the public are significantly minimised.
- **Lower environmental impact** - no-dig methods limit disturbance to the ground, reducing the potential for dust, odours, and other environmental impacts.
- **Less disruption to the public** - with fewer excavations, the amount of required traffic management is reduced, helping to minimise disruption and avoid unnecessary damage to public areas.
- **Shorter delivery times** - eliminating excavation activities can substantially reduce programme duration. Faster completion helps maintain service to customers and reduces susceptibility to delays caused by adverse weather.
- **Reduced high-risk costs and greater budget certainty** - costs associated with material management and surface restoration are avoided, lowering the overall outturn cost. This also improves confidence in budget forecasts.

3.4. DECISION MAKING

132. In section 2.3.2 and 3.2, we describe the register of sewers that we hold in our prioritiser. This records the historical performance of sewers and uses the benefits from these to prioritise which sewers we should invest in. We note that the key metrics for historical performance are:

- Flooding (internal, external)
- Blockages
- Pollutions
- Collapses

133. All of these (with the exception of sewer blockages) are also performance commitments as set by Ofwat at PR24, with values from our value framework.

134. Rather than targeting service performance, we could prioritise asset health condition – for example, tackling those sewers in Condition Grade 4 and 5 first. This would allow us to directly address the deterioration in asset condition described in section 2.4.

135. We consider that the best approach is to base our programme on the benefits to service performance, using our sewer prioritiser to target the sewers with historic performance incidents. This is because:

- These are the sewers that deliver the most benefits now – or at least, we would expect this to be the case based on historical performance. Although sewers in a worse condition grade are *more likely* to have risks to performance, these sewers are known to have risks directly. If we assume that the unit cost applies to all sewers (and on average, this is true) then this option would be the **most cost beneficial**.
- These sewers have known benefits that can be addressed now, with a reasonable expectation of an immediate impact on service levels. This is consistent with customer preferences for asset health (see section 3.4) and means that benefits (or at least, risk reduction) are more certain than for sewers chosen based on condition only.
- Customers and stakeholders have been clear that we should focus on reducing pollution incidents and sewer flooding in particular – this is evident in the discussions we have had (see section 2.6) and the values placed on these benefits within our value framework (and similarly, through Ofwat ODIs).
- We consider it likely that sewers that have led to pollution incidents and sewer flooding in the past are likely to be in poor condition too. In investigating these sewers, we will be able to identify those sections where condition has caused historical service performance issues and rehabilitate these accordingly. Where this is not caused by asset health, or the sewers are in good condition, we would not rehabilitate sewers.

136. This shows that a programme based on benefits to service performance would be more cost-effective – but also delivers customer preferences more effectively. We note that this is **not in conflict** with Ofwat's guidance, which states that the investment should not be primarily driven by flooding or storm discharges, and this proposal remains focused on improving asset health over the long term. However, as we are selecting only a small proportion of gravity sewers in condition grade 4 or 5 for this investment programme in AMP8, it seems sensible to prioritise those sewers with historic performance incidents *within* this group.

3.4.1. Are there any specific risks?

137. We considered any specific environmental and customer risks – and concluded that these would be best measured by service performance (particularly pollution and sewer flooding).

138. This is not the only approach we could take. For example, we could consider the criticality of sewers according to their location (such as being near a watercourse or protected area) and so how likely they would be to cause a

pollution incident. We could consider where flooding is more likely, and so where failures might have more impact on customers.

139. However, this would require more information and models to do this type of analysis. We also risk potentially rehabilitating sewers that have not yet deteriorated to a point where we might start to see service failures, and so this investment might not be necessary. For AMP8, the historical performance is likely to be the best guide to sewers that require rehabilitation.

140. We also considered the risk of specific materials. As we describe in section 2.3.3 and 3.2, pitch fibre sewers have a particular risk profile that means that these are likely to have already exceeded their useful asset life, and we would expect to see failures that are harder to address through operational methods. Although we could not directly quantify this risk, the expert judgement was that these would be as urgent to address as those sewers identified through historical performance.

3.4.2. Sustainable pace of investment

141. Our long-term strategy seeks a "programme of replacement assets sufficient to maintain asset health in the long-term" (section 2.5). Similarly, customers have asked us to "seek to keep pace with the required level of work – focusing on exactly where we know work is needed now, and where this has an immediate impact on service" (section 3.4). In section 2.4, our analysis showed that we would expect 71.9km of gravity sewers to move into Condition Grade 4 each year – and so we would need to rehabilitate this length each year to keep pace and maintain asset health in the long-term.

142. Our optioneering in section 3.1 and 3.2 showed that Option C (see Figure 11) would be a more optimum pace to meet both the modelled level of asset health deterioration, moving us closer to the long-term sustainable replacement rate (even if there is still some residual increase in risk) but also to target investment where this has a greater impact on service.

143. We consider, based on the evidence, that this is a sensible 'no regrets' level of investment that would allow greater consideration of the long-term sustainable rate in PR29 and beyond where stepping up to this level in 2030 could be considered. We note that this still implies a 400 year asset life – which we think is likely to be an overestimate, and so this could be considered a "no regrets" step towards a higher sustainable replacement rate.

144. As a cross-check to test if our optioneering had really considered the right sustainable pace of investment, we asked ourselves a series of questions:

- Could we be confident that a programme in AMP8 that focused on a stable asset health deterioration rate would still be able to focus on known benefits? Our optioneering shows that our sewer prioritiser had sufficient length of sewers that we had surveyed and that had historical performance issues. We confirmed that we would be able to put forward sufficient gravity sewers that had either pollution incidents or sewer flooding incidents associated with them in the last ten years, and that this would deliver benefits for customers.

- What would the benefits of a lower replacement rate be? This would mean fewer benefits and increasing risk but would mean lower bills too. In practice, a long asset life for gravity sewers would mean that each additional £10m of funding would translate to between 27p and 32p on wastewater bills by 2030 (using the same calculations we applied at PR24 for testing affordability). However, as we noted in our long-term strategy, delaying work on asset health in poor condition is likely to lead to increased costs as well as poor service. This is particularly true where pollution incidents and sewer flooding incidents can be avoided, as these have significant direct costs as well as significant environmental and public costs. We noted that our Option C shows that any lower replacement rate would mean the avoidable risk of pollution incidents and sewer flooding incidents would not be addressed.
- Should we seek to improve the asset health of this asset class by going further? With water sector reforms, we might expect to see new asset standards that seek to improve asset health, particularly in areas such as sewers which can have a serious impact if they fail. However, we do not know what these standards will be. We also do not know the relative asset health of this class across the sector, and so we do not know yet what that pace of improvement is likely to be.
- Should we address the specific risk of pitch fibre sewers now? We note in 2.3.3 that these have a particularly short asset life and pose a specific risk to safety and service. We could wait until AMP9, but this risk will need to be addressed in the short-term.

145. We could not see any reason to move to a lower replacement rate, as this: would not deliver what customers had asked for; would be unlikely to lead to cheaper bills over the medium term (though bills would be a little lower up to 2030); and would lead to worse service. In our optioneering (in 3.2) we showed that our Option C would be the optimum rate for service performance too.

146. We could see a reason to increase the replacement rate further, as there are further benefits to improving asset health. It is unlikely that an implied asset life of more than 200 years is realistic. However, we considered that this would not be the right decision, because:

- There were limited benefits identified from our current data of going beyond Option C (we identified no marginal benefit to internal sewer flooding and pollution incidents of going further). This does not mean that there would not be benefits; only that we cannot clearly establish what these would be using our current data.
- Customers have said clearly that they want a rate of investment that means that asset health does not deteriorate, but they have not yet discussed options or considered the benefits for going further than this – and they should have the opportunity to do so.
- The Government has now said it will consider asset standards – we should wait for insights from this work before going further on asset health.

- The only exception to this is pitch fibre sewers, where we consider that having identified these risks, delaying replacing these further would be an unacceptable risk that would not match customer preferences.

3.5. PROPOSED SOLUTION

147. Having assessed the options for intervention, we have proposed a combination of rehabilitation and replacement programmes to reduce the risks to service in these areas. We are proposing to replace all known pitch fibre sewers as rehabilitation is not appropriate for these types of sewers. Rehabilitation will be carried out on the remaining sewers that we have identified for rehabilitation. We have chosen to rehabilitate these sewers rather than replace them to reduce delivery risks during the reduced delivery period and achieve the highest possible rate of intervention during the delivery period.

148. Our proposed solution is to rehabilitate gravity sewers between 2027/28 and 2029/30 as follows:

FIGURE 16 - PROPOSED LENGTH OF SEWERS REPLACED AND REHABILITATED

Year (km, cumulative)	2025/26	2026/27	2027/28	2028/29	2029/30
Base wastewater model funded rehabilitations	13.4	26.8	40.2	53.6	67
Asset health base adjustment rehabilitations	12.2	24.4	55.5	118.0	186.9
Pitch fibre replacements			6.9	25.4	46.1
Total	**25.6**	**51.2**	**102.6**	**197**	**300**

149. This moves to a rehabilitation rate of **0.25%** per year from 2027/28 (or Option C). We note that this is a slightly different length to Option C due to minor changes in the implicit allowance calculation after our optioneering.

150. We have demonstrated improvements in service performance that we have seen from sewer rehabilitation (section 2.1) and that we have at least this length of sewers where there is historical evidence of pollution incidents and sewer flooding in our prioritiser. Analysis from our deterioration and prioritiser models has led to us proposing 46.1km of replacement of pitch fibre sewers and 186.9km of additional relining rehabilitation to address these risks. The models show that this programme would:

- Reduce pollution incidents and sewer flooding incidents. In section 3.2, we showed that the additional sewers in our proposed solution had pollution incidents and sewer flooding incidents over the last ten years. As we explain in 3.2, we would not expect to see this scale of benefits, as these incidents will not necessarily repeat on these specific sewers, but this indicates the potential to reduce at least *some* of these incidents.
- Stop the deterioration of the gravity sewer asset class (on average). Our model shows that we would expect more sewers to deteriorate and we will likely see increasing risk of pollution incidents and sewer flooding elsewhere – but under this programme, we would at least keep pace with asset deterioration (section 3.2).

- Replace all our known pitch fibre sewers, which are a particularly high risk. We expect that there will still be some pitch fibre sewers in our network, as we are unlikely to have identified everything, but this will at least reduce the known risk (section 3.2).

151. We note that at the moment, performance in this asset class has been largely driven by operational improvements and more resources dedicated to detecting, preventing, and tackling issues. However, there is clear potential to reduce incidents by rehabilitating the sewers that are most vulnerable to these, and a clear risk that continuing at our current rate of rehabilitation (which remains much higher than the sector average) will create increasing risks into the future. We see this programme as a reasonable step change for now, that will allow projects such as asset standards and sampling surveys to support an agreed sustainable rehabilitation rate in the future.

3.6. CUSTOMER ENGAGEMENT

152. In our PR24 business plan[19], we set out how we engaged with our customers on asset health in general. We explained our understanding of customer preferences and our customer engagement in our PR24 enhancement case (NES35) and in our Line-of-Sight summary of our decisions:

> "Our customers described the decision about phasing as a "dilemma between a short-term fix and a long-term plan". Some customers were cautious about spending money before it is necessary and noted that the future was uncertain. They prioritised affordability over asset health. The majority of customers thought we should do more, noting that this could prevent costs and problems escalating in future years. They also valued safe, clean spaces for workers and communities (enhancements and other service area summaries, NES43). In the North East, customers were more likely to favour bill reductions.
>
> "Customers asked for a "hybrid, middle ground" option, that focuses on where we know exactly where work is necessary now, and where this has an immediate impact on service (and safe, clean spaces). This middle ground would be more affordable now, without taking too much risk on problems escalating in future years (enhancements and other service area summaries, NES43).
>
> "Investments to replace concrete tanks at service reservoirs, water treatment works and wastewater treatment works were viewed as a high priority for respondents across all regions as they relate to the main function of the company - to provide a safe water supply. Most customers included asset health in their "ideal plan" (enhancements and other service area summaries, NES43).
>
> "In our Affordability and Acceptability Testing qualitative research, customers supported our "medium" investment in asset health – seeing this as keeping pace with the required level of work, while allowing a high level of investment in other areas.

[19] Appendix A7.1, Line of Sight (NES45)

> "In Essex and Suffolk, customers often preferred a higher phasing option – which included increasing our mains replacement in this area."[20]

153. We developed our PR24 plan based on the criteria from customer engagement – that is, to focus on areas where we know exactly what work is necessary now, and where this has an immediate impact on service.

154. We did not discuss gravity sewer replacement rates with customers at PR24, as we were not proposing any change in replacement rates. Similar to the water mains renewals cost adjustments, Ofwat has now provided the opportunity to move towards a more sustainable, proactive rate of intervention on gravity sewer assets. We are supportive of his opportunity, but it now accelerates our plan a little, from 40km per year in our PR24 business plan to 48km per year.

155. In practice, our plans for base investment have had to change since our PR24 business plan. We did not receive the funding we needed for proactive asset health investments, and although some of these are now included in the asset health cost change process, some are not. This means that we have to make some investments in other asset classes (such as storm tanks) using base expenditure that we had not anticipated. Funding our gravity sewers rehabilitation to our BP24 planned volume of 40km per year (rather than just funding in base allowances for just 13.6km per year) would allow some of our existing base funding to be prioritised to those areas that customers said they wanted to invest more in. We are now proposing to increase the rate of rehabilitation to 48km a year[21] to help to reduce the risk in some priority areas of our network that are at risk of poor asset health and likely to cause flooding or pollution impacts.

156. We considered whether, in the absence of time for direct customer research, there was evidence to suggest that customers would support an increase from 40km of rehabilitation per year, to 48km. We concluded that:

- The principles that customers set out at PR24 suggested that we should seek to keep pace with the required level of work – focusing on exactly where we know work is needed now, and where this has an immediate impact on service; without taking too much risk on problems escalating in future years. Further to this, customers preferred us to take a "risk driven" approach to asset health (that is, reducing the risk of service failure).
- Customers prioritised internal and external sewer flooding as "high" at PR24, across a range of research including CCW and Ofwat reports. Many customers supported a higher level of ambition in our deliberative research, but in the acceptability and affordability testing in 2023 customers felt our ambition was "just right".
- Customers were more concerned about asset health when we described the impacts on service – for example, this was ranked more highly when we described "avoiding service failures" and "ensuring reliable and resilient services" than "replacing infrastructure and doing more maintenance".

[20] Appendix A7.1, Line of Sight (NES45), p25
[21] This is the average over AMP8 after this proposal.

- Customers **prioritised reducing pollution incidents as "high" at PR24**, and in the acceptability and affordability testing customers said that our plan was not ambitious enough. Most customers agreed with our long-term ambitious goal to have zero pollutions as a result of our assets and operations.

157. We also considered evidence from third parties that suggested that: if no action is taken to increase the level of asset maintenance and replacement, service quality will deteriorate significantly by 2030 such that sewer blockages and collapses, and the resulting flooding and pollution, will increase by 6%[22]; the replacement rate of sewers is much lower in England and Wales than in other countries[23]; and there has been stakeholder and media dissatisfaction at low levels of sewer replacements and how long this implies for asset lives.

158. An increase from 40km to 48km per year seems to be a sensible step, based on this evidence (this increases the rehabilitation rate to around 0.25%, which still implies a 400-year asset life). This matches the length of main that we expect to become CG4/5 each year (using a "three-year" no deterioration approach) and so keeps pace with the required level of work – so this means we do not do anything unnecessary, but avoid taking on too much risk on problems escalating in future years. We have also included known pitch fibre sewers as these are a high risk for both performance and safety.

159. This means that the customer evidence we had already seemed to support a small step change to increase the rehabilitation rate now, before we can consider this in more detail. We note that increased inspections will help to develop this detail.

160. In developing this case, we carried out research with our People Panels on 23 April 2026 to understand if customers supported an increase in investment, including the impact on bills. In the Northumbrian Water area, 83% of participants supported this increased investment now rather than waiting until 2030. We provide the customer research report as Appendix 1.

161. Finally, it is clear from the customer research that customers expect us to focus on preventing service failures rather than targeting the lowest condition grades. This means that it is important to include other factors (such as criticality and service risks) in determining which sewers to target – not just condition grade.

162. Although Ofwat's **Consumer Involvement Rule** did not exist during the PR24 business planning process, we consider that this decision could be "likely to have a material impact on customer matters" and so we have tested this against the Rule.

[22] UKWIR, "Long Term Investment in Infrastructure" (2017)
[23] **Economic Insight**, 2022 – the comparison is for rising mains, there is no comparison available for gravity sewers.

FIGURE 17 - SUMMARY OF CUSTOMER INVOLVEMENT RULE ANALYSIS

Requirement under the Rule	What did we do?
Component 1 – insight on views and preferences: To support delivery of the core requirement, undertakers must put in place, and follow, effective arrangements to appropriately understand the views and preferences of their consumers in relation to matters relevant to this rule. Such arrangements must include: • Surveys of consumers; or, • Qualitative research among their consumers; or, • Engagement with independent consumer experts; or, • Additional or alternative approaches which achieve the outcome in paragraph 7; or, • A combination of any of the above arrangements.	Our PR24 programme of customer research had effective arrangements for understanding the views and preferences of customers – we describe our strategy and approach, including triangulation, in our business plan appendix A7. This includes describing how we met the principles for good customer engagement. This programme included surveys of customers, qualitative (and deliberative) research, and engagement with the independent Water Forum and its Customer Engagement Panel (assessing quality of research). We published the reports from the independent Water Forum and Customer Engagement Panel with our business plan.
Component 2 – decision-making mechanisms: Undertakers must have arrangements in place at the appropriate levels of decision-making within the undertaker to deliver the core requirement. This means that undertakers must ensure that the views, experiences and preferences of consumers, including those understood as a result of component 1, are appropriately fed into, and taken into account, in the decision-making process for decisions that are likely to have a material impact on consumer matters. At Board level, in relation to decisions relevant to this rule, this must include: • Allocated time within the annual board cycle for discussions focusing regularly on consumer matters at meetings of the Board; or, • Arranging for the regular attendance of independent consumer experts at meetings of the Board; or, • Designating an independent non-executive Board member with specific responsibilities for involving consumers; or, • Holding open meetings of the Board which consumers are able to attend; or, • Additional or alternative approaches which achieve the outcome in paragraph 8 or, • A combination of any of the above arrangements.	We fully integrated customer preferences into our PR24 business planning process. Our line-of-sight report describes the top-down assessment from discussions at our Board, Water Forum and other similar forums (informed by our customer engagement); and our bottom-up assessment from our PR24 planning teams, reviewing a range of insights and making judgements on the findings to inform decisions through the business plan development process. This meant that the business plan proposals were continually refined using the full range of insights, not just at limited decision points. The light-of-sight report describes how we took customer views into account for each decision, including asset health. In addition to this, our data, information and assurance appendix describes how we made sure that we had fully met the requirements on customer research – and how our Board satisfied itself that our Business Plan really was supported by our customers (this was beyond the requirements for Board assurance). The Board sub-group met 17 times during the development of the plan; including Water Forum attendees at two meetings. Our Board nominated an independent non-executive member (Peter Vicary-Smith) as the Board lead on customer engagement, attending Water Forum meetings as required. Members of the Board sub-group attended customer engagement sessions, as well as operational colleagues, to seek to make sure that this was integrated into decision making culturally as well as practically. Ofwat confirmed through its PR24 QAA that this met its quality requirements on customer engagement and assurance.

Requirement under the Rule	What did we do?
Component 3 – Feedback on consumer experiences: In order to deliver the core requirement, undertakers must seek feedback from consumers on their experiences relevant to this rule, so that the impact on consumers of past decisions: • is understood; • is taken into account in decisions affecting current and future consumers; and • informs relevant future planning for delivery of this rule.	The feedback component is not as relevant to this particular process, as this was about making decisions about future phasing and needs (that is, the impact of past decisions about asset health is simply that this has been delayed as much as possible by Government and regulators and there now needs to be more investment). We will repeat this research as we move towards PR29 and for other asset health in-period processes, including testing the decisions and criteria set by PR24 respondents.
Guiding considerations: Accessibility – making involvement as easy as possible for a range of audiences. • Independence – ensuring that views are not unduly influenced by the undertaker and reflect the genuine views of consumers. • Timeliness – considering consumers' views at a frequency and time that makes sense for the subject matter and allows for meaningful involvement. • Representativeness – involving a broad range of consumers or independent consumer experts that appropriately reflects the range of consumers the undertaker serves. • Transparency – being open and honest with consumers who are being involved in decisions, and being open about how consumers have been involved in decisions.	We met these requirements by: • Independence – we described in our Appendix A7 how we met the best practice principles, including using an independent research partner. The Customer Engagement Panel reported its independent views on the quality of our research. • Timeliness – we carried out this research during the business planning process, in time for these decisions to be made using customer preferences. We also asked customers how they wanted us to respond to DD24. This research is now >18 months old, but it is not appropriate to ask customers the same questions again as these preferences have not yet been acted upon. • Representativeness – we used representative customer panels for deliberative discussions, and a representative sample for our acceptability research

163. Throughout our PR24 customer engagement programme, we held discussions specifically focused on resilience and asset health, presenting customers with a series of choices about investment at treatment works, service reservoirs, and more extensive infrastructure such as water mains. We sought to understand not only whether customers supported investment, but also how they balanced long-term risk, affordability, and service reliability. Their feedback directly influenced how we refined our proposed approach and ensured that our enhancement case reflected the solutions customers valued most.

4. ROBUST AND EFFICIENT COSTS

4.1. DETERMINING COSTS

164. We have adopted bottom-up and top-down estimating approaches to determine the costs of our proposed programme of gravity sewer rehabilitations. We explain these in sections 4.1.1. and 4.1.2.

4.1.1. Bottom-up estimates

165. The APR collects data for the length of sewers rehabilitated but it does not collect information on the cost of this activity, and we have found it difficult to extract the cost of this as a separate activity as we often undertake similar and related work as part of the same contracts with our supply chain.

166. We engaged with our supply chain to identify the contractor costs we incurred in 2025/26 and these are set out in the table below.

FIGURE 18 - BOTTOM-UP UNIT COSTS FROM 2025/26

Type	Contractor cost	Length	Cost per metre (2025/26 prices)	Cost per metre (2022/2023 prices)
Rehabilitation	£4.390m	12,752m	£344.25	£304.60
Replacement	£0.023m	24m	£983.24	£869.99

167. These costs do not include any allowance for our own project management costs or other enabling activities such as street works permits, estates and ecology. We have historically allowed a budget for these items of 10% for project management and 8% for permits, estates and ecology. We have applied these percentages to our unit rates to calculate a full cost (that is, including overheads).

FIGURE 19 - BOTTOM-UP UNIT COSTS FROM 2025/26, INCLUDING OVERHEADS

Type	Total cost per metre (2022/23 prices)
Rehabilitation	£361.87
Replacement	£1,033.55

Note: these are the rates in Figure 18 multiplied by 1.08*1.10

168. This does not include some associated costs, such as any replacement or repairs to manholes – and nor does this include any share of capital overheads such as programme management or other corporate services. So, these are likely to underestimate the costs of delivering the programme. We therefore treat these numbers as a lower bound.

169. To get a more representative estimate of the costs we asked Turner and Townsend to undertake a bottom-up exercise using our contractor framework rates and to apply appropriate adjustments to these to get a total cost for the activity.

170. The results of their analysis are set out in the table below[24].

FIGURE 20: BOTTOM-UP UNIT COST FROM FRAMEWORK AGREEMENTS

	Rehabilitation – CIPP lining	Replacement – open cut
Supply & install rate	170.21	482.13
Traffic management & associate cost allowance	60.00	60.00
Sub-total direct cost	230.21	542.13
Main contractor overhead 30%	69.06	162.64
Sub-total contract award	299.27	704.77
Client cost 15%	44.89	105.72
Sub-total project cost	344.17	810.49
Risk 10%	34.42	81.05
Estimating uncertainty 20%	68.83	162.10
Total (2022/23 prices)	**447.42**	**1,053.63**

171. We focussed on CIPP relining and open cut replacement as these are the activities we expect to carry out to deliver the additional activity. Overall, we expect this to be made up of 73% relining and 27% replacement[25] which gives a blended unit cost of **£609.9/metre** in 2022/23 prices. We think this is a more reliable estimate than the incomplete information we have been able to identify for activity in 2025/26, as it uses our framework rates and transparent assumptions for the additional costs that are in line with market norms.

4.1.2. Top-down benchmarking estimates

172. We have explored two different top-down benchmarks. First, we looked at the unit rates from the industry expenditure and workload dataset.

173. Our analysis of the expenditure and workload dataset shows that there is likely to be some variability in the definitions used across companies. It can clearly be seen that some companies have higher unit costs after 2021, likely relating to a change in definition for sewer lengths rather than any change in activity (ANH, NES, SWB, YKY). It can also be seen that some companies were likely already using this definition (WSX, SVE, SVH). For some companies, it is difficult to tell as there is much more variability in unit rates – however, this effect can be seen for WSH, UU, and TMS to some extent too.

174. Figure 21 shows the unit rates derived from the industry expenditure and workload dataset. We note that the difference between the 2012-25 and 2021-25 period shows clearly the impact of the change in definition – and so it is not sensible to use the longer-term dataset in this case.

[24] NWL Asset Health Benchmarking report, Cost Change Submission Appendix 1, page 15-16.
[25] The proportions are calculated using data from Figure 16. Total length proposed for this case is 172km of which 125.9km is for rehabilitations and 46.1km is for pitch fibre replacements.

FIGURE 21 - UNIT RATES DERIVED FROM THE INDUSTRY DATASET (£M PER KM IN 2022/23 PRICES)

Company	2012-25	2021-25
ANH	1.314	1.851
NES	**0.240**	**0.535**
SRN	2.797	6.527
SWB	0.319	0.414
TMS	1.867	2.614
UUW	1.141	1.957
WSH	0.440	1.442
WSX	0.551	0.519
YKY	0.845	1.294
SVH	0.554	0.561
Median	**0.700**	**1.368**
Median excluding TMS and SRN	**0.553**	**0.927**
Mean	**1.025**	**1.771**
Upper quartile	**0.468**	**0.542**

Source: NWL analysis. Unit rates are calculated from the industry expenditure and workload dataset.

175. This dataset shows much higher median and average unit costs than our bottom-up estimates. For instance, the median (excluding Thames and Southern) gives a unit rate of £927/m which is significantly higher than our bottom-up blended rate of £614/m.

176. Other companies may have had difficulties, as we did, in accurately estimating the costs of this activity and the blend of work may be different to what we propose to undertake. We therefore asked Turner and Townsend to provide a top-down estimate of the relevant unit costs from the costing database of delivered projects. This provided the following estimated unit costs from their database[26].

FIGURE 22: T&T TOP-DOWN BENCHMARKS FOR SEWER REHABILITATION AND REPLACEMENT

	Unit cost (£/m in 2022/23 prices)
Rehabilitation – CIPP lining	634.67
Replacement – open cut	826.64

177. We note that our benchmarking report does not show individual cost build up for these rates, and this draws on 570 datapoints covering a variety of surface types, materials, diameters and lengths.

178. From these we obtain a blended unit rate of **£686.12/metre,** which is higher than our bottom-up blended unit rate of £609.9/m. This gap, combined with an even larger gap observed using the expenditure and workload dataset, raises

[26] NWL Asset Health Benchmarking report, Cost Change Submission Appendix 1, page 15-16.

concerns that our bottom-up unit costs may not be deliverable as we may experience some of the cost pressures that are driving other companies' numbers to be higher. This is likely to be due to the following reasons:

- **Increased delivery reliance and market capacity constraints**: The substantial expansion of the programme will require us to draw on a wider pool of delivery partners. Although many partners within our existing Living Water Enterprise have the capability, capacity, and commercial rates already familiar to us, it is likely that we will need to supplement this with additional partners outside of our framework to meet programme volumes. Engaging new suppliers may introduce higher market rates or mobilisation costs and could place upward pressure on overall programme expenditure.
- **Increased traffic management pressures**: Over time, local authorities are introducing more onerous traffic management requirements such as permitting schemes and lane rental charges. It is likely that these costs will cost over time and lead to an increase in our sewer rehabilitation unit costs.
- **Reduced flexibility in scheme selection leading to more complex delivery environments**: Our past programmes have benefitted from the ability to select rehabilitation schemes from a broad risk-prioritised pipeline, allowing us to optimise sequencing and minimise delivery complexity. With the increased programme length, this flexibility reduces. As a result, a greater proportion of schemes may fall within challenging operational environments such as customer properties, major highway infrastructure, or areas in close proximity to other utilities. These locations typically require more extensive reinstatement, higher traffic management costs, increased compensation liabilities, and additional third-party coordination, each of which has the potential to elevate total programme costs beyond historical averages.
- **Cost variability associated with different risk drivers**: Historical evidence demonstrates that the cost of sewer rehabilitation varies materially depending on the primary outcome being targeted. Schemes prioritised for pollution reduction are typically more expensive per metre than those driven by flooding risk. This is due to factors such as: pollution-risk assets often being located near watercourses with limited access, requiring temporary tracked access routes; larger pipe diameters being more common in these locations, increasing over-pumping and installation costs; and higher environmental risk mitigation obligations. In AMP7, our programme mix shifted more heavily towards addressing sewer flooding risk, which reduced average unit costs. However, the proposed expansion in investment will likely lead to a greater share of pollution-driven priorities, and with it, an increase in unit cost pressure.

179. To mitigate these risks, we have decided to use the mid-point of these two data points – that is, the bottom-up estimate from our framework rates of £609.9/m and the top-down estimate from the T&T benchmarking database of £686.1/m, which is **£648.01/m**. We think this unit rate is efficient as it is based on both our tendered framework rates (and therefore represents competitive prices) and benchmarked industry data on many historically delivered projects.

180. Based on delivering 125.9km of relining and 46.1km of replacement, this gives a total additional cost of **£111m** for the additional investment.

4.2. EFFICIENT COSTS

181. In addition to the additional 172km of sewer rehabilitation and replacement outlined above, we will also be continuing our programme of works from base. These are set out in the table below.

FIGURE 23: BASE SEWER REHABILITATION ACTIVITY

Sub-programme	2025/26	2026/27	2027/28	2028/29	2029/30	Total AMP8
Sewer Rehab Flooding Other Causes	£3,124,785	£3,500,000	£3,500,000	£3,500,000	£3,500,000	£17,124,785
Sewer Rehab Flooding	£829,365	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£4,829,365
Sewer Maintenance	£7,038,211	£6,174,000	£6,250,000	£6,250,000	£6,250,000	£31,962,211
3rd Party Sew Damage	£4,424	£50,000	£50,000	£50,000	£50,000	£204,424
Sewer Rehab Pollution Find and Fix	£942,374	£1,060,454	£1,060,454	£1,060,454	£1,060,454	£5,184,190
Sewer Rehab Pollution	£836,329	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£4,836,329
DWF Minor Works	£4,337,882	£1,000,000	£1,000,000	£1,000,000	£1,000,000	£8,337,882
Total cost in 22/23 prices	**£17,113,370**	**£13,784,454**	**£13,860,454**	**£13,860,454**	**£13,860,454**	**£72,479,186**
in £m	£17.11	£13.78	£13.86	£13.86	£13.86	£72.48
Rehab length (km)	28	25	25	25	25	128
Unit cost	**£611.19**	**£551.38**	**£554.42**	**£554.42**	**£554.42**	**£566.24**

182. We think the implied unit cost from these programmes is good value for money compared to the sector expenditure and workload unit costs and the T&T benchmark costs as our unit cost of £566.24/m is lower than both of these. The table below provides more detail on the scope of these line items.

FIGURE 24 - DESCRIPTION OF SEWER REHAB SUB-PROGRAMMES

Sub-programme	Description
Sewer Rehab Flooding Other Causes	Annual sub programme of planned sewer rehabilitation , prioritised on historic flood risk identified through risk modelling.
Sewer Rehab Flooding	Annual sub programme targeting known sewer defects, linked historic flood risk
Sewer Maintenance	Annual reactive maintenance expenditure, for sewer rehab illation elements only
3rd Party Sew Damage	Annual reactive sub programme - focused specifically on recovering cost of repairs from party responsible
Sewer Rehab Pollution Find and Fix	Annual sub-programme of planned sewer rehabilitation prioritised on risk to watercourses identified through risk modelling
Sewer Rehab Pollution	Annual sub programme targeting known sewer defects, linked historic pollution risk
DWF Minor Works	Annual sub-programme of sewer rehabilitation focused on Dry Weather Flow and Flow Pass Forward compliance

4.3. DETAILED COST BREAKDOWN

183. The table below sets out the full cost of our programme and the resulting investment request from the cost change process.

FIGURE 25: TOTAL INVESTMENT REQUEST

Gravity sewers	Capex	km of sewer rehab	% Rehab rate
Asset health base adjustment rehabilitations	111.5	125.9	0.11%
Pitch fibre replacements		46.1	
AMP8 base plan	72.5	128	0.08%
Implicit allowance (subtract)	37.7[27]	67	0.04%
Maintenance savings	0.0		
Total request	146.3	233	0.15%

184. Since we plan to deliver around twice what base buys under our business-as-usual activities, this means that our request in this area covers both the element beyond what base buys and the additional investment proposed on top of this. This is reasonable because our current levels of sewer rehab have been much higher than the sector and by

[27] This uses the same unit cost as our AMP8 base plan of £566/m

any measure are in excess of what base buys. Moreover, our unit costs compare favourably to the sector unit cost benchmarks that we have.

185. Overall, we are requesting an additional **£146m** to deliver 233km of additional sewer rehabilitation activity beyond the 67km that we consider base already buys. This is calculated from Figure 25 as: 172km of additional investment * 648.01 £/m = £111.5; plus (128 – 67) * 566.24 £/m = £34.5m; for a total of £146m.

5. CUSTOMER PROTECTION

186. We propose a PCD which is mostly consistent with the existing PCDs for mains renewal and sewage pumping mains renewals. There is one major difference – for gravity sewers, we do not propose that rehabilitations funded under a base cost adjustment should be limited to Condition Grade 4 and 5. This is because gravity sewer rehabilitations should focus on service improvements much more than water mains renewals – as issues such as location and other network factors can have more impact on flooding, pollution incidents and other similar service issues. Our customer engagement at PR24 shows that customers expect us to focus more on service performance than condition, and our prioritisation (as set out in Section 2 and 3) takes into account many more factors. Limiting this to Condition Grade 4 and 5 would not be an efficient use of these funds.

187. Using the mains renewal PCD as a guide will support us in making sure that the PCD is consistent with the approach adopted in the PR24 final determinations – that is, based on a similar common framework; protecting customers if we fail to deliver funded improvements by returning the funding to customers; and incentivising us to deliver "on time" where appropriate.

188. We set out the proposed PCD below, using the same headers as the Ofwat appendix. We note that we include all gravity sewers already funded from base expenditure (that is, 13.4km per year). Under our proposal, the subcomponents could simply be combined to a single profile as there is no functional difference between these – however, we have kept them separate to be consistent with the updated Ofwat guidance. We have used individual unit rates for these.

189. We have considered the impact on PCLs, and we consider that this is likely to be very small compared to the size of the network (this increase still only means improvements for less than 1% of the network in AMP8). We note that PCLs for pollution incidents and internal/external sewer flooding were set by Ofwat at PR24 using comparative data, not the relative replacement rates or risks of individual sewer networks. We cannot quantify the exact benefits from PCLs that we would expect, because although we know these sewers are higher risk and have had previous impacts and PCLs, we cannot estimate future risk to performance. There is no overlap with other PCDs, as there are no PCDs that affect gravity sewers.

5.1. DELIVERY OF THE AMP8 PROGRAMME

190. Section 6.2 sets out how we are delivering our existing programme in AMP8. This shows that we are currently on track to deliver most of our programme, and the areas that we have identified as at risk of late delivery are for specific reasons (rather than a lack of capacity or effort to do so). In Section 2.2.3, we set out our AMP8 base plan for capital maintenance in this area and we confirm that we forecast to spend our base allowances in full (and exceed these).

191. Section 2.2 shows that we are already using our AMP8 base allowances to rehabilitate much more than our implicit allowance for gravity sewers. This demonstrates that we are using our AMP8 base allowance for this asset class appropriately.

192. We can also demonstrate that we are efficient in delivering these rehabilitations. Our cost estimates for gravity sewers, based on our own historical costs, are similar to our external benchmark (see section 4.2).

5.2. DELIVERABLE

193. The company is required to deliver gravity rehabilitations and replacements in line with those specified in Ofwat's base PCD model. There are three specified subcomponents based on the cost change process allowances:

- **Base wastewater model funded rehabilitations** – length of sewers rehabilitated funded through wholesale wastewater network plus modelled base allowances only, determined based on the historical sector average rehabilitation rate.
- **Asset health base adjustment rehabilitations** – length of sewers renovated funded through the gravity sewers base cost adjustment.
- **Pitch fibre replacements** – length of sewers replaced funded through the gravity sewers base cost adjustment.

194. As defined in RAG4.13, line 7C.14, the "length of gravity sewers rehabilitated" is the total length of sewer renovated or replaced in the report year. The length reported is the actual length renovated or replaced rather than the distance between the manholes either side of the section of pipe in question.

195. Any rehabilitation carried out must recreate the functionality of a new sewer. There should be no loss of capacity, functionality or ability of the rehabilitated sewer to provide the same service as the old sewer (when it was new).

FIGURE 26 - PCD OUTPUTS (CUMULATIVE)

PCD outputs (cumulative)	Unit	2025-26	2026-27	2027-28	2028-29	2029-30
Base wastewater model funded rehabilitations	km	13.4	26.8	40.2	53.6	67
Asset health base adjustment rehabilitations	km	12.2	24.4	55.5	118.0	186.9
Pitch fibre replacements	km			6.9	25.4	46.1

196. The non-delivery PCD payment rate is based on the unit costs for delivery set in Ofwat's determination (note, we have not adjusted these for RPEs and frontier shift as we assume this will be applied in Ofwat's models).

FIGURE 27 - PCD NON-DELIVERY PAYMENTS

Non-delivery PCD payment	Unit	Payment rate
Base wastewater model funded rehabilitations	£/m	566.24
Asset health base adjustment rehabilitations	£/m	541.05
Pitch fibre replacements	£/m	940.14

Note: we have calculated these non-delivery payments based on 1) for base funded, we have used our forecast AMP8 unit rate from Figure 23; 2) for asset health base adjustment rehabilitations and pitch fibre replacements, we have used the average between top down and bottom up unit costs in Figure 20 and Figure 22.

5.3. DELIVERY PROFILE

197. The PCD delivery profile is based on delivering both the rehabilitations funded from base (throughout the 2025-30 period) and additional volumes from 2027/28 onwards. We propose a single set of time incentives that apply to both subcomponents. These are based on the same calibration as for the mains renewals PCD (that is, 3.97% of the non-delivery payment rate for under-performance).

Time incentives PCD rate	Unit	Under-	Out-
Base wastewater model funded rehabilitations	£/m	22.50	7.49
Asset health base adjustment rehabilitations	£/m	21.48	7.16
Pitch fibre replacements	£/m	37.32	12.44

198. We propose that these time incentives should apply to each of 2027-28, 2028-29 and 2029-30 only – but should incorporate the base funded renewals from 2025/26 and 2026/27 in the cumulative numbers. This removes any incentive to delay sewer rehabilitations to 2027-28, while ensuring that time incentives do not apply retrospectively.

5.4. MEASURING AND REPORTING

199. The company should report progress against deliverables as per the common reporting requirements set out in Ofwat's PCD appendix.

200. The company should also report on the total length of sewers rehabilitated. This does not require any further details as set out in the mains renewal PCD (such as condition grade and driver) unless there are any specific conditions attached to elements of subcomponents.

5.5. OTHER CONDITIONS

201. We note that there are no third party funding or delivery arrangements that apply for this investment, and so customers do not require additional protection against third party funding risks.

5.6. ASSURANCE

202. Common assurance requirements apply as set out in Ofwat's PCD appendix.

203. In addition, independent third-party assurance should be provided on the following:

- Length of delivered sewer rehabilitations;
- Confirmation that rehabilitation is compliant with the requirements set out above (e.g. that it provides the same service of the existing sewer if new); and
- Method of prioritisation for selecting lengths to deliver.

5.7. PAYMENTS

204. Non-delivery payments will apply where the company does not deliver sewer rehabilitation lengths as reported in the Base PCD model (and as set out above). These will be applied in line with the formula:

$$Non-delivery\ PCD\ payment = Payment\ rate * (PCD\ target_t - PCD\ performance_t)$$

205. The payment rate is the unit allowance, calculated as the unit cost of renewal with the application of frontier shift and RPEs (as defined in the CMA final determination). Payment rates will be defined for each company in the Base PCD model.

206. Time incentive underperformance payments will apply where performance falls short of the PCD target. These will be applied in line with the following formula:

$$Time\ incentive\ under-performance\ payment = Under-performance\ rate * (PCD\ target_t - PCD\ performance_t)$$

207. Where year ‘t’ goes from year 3 (2027-28) to year 5 (2029-30).

208. Time incentive out-performance payments will apply for any given year in line with the following formula:

$$\begin{aligned} &Time\ incentive\ out-performance\ payment \\ &\quad = Out-performance\ rate \\ &\quad * \mathrm{Max}(0, \mathrm{Min}((PCD\ target_t - PCD\ performance_{t-1}), (PCD\ performance_t - PCD\ performance_{t-1}) \end{aligned}$$

209. Where year t goes from year 3 (2027-28) to year 5 (2029-30).

6. INVESTMENT DELIVERY PLAN

210. We examined the wider aspects of deliverability in our business plan, describing the steps our Board had taken to satisfy itself that the supply chain risk was manageable and delivery plans accounted for: the ability of NWL and its supply chain to expand its capacity and capability; the impact of similar levels of growth across the sector and any overall sector and supply chain capacity constraints; and key supply chain risks and capacity constraints. Appendix A6 of our Business Plan (NES07) describes the steps we took and the results of deliverability reviews. This included the 40km of gravity sewer rehabilitations per year in our PR24 business plan.

211. In this section, we explain how we have reviewed this position in the context of our progress towards AMP8 delivery. In the absence of funding for the asset health investment in our business plan, we could not deliver this level of gravity sewer rehabilitations per year from base expenditure alone.

212. In section 5.2 of the "Northumbrian Water - cost change submission" document, we revisit this wider supply chain risk and describe how we have made sure that sufficient resources are available for the design and delivery of our proposals in aggregate – that is, including our asset health proposals and our projects under the Large Scheme Gated Process (including Bran Sands in the 2026 cost change process). This shows that we have capacity within our supply chain to deliver the whole programme, including our cost change proposals. In section 6.1 below, we explain how this separate assessment is relevant to gravity sewers specifically.

213. We have reviewed our programme, and we could deliver this step-up in investment if decisions about the right level of investment can be agreed (and communicated) early enough. We estimate that this requires around **nine months** to scale up our current programme, and so we would need to know by June 2026 whether we should do this or not. This does not require final decisions about precise deliverables and funding, so draft decisions (currently scheduled by Ofwat for July 2026) should enable this. We note that our profile for delivery includes a smaller step up in 2027/28 to reflect this potential deliverability challenge.

214. In section 5.3 of the "Northumbrian Water - cost change submission" document, we also summarise our current delivery plan. Our existing AMP8 investment is on track, and we are confident that additional allowances can be delivered. Since this applies to all cases together, we provide the evidence for this separately in that document. In section 6.2 below, we comment on how this applies specifically to gravity sewers.

215. In section 6.3, 6.4, and 6.5 below we explain the design and delivery risks for this programme in particular, our specific stakeholder engagement needs, and our delivery programme. We provide our risk register separately as Appendix 2.

6.1. SUPPLY CHAIN ENGAGEMENT

216. In our separate "Northumbrian Water - cost change submission" document, we describe our two primary delivery vehicles which differentiate our approach depending on the size, complexity, and technical input required of each project scope. This takes into account repeatability, opportunities to batch for efficiency, technologies, project duration, and cost.

217. We also describe how we monitor our overall supply chain capacity, and how we have confirmed that we have supply chain capacity for these programmes. This includes our gravity sewers programme, which we propose to deliver over the three remaining years of AMP8 through our Integrated Delivery Services route.

218. We have confirmed that the availability of materials for gravity sewers is not a high risk. As described in the individual cost breakdowns (see Section 4), there are no non-standard materials required in the design. Our risk register shows that inflation or materials scarcity would likely lead to increases in costs, rather than placing the delivery of the programme at risk.

6.2. 2025-30 (AMP8) DELIVERY

219. In section 5.3 of the "Northumbrian Water - cost change submission" document, we summarise our AMP8 delivery plan. This confirms that our existing AMP8 investment is on track to be delivered by the end of the 2025-30 period.

220. In our Delivery Plan Summary in November 2025, we raised some “red” and “amber” risks. Following the CMA determinations in March 2026, only one of those risks remains: that is, our **Linford WTW and borehole scheme**, which is currently behind schedule due to the inability to secure a land lease agreement, with competition from (and concerns about) other infrastructure projects

221. This does not raise any general concerns about overall supply chain capacity. We note that for other programmes delivered by our IDS route (such as metering, lead replacement, and mains replacement) we are ahead of schedule and do not have any specific concerns.

6.3. DELIVERY RISKS

222. We have included a detailed delivery risk register in Appendix 2. After our initial risk assessment, we have identified the following key risks that will need to be managed throughout the delivery of the investments:

- Contractor or resource availability constraints: Inspection and rehabilitation works often require specialist contractors with specific equipment and technical skills and there will be a significant increase in the amount of survey work that is planned to be carried out across the sector.
- Ecology constraints: Some sewer routes pass through environmentally sensitive areas where wildlife protections, habitat restrictions, or regulatory requirements apply.

- Regulatory non-compliance: If works inadvertently cause pollution, breach permits, or fail to follow regulatory procedures, we may face fines, reputational damage, or enforced shutdowns.
- Rehabilitation method not suitable once inspection complete: Following inspection, the defect types or severity may differ from what was originally assumed during the planning stage.
- Insufficient budget to complete increased scope: If inspection results show that sewers are in poorer condition than expected, the scope of rehabilitation work may increase beyond the allocated budget.
- Weather-related delays affecting rehabilitation works: Heavy rainfall, flooding, or infiltration from elevated groundwater levels can prevent certain rehabilitation techniques from being carried out safely or successfully.
- Unexpected site conditions (buried utilities, obstructions): Sewer routes sometimes intersect with other buried infrastructure or contain obstructions such as silt, debris, or intruding connections that were not identified during planning.
- Bypass pumping failure during rehab: During certain rehabilitation works, flows must be diverted using temporary bypass pumps.

6.4. STAKEHOLDER ENGAGEMENT

223. We discuss our engagement with the EA in section 2.6. We will report on any findings from our increased gravity sewer programme in our delivery plans and annual performance report, as well as through our normal engagement with the EA on managing pollution incidents.

224. We do not have any engagement with local planning authorities, as we would not expect to need this. We will still engage with very local stakeholders where these works are expected to be disruptive, using our standard approach to such work.

6.5. DELIVERY PROGRAMME

225. As we describe in section 6.3, we have set out a three-year programme for our gravity sewers, starting from April 2027. We would like Ofwat to confirm funding for all three years of this programme in-period. In response to the “scaling up” risk (identified in the introduction to this section), we have used an increasing profile for delivery.

226. The delivery profile of the additional gravity sewer rehabilitation works will be split between the remaining three years of the AMP as follows:

Rehabilitation Delivered Each Year	Unit	2025-26	2026-27	2027-28	2028-29	2029-30
Base wastewater model funded renewals	km	13.4	26.8	40.2	53.6	67
Asset health base adjustment rehabilitations	km	-	-	18.9	69.2	125.9
Pitch fibre replacements	km	-	-	6.9	25.4	46.1

227. The programme for delivery will feature the following milestones:

Delivery Milestone	Milestone Date
Full investment proposal submission	May 2026
Commence Deliverables for Gateway 0: Programme Initiation	June 2026
Draft investment decision	August 2026
Commence Deliverables for Gateway 1, 2 and 4 (combined): Programme Definition	September 2026
Final investment decision	December 2026
NWL Authorisation for Delivery	January 2027
Instruction to Supply Chain Partners	January 2027
Mobilisation of Supply Chain Partners	Jan – Mar 2027
Commence Works	April 2027

7. ASSURANCE

228. We have provided separate technical and commercial assurance reports from our suitably qualified providers (the same providers as for our delivery plan and large scheme gated processes). These confirm that the proposed investment meets the requirement in the Ofwat guidance.

229. In response to this assurance, we have addressed issues raised by our assurance providers. There are no remaining red or amber issues.

8. APPENDICES

Appendix 1 – NWL Customer Research Report – to be provided separately

Appendix 2 - Gravity Sewers Delivery Risk Register.xlsx

Appendix 3 - Delivery Programme - Asset Health Investment Case - Gravity Sewers.pdf

Appendix 4 - Asset Group Strategy - Sewers.pdf