Asset Health Engineering Justification Framework

Multiple Occupancy Buildings & Complex Distribution Systems

Contents

1. Summary Table

Name of Project	Gas for Multiple Occupancy Buildings and Complex Distribution Systems
Scheme Reference	WWU.29
Primary Investment Driver	Asset Health
Project Initiation Year	2026
Project Close Out Year	2031
Total Installed Cost Estimate (£)	[redacted]
Cost Estimate Accuracy (%)	10% based on significant experience of delivering this work and detailed work and cost records
Project Spend to date (£)	[redacted]
Current Project Stage Gate	Not started
Reporting Table Ref	CV4.02 Maintenance, CV6.09 Risers
Outputs included in RIIO-GT3 and RIIO-GD3 Business Plan	Outputs will be in the NARMs workbook

Spend apportionment 23/24 prices	G2	G3	G4
	[redacted]	[redacted]	[redacted]

2. Executive Summary

In accordance with our RIIO-GD2 commitments, we have completed an inspection programme of above ground gas pipes, known as Risers and Laterals, supplying Multiple Occupancy Buildings (MOBs) within our geography and we have started an inspection programme for the Complex Distribution Systems (CDSs) within our geography. The condition of these pipes has been collected, reviewed and the risk of each asset assessed.

The surveys have resulted in us increasing interventions in RIIO-GD2 to levels above those allowed in the RIIO-GD2 Final Determinations. A summary list of the interventions in RIIO-GD2 can be found in Appendix 1. Our RIIO-GD3 plan is an increase in interventions compared to the RIIO-GD2 average but a continuation of the work we will do in the final 2 years of the current price control.

Our RIIO-GD2 and RIIO-GD3 workload and costs are detailed in the table below.

	RIIO-GD2 Costs (£m)	RIIO-GD2 Workload (No.)	RIIO-GD3 Costs (£m)	RIIO-GD3 Workload (No.)
Planned Replacement	[redacted]	961	[redacted]	3,405
Replacement on Failure	[redacted]	94	[redacted]	0
Planned Refurbishment	[redacted]	0	[redacted]	19
Refurbishment on Failure	[redacted]	0	[redacted]	0
Planned Permanent Isolation	[redacted]	98	[redacted]	210
Permanent Isolation on Failure	[redacted]	30	[redacted]	0
MOB Buy Out	[redacted]	0	[redacted]	23
Riser Pipeline Isolation Valve Surveys	[redacted]	0	[redacted]	4,988
Total – Riser	[redacted]	1,183	[redacted]	8,646
	[redacted]		[redacted]	
Complex Distribution Systems	[redacted]	0	[redacted]	25
Total – CDS	[redacted]	0	[redacted]	25
	[redacted]		[redacted]	
Total	[redacted]	1,183	[redacted]	8,671

Table 1: RIIO-GD2 and RIIO-GD3 workload and costs

An increase in workload in the last 2 years of RIIO2 is a response to the evolving requirements of the Health and Safety Executive (HSE) in relation to the new requirements for higher risk buildings which are regulated by the Building Safety Regulator (BSR) set up under the Building Safety Act 2022, and analysis of our inspection results highlighting action needed to comply with IGEM/G/5 Edition 3, which was first published in 2022 .

RIIO-GD3 Workload continues our proactive programme of replacement of Risers/Laterals, driven by condition and risk assessments and is prioritised using our risk assessment model. Intervention activities are balanced between full replacement where assets are at or beyond end of life, or refurbishment where this is viable and represents a lower whole life cost. We are replacing mild-steel that is end of life and have extended the programme to include polyethylene, copper and other non-compliant Riser/Lateral systems due to recent HSE feedback (after RIIO-GD2 was set) that these are no longer acceptable materials for gas supply to MOBs.

Replacement is with a proprietary stainless-steel press fit solution which minimises installation cost and reduces future inspection/maintenance work, representing a lower whole life cost when compared to alternatives.

In addition, we have included workload associated with removing Riser/Lateral systems from buildings where the MOB/CDS owner decides to cease using gas, or where we are unable to gain permission under, for example, Listed Building Consent to install new Riser/Laterals in accordance with current industry standards (IGEM/G/5 Edition 3). We are experiencing an increasing number of instances where the relevant Planning Authority refuses permission for the installation of new gas infrastructure on Listed Buildings, due to the negative impact on the appearance of a building. In these cases, we will progress a 'buy-out' with the owner(s), funding the cost of switching to electrical appliance for heating, hot water and cooking. This can include extensive work on the electrical infrastructure in the building and in some cases installation of a new supply to the building by the local DNO, funded as part of our buy-out policy.

Delivery of the RIIO-GD3 intervention programme for this asset group will result in enhanced average asset health across the population of Risers/Laterals and an improved level of safety risk. The success of our plan will be measured by the Network Asset Risk Metric (NARM) and by tracking faults and failures on our riser population.

3. Introduction

This project is a balanced on-going programme of inspection, maintenance and replacement of gas riser/lateral systems, and manifolds to ensure compliance with the Pipelines Safety Regulations (PSR) Regulation 13 which states - *The operator shall ensure that a pipeline is maintained in an efficient state, in efficient working order and in good repair*.

Risers/Laterals are above ground gas pipes which we own and operate and which supply gas to properties situated in Multiple Occupancy Buildings (MOBs) or Complex Distribution Systems (CDS). Manifolds are above ground gas pipes before the ECV, typically in meter rooms where banks of gas meters are situated, we are responsible for the pipe work up to the ECV. The individual properties are supplied via outlet pipework, i.e. after the ECV and meter, that is the responsibility of the building/property owner.

MOBs are defined as buildings with at least three storeys, usually in the form of a block of flats although some also house commercial properties, for example a block of flats with shops on the ground floor. MOBs are split into three classifications: Low-rise (3-5 storeys); Medium-rise (6-9 storeys); and High-rise (10+ storeys).

Complex Distribution Systems (CDS) are defined as MOBs which consist entirely of industrial and/or commercial units that do not meet the classification of either a High-rise or Medium-rise building, where supplies are to more than two primary meter points, for example a shopping centre with three or more meter points that are supplied by risers/laterals.

The RIIO-GD3 workplan has been generated from the extensive inspection programme we carried out in RIIO-GD2, and the forecast condition of the population based on expected deterioration rates for riser/lateral systems. This will manage condition and risk and ensure compliance with PSR. Our RIIO-GD3 plan requires an increase in expenditure when compared to RIIO-GD2 average due to the increased work we will undertake.

We utilise a lowest whole-life cost approach to this asset group that will deliver stakeholders' wishes to minimise safety risk, and ensure reliability of supply, as well as the need to remain compliant with key legislation and HSE regulations.

Our plan has been derived utilising our Asset Investment Manager (AIM) risk modelling software, which uses the industry-leading Gurobi optimisation engine to derive an investment programme which delivers our planned outputs at lowest cost. Numerous factors are taken into consideration when selecting assets for proactive interventions, some examples being: the height and material of the riser, where it is located (internal or external) and the condition of the pipework.

In RIIO-GD3, we plan to invest [redacted] to intervene on 1,991 risers and laterals on MOBs, 330 manifolds on MOBs, 25 sites with a CDS, 1,336 sites for Pipeline Isolation Valve compliance and 4,988 sites for riser pipeline isolation valve surveys and identified work.

This paper sets out the workload, associated cost and justifications for this investment programme.

4. Equipment Summary

4.1 Risers and Laterals

Risers are vertical and laterals are horizontal above ground pipes, supplying more than two end users within a single building, that are part of our distribution network. The gas supply is at low pressure (<70mbar) and MOBs and CDS sites are located across all regions of our network. Each riser must have a Pipeline Isolation Valve (PIV) in accordance with industry standard IGEM/G/5 Edition 3. Figure 1 below shows a schematic of a single riser system.

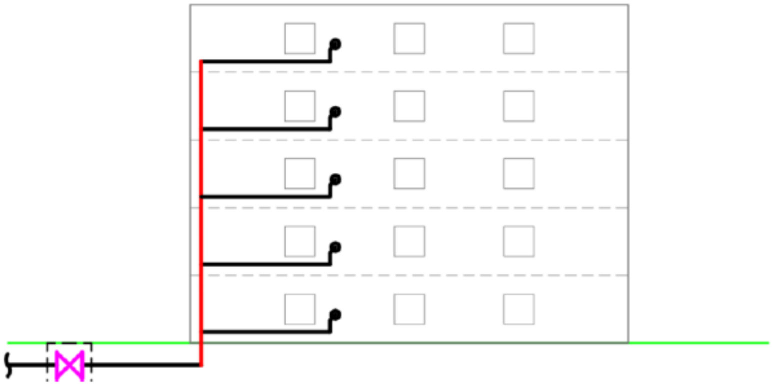


Figure 1: Schematic showing the gas supply to a MOB with a Pipeline Isolation Valve and the single vertical riser with laterals providing gas entries to individual apartments

There can be multiple risers on a MOB, figure 2 below shows some photographs of a multiple riser system on an MOB in our network which has been replaced with stainless steel.

Figure 2: Photographs showing a high-rise MOB in our network with multiple risers and laterals replaced with stainless steel in RIIO-GD2

The riser and lateral system on a single building is generally managed collectively because they generally have common installation dates and are subject to the same environmental conditions. The intervention on these assets does however consider whole and part replacement or refurbishment of individual laterals/risers if this is viable and represents a lower whole life cost.

Compared to other the gas networks we have a relatively small population of large tower blocks within our network, with the bulk of the population we manage categorised as low-rise.

Our population of risers (see Appendix 2) in 2024 is confirmed as:

- High rise (10 storeys and above) – 189 risers (43 MOBs)
- High rise (6-9 storeys) – 271 risers (74 MOBs)
- Low rise (3-5 storeys) – 6,390 risers (2,876 MOBs)

In RIIO-GD1 ICS Consulting provided WWU with a list of 1,489 potential CDS sites in the network (see Appendix 3), rating 88 of the sites as very high risk.

CDS Sites provided by ICS Consulting	
Very High Risk (ICS Rating)	**88**
Surveys completed	76*
High Risk confimed following WWU Survey	*7*
Medium Risk confimed following WWU Survey	*25*
Low Risk confimed following WWU Survey	*44*
Surveys remaining	12
High Risk (ICS Rating)	**192**
Surveys remaining	192

Table 2: CDS Sites with risk ratings

*Following detailed review 25 of the highest risk CDS sites will undergo intervention in RIIO-GD3.

We have prioritised the very high risk rated sites for survey during RIIO-GD2 and we have positively confirmed a population of 76 CDSs to date. 7 of these sites now have a confirmed high risk score, 25 have a medium risk score and 44 have a low risk following our site survey and risk assessment. Noting that our survey programme is less advanced that the survey programme for MOBs and as such, this is a population that will be further refined for accuracy as we progress through our survey schedule, next visiting the 192 sites rated as high risk in the dataset provided by ICS Consulting.

The confirmed investment in RIIO-GD1 and RIIO-GD2 is [redacted] and [redacted] (in 2023/24 prices) respectively.

Details of the planned interventions for MOBs and CDS sites in RIIO-GD3 can be found in Appendix 4 and Appendix 5).

4.2 Manifolds

A manifold installation is defined as three or more primary meter installations in a single compound/enclosure. The meter installations are supplied from a common manifold at the end of a network pipeline. Figure 3 below shows a photograph of a manifold installation in our network. The pipe work after the meter feeds individual premises in the MOB via outlet pie work which is the responsibility of the building/property owner.

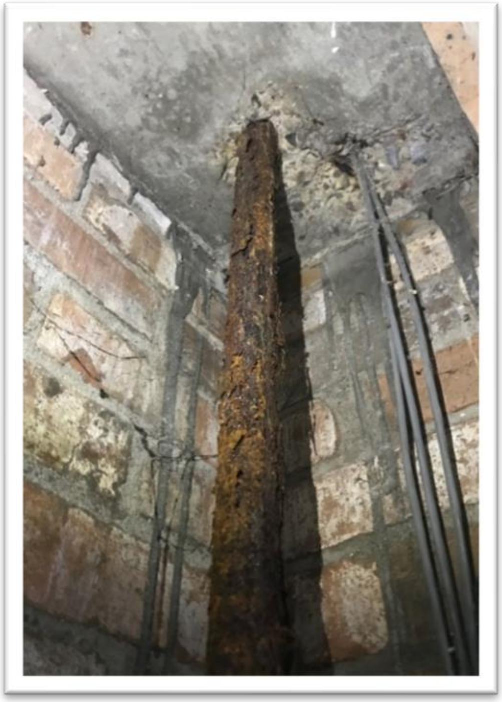
Figure 3: Manifold installation in a dedicated room at ground level

5. Problem/ Opportunity Statement

Our riser intervention programme commenced in RIIO-GD1 to ensure we satisfy our legal duty under the Pipeline Safety Regulations 1996 to ensure all pipes comprising the gas distribution network are ‘maintained in an efficient state, in efficient working order and in good repair’ (PSR Reg.13). This will necessitate carrying out replacement or remedial work on a riser and lateral system on an MOB, or on a manifold that supplies an MOB, where the pipe work is not in good repair.

Our planned work manages deterioration of the population due to mechanisms such as the corrosion of mild-steel gas risers that are exposed to a damp or wet environment or ocean salt causing metal to rust quickly, and during the surveying of some of our coastal MOBs we have seen evidence of this. The photographs in figure 5 show the condition of an MOB in Penarth, Wales (see figure 4 for location).

Figure 4: Northcliffe MOB, Penarth, Wales



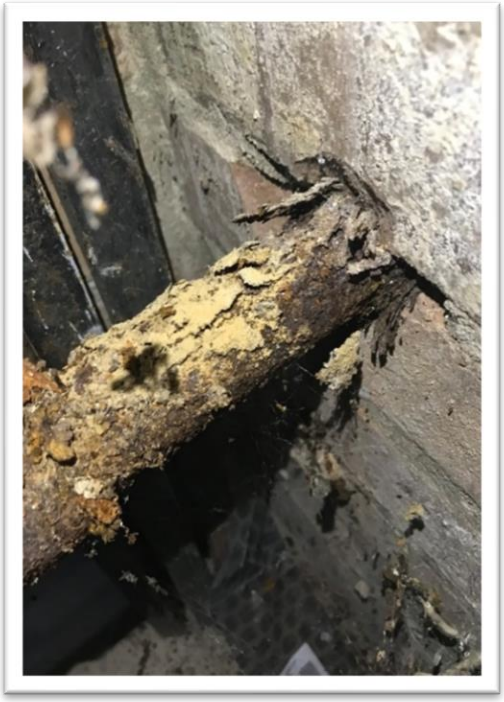


Figure 5: Photographs of corrosion at Northcliffe, Penarth, Wales

The images in figure 6 show the concentration of MOBs within our network within 1 mile of the coast; 56 high rise MOBs and 1,115 low rise MOBs. This represents 39% of our overall MOB population and almost half of our high rise MOBs. This highlights the challenges we have due to the nature of our geography in managing exposed steel pipework.

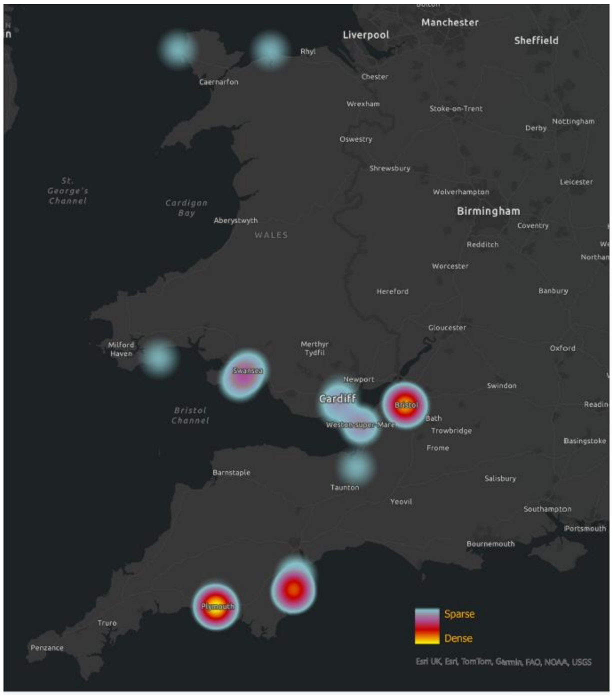
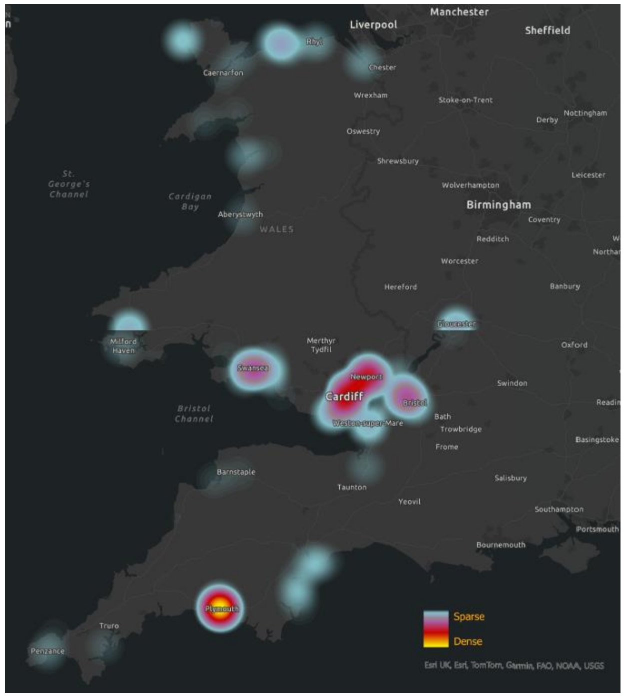


Figure 6: Distribution of High Rise (above) and low rise (below) MOBs in coastal areas of our network.



In addition to corrosion, we also need to invest in supports and fittings to ensure the riser is appropriately supported and cannot fail due to excessive movement of the pipes.

If the condition of risers is not addressed in a timely manner there is a risk of a failure resulting in gas entering a multi-occupancy building. Gas within the building is almost certain in the case of a leaking internal riser systems, and likely in the case of an external leaking riser system.

The proactive replacement of risers in poor condition, but prior to failure, also mitigates the risk of unplanned customer interruptions. This can lead to customers being left without their gas for heating, cooking, or hot water for a considerable period due to the time required to design, gain the relevant permissions, and replace the pipework. These delays are exacerbated where the ownership of the building and individual flats spans different individuals and organisations, and in particular where an MOB is a Listed Building.

The Grenfell Tower fire on 14 June 2017 significantly changed the social risk perception of high-rise MOBs. In July 2018, the Health & Safety Executive took the unprecedented step of issuing a Multi-Occupied Building Topic Inspection Pack, which stated the expectations and legal requirements to be observed by the Gas Transporters, including us. This resulted in 'setting of the bar' of minimum requirements for management of high-rise MOBs.

Along with the other GDNS, we must comply with the requirements of the HSE, as noted above, and those of the Building Safety Regulator (BSR) in England set up under the Building Safety Act

2022. The arrangements for Wales are yet to be confirmed by the devolved administration, however we will need to conform to any variations when they are established.

We continue to invest time to ensure that designs intended for MOBs in our network meet the Building Safety Regulations standards for fire safety. The HSE have undertaken a number of intervention visits to us in recent years and are supportive or our approach having scrutinised the MOB management system and the surveys/inspections we have undertaken of our MOB population. The HSE have indicated support of our plan and ongoing intervention work, with particular interest in; the details of the MOBs that we are prioritising for intervention aligned to our risk ranking, how we manage our PIVs, our records, and how we train our MOB surveyors. The HSE notified us of the next planned intervention to look at the management of assets on MOBs and on buildings with a CDS in Q1 of 2025, demonstrating the high priority of this area with the safety regulator.

There are two additional areas of work that we plan to deliver in RIIO-GD3 in order to meet the compliance of our industry standard (IGEM/G/5 Edition 3); the removal of non compliant materials (i) PE and (ii) copper.

To meet the justified safety requirements there are a number of supporting activities that we must conduct to manage our MOB asset base:

- It is imperative that we continue to inform the Golden Thread (information about a higher-risk building that must be kept by clients, principal designers, principal contractors and accountable persons) and provide associated support when work is required on the risers and laterals located on higher risk buildings in England (7 stories and/or 18 metres and above, with 2 or more residential units). This includes proactive liaison with the Building Owners and the provision of an agreed design and project completion information. In particular, there is additional work and cost in creating and providing Building Owner Packs to Building Owners for their Building Safety Cases (and also the potential for these resulting in intervention work). Our intervention programme includes costs for projects where we, via the Building Owner, need approval from the BSR for our intervention work (including the work to create the application and additional engagement and consulting needed to gain permission to proceed); and lastly, there is further costs associated with the need to engage with additional third parties that may be appointed by a Building Owner as part of their own compliance activities.
- The high-rise MOB population in our geography requires an in-depth post survey review and detailed reports are maintained in accordance with our WW/PR/LC/21A Work Procedure for inspection, maintenance and monitoring of supplies to MOBs. For all MOBs, regardless of their classification, We uphold our role as a responsible network and inform building owners where non-gas-related safety issues are identified by us on site. This process has been initiated in RIIO-GD2, however we recognise the importance of working more closely with building owners, helping them to identify issues and therefore plan to increase support activities for this in RIIO-GD3. This will become more significant in Wales as the Welsh Government has indicated its plans in recent consultation to roll out an even more stringent building safety regime than is currently in place in England.

- We place great importance on the data being collected through our MOB survey programme. We have trained surveyors and a validation process in our Back Office to ensure quality of data. Our Asset Integrity team review and audit the information to define and schedule the programme of intervention based on risk.
- A number of the MOBs in our network hold Listed Building status and hence any work carried out on these buildings has to be in line with tight restrictions to preserve the appearance and/or fabric of the building. In RIIO-GD2, we have managed a small number of replacement projects, following asset failure (leakage), on MOBs that are Listed Buildings. The intervention process for work on a Listed Building is a very time-consuming process for planned and reactive projects due to the planning consent and approval timelines controlled by the local authorities. This is expected to affect more projects in RIIO-GD3 as workload increases on our risk based proactive intervention programme.

Gas in Listed Buildings

Our most recent case at The Paragon in Bath resulted in costs to remove the gas pipework and supply the individual flats with appropriate electric alternatives, through our buyout process, which were significantly above the cost to replace standard riser systems. This followed the local authority refusing permission for us to replace the gas riser on the Listed Building.

We plan to increase resource levels in RIIO-GD3, including external specialist support for completing planning applications and Listed Building consents, to plan projects effectively and to drive a quick response if a riser leaks and consumers are left off gas. Increasingly, the local planning authorities are imposing stricter requirements, in particular for Listed Buildings and for buildings in Conservation Areas and so we have to design replacement solutions which are considerably more detailed and exceed the requirements of the industry standards.

If we cannot obtain listed building consent to undertake the work safely and in accordance with industry standard then we would have no option, but to permanently disconnect a supply - see s.10 of the Gas Act 1986 extract below:

"*S.10 Duty to connect certain premises:*

(9) Nothing in subsection (2) or (3) above shall be taken as requiring a gas transporter to connect, or to maintain the connection of, any premises if—

(a) he is prevented from doing so by circumstances not within his control;

(b) circumstances exist by reason of which his doing so would or might involve danger to the public, and he has taken all such steps as it was reasonable to take both to prevent the circumstances from occurring and to prevent them from having that effect; or ……."

In cases where risers have failed and local planning authorities refuse permission for us to install replacement gas infrastructure that is compliant with industry standard IGEM/G/5 Edition 3, we are left with no option other than to terminate the gas supplies. To ensure a continued energy supply for consumers, we have a Buy-out Process, where we agree with the building owner(s) to terminate supplies and pay for the conversion of heating/cooking to an electric alternative. This results in what would otherwise have been a planned Repex cost becoming an Opex cost for some of the MOB intervention programme and in some cases can be substantially more expensive that the replacement solution. In particular this is the case where the electricity supply to the building needs to be upgraded and electrical infrastructure within the building needs to be replaced to accommodate the increased load of the replacement electric appliances.

Complex Distribution Systems (CDSs)

In RIIO-GD2, we have advanced with our inspections of Complex Distribution Systems. A CDS is a MOB of industrial and/or commercial units that do not meet the classification of either a high rise or medium rise building, where supplies are to more than two primary meter points. The results have highlighted that a degree of intervention is needed on some sites in RIIO-GD3.

As an example, we are currently planning work on Eastgate Shopping Centre, Gloucester (figure 7), which has two risers. Riser 1 is inaccessible and riser 2 has previously been painted but has now corroded. Some of the laterals have severe corrosion (see figure 8), and the pipework on the manifold is in poor condition (see figure 9).

Figure 7: Eastgate Shopping Centre, Gloucester

Figure 8: Lateral one with severe corrosion

Figure 9: Manifold at Eastgate Shopping Centre

Investment Success

The success of the investment in the MOB and CDS programme of work is measured in NARMs and by tracking MOB gas escapes following the removal of the poor condition or non-compliant risers on an MOB.

The table in Figure 10 below shows the success of our investment with details of the volume of risers that we have taken off risk. There have no gas escapes on any of these risers following our interventions.

Monetised Risk Distribution R£m

Year	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total
2022	[redacted]										
2023											
2024											

Figure 10: Risers removed from risk

To date, we have undertaken over 1,200 high rise multi-occupancy building inspections and over 34,000 low rise inspections. At the time of writing, these have resulted in the replacement or refurbishment of 2,229 gas risers, those in the very worst condition.

MOB Population	
Risers	**6850**
*Inspections completed**	*35200*
Risers replaced or refurbished	2229
Risers without intervention to date	4621

Table 3: MOB Population

*Inspection frequency ranges from yearly to every 10 years.

We aim to manage these assets at the lowest whole life cost. Our preferred approach to managing assets is extending life where possible through refurbishment. When intervening on risers, access can be difficult and expensive. it often requires cherry pickers, scaffolding or cranes. This requirement is very similar for either replacement or refurbishment and as this is such a large element of the cost, refurbishment cost can be very similar to replacement but with lower comparative benefits. We base the decision to refurbish or replace on CBA.

5.1 Narrative Real Life Example of Problem

Further details of these Case Studies can be found in Appendix 6.

Example 1 – Countisbury Avenue, Cardiff

This is a low-rise MOB, that was scheduled for a full MOB survey during RIIO-GD2. The assets on this MOB were assessed and the condition factors were put through our risk model to deduce a risk score. The risk score for this MOB was 5.7/10, which, although falls just outside of our high-risk category (a score of 6 and above) as heavy corrosion was noted on the pipework, the project was included within the 2023/2024 programme. To ensure compliance with IGEM/G/5 Edition 3, stainless steel supports were included in the design to be installed, along with a PIV for the riser, and a pipe guard. The photographs in figure 11a below show the original corroded external pipework then the newly installed stainless-steel system (see figure 11b).

Figure 11a: Countisbury Avenue vertical riser on MOB before replacement

Figure 11b: Countisbury Avenue MOB after replacement (new vertical)

Example 2 – Hatherleigh Court, Swindon

This is a high-rise MOB, that was also scheduled for survey during RIIO-GD2. A full replacement of the internal steel riser system was scoped and designed. A new external stainless-steel system, including stainless steel supports, along with a PIV for each riser and a pipe guard was installed in June 2023. The photographs in figure 12 show the corroded pipework and figure 13 shows the extent of the new installation.

Figure 12: Hatherleigh Court, Swindon MOB Riser 1 before replacement

Figure 13: Hatherleigh Court, Swindon MOB Riser 1 after replacement

Example 3 – The Paragon, Bath

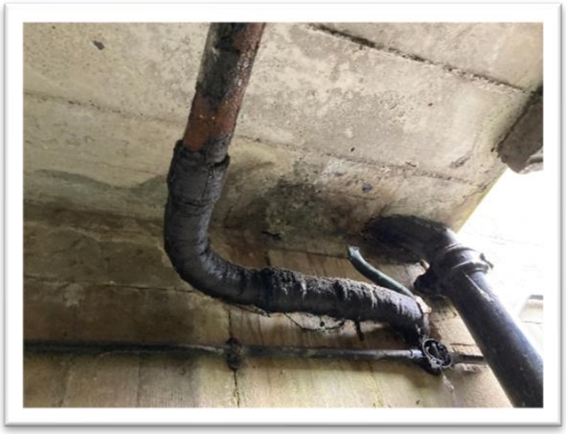


Figure 14: Photograph of The Paragon MOB in Bath and the location of the gas leak

We disconnected the gas supply to the MOB at The Paragon, Bath, following a gas leak on an internal riser (see figure 14). The building is Grade 2 Listed and a full external replacement of the riser system was not possible. The agreed solution involved constructing new supplies to the 3 maisonettes in the MOB via the light-well below pavement level and permanently terminating the gas supply to the remaining 6 flats and agreeing a buy out with the flat owners.

The buy-out value for each flat covered the cost to the flat owners to purchase electrical alternatives for the functions (cooking, heating, hot water) that were previously supplied by gas. We also worked with National Grid Electricity Distribution to upgrade the electricity supply to the building to accommodate the new load.

5.2 Project Boundaries

This paper covers investment relating to risers and laterals but does not cover replacement of mains in the highway that may need to be carried out in conjunction with this work. This is covered in the Non-Mandatory Distribution Mains Replacement Programme Paper and the Mandatory Distribution Mains Replacement Programme (including Services, Consequential Steel, and non-compliant stubs).

6. Probability of Failure

Predicting future performance of assets is critical to the assessment of potential customer interruptions, safety risk and to meaningful Cost Benefit Analysis. To forecast future failures, we assess:

- probability of failure for each riser
- rate of deterioration for the population

The rates of failure have been calculated using actual repair data going back to 2006. We record the cause, component, and repair type for every failure we experience on the network. A typical example for records for riser failure is illustrated in the table below:

Cause	Component	Repair type
Failure	Joint	Replacement

Figure 15: Shows a typical example of failure for risers and the repair type

This detail is recorded in our asset repository (SAP) against the individual asset. This enables us to calculate the annual rate of failure for risers in our network. We use trends over time to derive a deterioration rate to predict future performance.

There are three modes of failure for gas risers – joint failure, corrosion defects, and interference/damage. Our GD1 NARMs modelling used nationally derived failure rates. We updated these in RIIO-GD2 with WWU specific failure rates and continue to use our own rates. This has significantly improved our assessment of risk on these assets.

The probabilities of failure through these modes are presented as a formula which calculates the rate of failure based on the length and material of the gas riser. These formulas have then had a scalar value applied to bring the total number of failures in line with actual recorded totals, thus validating the predicted failure rates.

Joint Nr/Asset/Yr
IF(ASSET_MATERIAL="PE",0.000002403,0.000013265)*ASSET_LENGTH*exp(DYear*IF(ASSET_MATERIAL="PE",joint_det_pe,joint_det_nonpe))*(36.815/2/2.6172500689453428118757934297042)
Interference Nr/Asset/Yr
ASSET_LENGTH*IF(ASSET_MATERIAL="PE",0.00001,0.00000365)*(25.481/2/2.6172500689453428118757934297042)
Corrosion Nr/Asset/Yr
IF(ASSET_MATERIAL="PE",0,0.00027562)*ASSET_LENGTH*exp(DYear*IF(ASSET_MATERIAL="PE",corrosion_det_pe,corrosion_det_nonpe))*(4.801/2/2.6172500689453428118757934297042)

Figure 16: Shows the formulas which calculates the rate of failure based on length and material of the riser.

6.1. Probability of Failure Data Assurance

We have multiple system validations built into our data repository system to ensure this data is accurate and we employ a Data Quality Team to investigate exceptions. For example, if a leak was recorded by a field operative as corrosion on a PE main, this would fail as an unacceptable combination as PE does not corrode. This would flag an exception and the Data Quality Team would contact the operative to understand exactly what was done on site and correct the record. We are therefore highly confident in the accuracy of our pipe failure data used to calculate probability of failures.

Our MOB records are currently held in 2 systems. The core asset data resides in our asset repository, SAP. This is used to issue work and record repairs and investment. Our interruption reporting comes from SAP.

We have a separate database to track inspections and hold condition, consequence and risk data.

This data is fed into our Asset Investment Manager (AIM) software. This is an industry leading tool that pushes the data through statistical assessment to derive the appropriate deterioration rates and then forecast future performance.

The chart below shows the forecast for gas escapes for the riser population. It can be clearly seen how network performance would deteriorate without investment to manage these ageing assets.

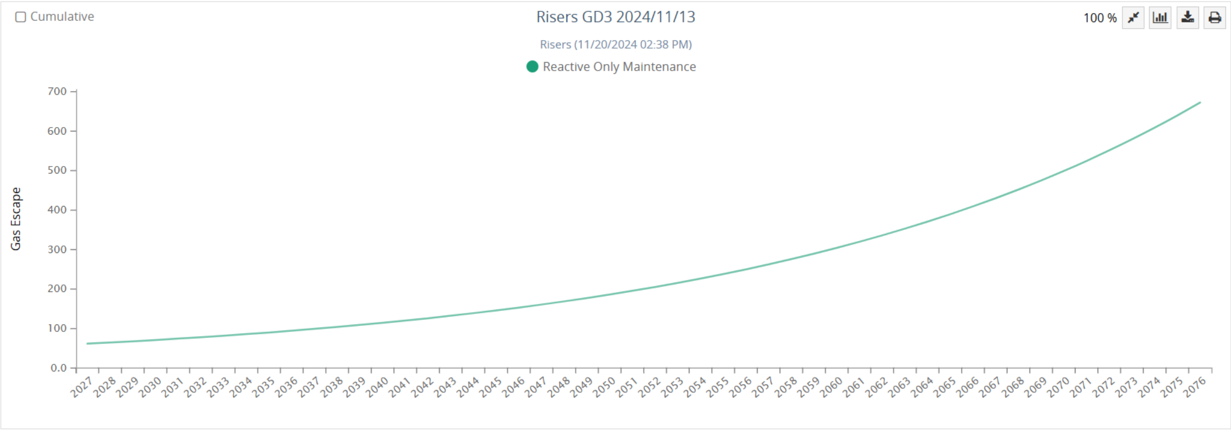


Figure 17: Gas escapes for risers without intervention

7. Consequence of Failure

The major chain of consequences resulting from a failure are a gas escape leading to gas ingress in a multi occupancy building, which in turn leads to an explosion causing a number of fatalities or major injuries, as well as substantial structural damage. This would be catastrophic to those involved and would lead to legal penalties being issued, and huge reputational damage to the company and industry. The records we hold for MOBs include height and number of flats to support our assessment of the consequence of failure and therefore risk for each building.

An extract of our event tree analysis of the consequences of a failure on a riser is illustrated below:

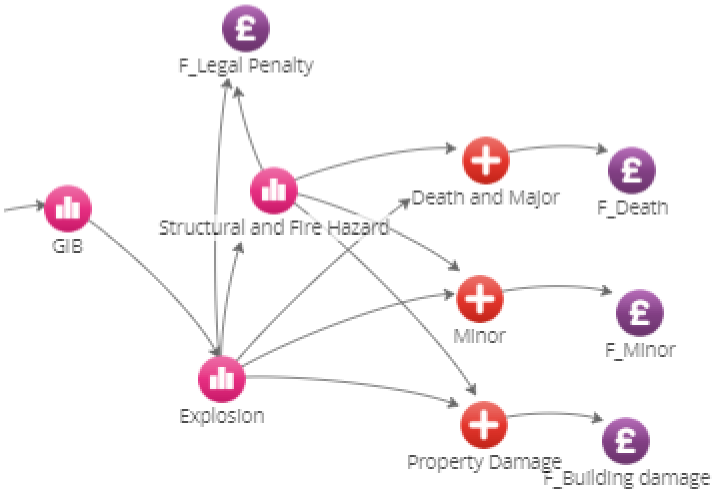


Figure 18: Consequences of failure

The likelihood of a Gas in Building event (GIB) is calculated based on the location of the riser. For an internal riser the likelihood of a GIB following an escape is 1, and for an external riser the likelihood is 0.01. For each GIB, the likelihood of an explosion is calculated using both nationally calculated parameters and company-specific data on the condition and attributes of the riser. The likelihood of a structural and fire hazard incident is based on whether the building features a Ronan Point style construction, whether the walls of the building have been strengthened, and the age of the building. For each explosion and structural/fire incident, the number of deaths is calculated based on the usage of the building, the number of storeys, and the number of supplies. We value a fatality at [redacted], the agreed figure for risk assessment of gas incidents. Multiplying the above probability of consequences (CoF) by probability of failures (PoF) give a likelihood of a death. Applying this likelihood to the [redacted] gives a monetised risk value of fatalities.

The illustration above is one branch of an event tree. For each asset group, there are many branches of failure, consequence and cost combinations assessing safety, reliability, environment and disruption. When all branches are summed together, we get a value of monetised risk for the asset. We can then assess interventions plan that reduce PoF or CoF and produce a new monetised risk value for the asset. The delta in monetised risk before and after intervention gives a value to the intervention. Our AIM software provides a powerful optimisation tool that assesses hundreds of thousands of intervention combinations to produce the optimum investment plan to manage risk on our assets at minimum whole life cost.

Failures of gas risers could also lead to customer interruptions and complaints due to the inconvenience to our consumers. This would incur costs through the Guaranteed Standards of Service penalties.

Additionally, there would be environmental consequences of gas riser failures, due to the leakage of methane into the atmosphere from pipe leaks, and also associated operational expenditure in order to repair any failures that occur, which are substantially larger for gas risers due to the complexity in carrying out the repair. These are factored into the NARM and CBA calculations.

8. Options Considered

Our riser investment plan is made up of 2 key drivers;

- risers connected to mains being replaced in RIIO-GD3 and cannot be transferred to the new main due to condition concerns and
- risers where the assessed condition and risk do not comply with legislation or lead us to replace as this is the lowest whole life cost option.

Risers connected to mains being replaced in RIIO-GD3

As we replace iron and steel mains, we will encounter risers fed from these mains. Our HSE supported policy for managing below 2 bar steel services and risers requires us to replace steel services and risers when replacing the parent mains. For risers, we have a deviation process in place which enables us to reconnect a steel riser to the replacement main if the riser is found to be in good condition. Risers found to be in poor condition and that exceed a standardised score in our prioritisation matrix are added to the scope of the replacement project.

For high rise MOBs the following factors are assessed (maximum score is 28, therefore, total score divided by 2.8 to give a standardised score out of 10):

Max Score	Riser Factor
10	Wall thickness score
5	Pipe environment score
8	Pipe corrosion score
3	Pipe protection score
2	Additional protection score

Table 4: Riser Factor

For low rise MOBs, a visual condition check takes place and the following factors are assessed (maximum score is 33, therefore, total score divided by 3.3 to give a standardised score out of 10):

Pipe Material		Pipe Protection		Pipe Corrosion		Pipe Environment		Section Condition	
Description	Score	Description	Score	Description	Score	Description	Score	Description	Score
Copper	6	GRP Tube	3	None	1	Dry	0	New	1
PE	1	Painted	3	Minimal (surface)	3	Damp	3	Good	3
Steel Galvanised	3	PE Coated	3	Minor (pitted)	6	Wet	6	Fair	4
Steel Plain	3	Wrapped Tape	3	Heavy (flaking)	9			Poor	6
Steel Stainless	3	Other	6						
Other	6	None	6						

Table 5: Low rise MOBs assessment

For high rise and low rise risers, a score of 6+ is high risk. Certain riser conditions including very heavy corrosion may mean that risers with risk scores slightly lower than 6 are included in our programme, particularly if there is a non-compliance with IGEM/G/5 Edition 3 noted in the inspection.

Our forecast volume of risers in this category for replacement in RIIO-GD3 is driven by the number of risers connected to mains in our planned RIIO-GD3 replacement programme multiplied by a factor for the number we historically transfer and the number we replace.

Risers where the condition and risk compromise compliance or lead us to replace as the lowest whole life cost option

We have utilised our Asset Investment Manager (AIM) software to derive this element of our riser investment programme for options 3, 4 and 5 outlined below. This is a powerful optimisation tool, designed to produce programmes of work to deliver a set of outcomes. In this case we have produced a programme with outcomes that maintain safety risk, intervene on the worst condition risers and maintain overall risk at the lowest whole life cost. We broadly maintain risk in preference to letting it increase or reduce, as our stakeholders have told us they are happy with current levels of reliability and safety performance and do not want to pay more to improve.

We set these outcomes as constraints in the AIM model. It then carries out hundreds of thousands of iterations to derive a programme that best meets these outcomes at lowest whole life cost.

Based on the above, our RIIO-GD3 riser investment plan requires investment on 1,991 risers and laterals, 330 manifolds on MOBs, 25 buildings with a CDS, 1,336 sites for Pipeline Isolation Valve compliance and 4988 sites for riser pipeline isolation valve surveys and identified work.

Investment Plan	
(Risers	1991)
Located on MOBs	913
Manifolds (1:1 ratio with the building)	330
CDS Sites (1:1 ratio with the building)	25
PIV Compliance Sites (1:1 ratio with the building)	1336
Sites for PIV Surveys and Identified Work (1:1 ratio with the building)	4988
Total Sites	**7592**

Table 6: Investment Plan

The options assessed to intervene on these assets are laid out below.

1. Do nothing (repair on failure only)
    - This option would involve no investment in risers other than to repair gas escapes as they are reported.

2. Replace on failure
    - This option would involve reactive replacement in risers when gas escapes are reported.

3. Pre-emptively replace high and medium risk condition risers, and all risers constructed in non-compliant materials (copper and PE) with stainless steel.
    - This option involves replacing the existing metallic risers with new stainless-steel pipework, covering both the vertical pipes and horizontal pipes entering the properties.

4. Pre-emptively replace high risk condition risers only.

5. Pre-emptively repair/refurbish all high and medium risk condition risers.
    - This option involves carrying out refurbishment work on the metallic risers, leaving them in situ but with added protection against corrosion, reducing the probability of gas escapes by slowing the deterioration of the pipes.

6. Isolation
    - This option involves permanently removing the gas supply to the MOB when there is no longer a requirement for this to be provided.

7. Buy Out
    - This option involves removing the riser system and compensating consumers to enable them to install alternative heating and cooking facilities.

8.1 First Option Summary

8.1.1 Repair on failure only (do nothing)

This involves repairing risers and laterals on failure, usually following a public reported escape. The riser or lateral will be repaired using the appropriate technique for the riser material and failure mode and left in place. This is not accepted by HSE and is included in our assessment as a counterfactual to investment.

The cost estimate for this option is based on the number of expected failures on the riser population based on the failure rates detailed above. The cost per repair is based on historical costs recorded in RIIO-GD2 against risers and laterals. The costs are recorded against individual assets which allows us to calculate an average cost for repair based on material and length of the riser.

8.1.2 Replace on failure

This involves replacing risers and laterals on failure, usually following a public reported escape. The riser or lateral will be replaced with new stainless-steel pipework.

The cost estimate for this option is based on the number of expected failures on the riser population based on the failure rates detailed above. The costs for this option are derived from a formula based on the number of storeys of the property being intervened on.

The benefit of this option is that the in-year expenditure is less than the other options, because no pro-active expenditure is being applied. This does not comply with PSR requirements or the expectations of our stakeholders.

8.1.3 Pre-emptively replace risers with stainless steel

Replacing with stainless-steel involves the full replacement of metallic (1,311 risers), PE (317 risers) and copper risers (126 risers) and associated laterals with new stainless-steel pipework.

The benefits of this option are a reduction in the risk of the asset population and compliance with legislation.

8.1.4 Pre-emptively repair (corrosion protection)

Corrosion Protection involves the refurbishment of existing metallic risers using a system of corrosion protection. This option features the same workload as the option above.

The benefits of this option are a reduction in the risk of the asset population; by reducing the likelihood of gas escapes occurring, it also reduces the likelihood of the consequences detailed in section 6 from becoming a reality. The downside is the associated cost which is comparable to replacement which offers greater benefits. The costs for this option are derived from historic actual costs and the number of storeys of the property being intervened on.

8.1.5 Isolation

Isolation involves a safe gas supply cut off operation to be undertaken, after which the risers and laterals cease to provide gas to the MOB. This is a lower cost option, is less time consuming and requires fewer materials, however this can only take place when the gas supply is no longer needed for the entire MOB. This can only happen with agreement from residents, which is rarely forthcoming.

8.1.6 Buy Out

Buy Out involves a process whereby WWU would pay customers to switch from gas fired appliances to electric appliances in order to permanently remove the gas supply to the property. This has not been built into the CBA spreadsheet as these are proposed on a case by case basis and normally where all options to restore a compliant gas supply have been exhausted. There is no guarantee that it will be viable for all, or any, multi occupancy buildings. The most significant issue is every consumer in the building has to agree to the Buy Out. During RIIO-GD2, the Buy Out option has been explored when external gas risers have not been accepted by the Local Authority due to the MOB being Listed. 23 Buy Outs of Listed Buildings are expected in RIIO-GD3 due to challenges with permissions and this has been included in our RIIO-GD3 investment planning.

8.2. Options Technical Summary Table

The costs for the proactive intervention options listed above are as follows:

Option Number/Description	First Year Spend	Final Year Spend	Intervention Volume (no.)	Investment Design Life	Total Installed Cost
Replace with stainless steel (condition only)	[redacted]	[redacted]	1,548	50 years	[redacted]
Replace high risk only with stainless steel	[redacted]	[redacted]	546	50 years	[redacted]
Refurbishment only	[redacted]	[redacted]	1,548	15 years	[redacted]

Table 7: Options Technical Summary Table

It should be noted that the CBA for each option only considers pipes being replaced for asset health reasons, it does not include replacement of PE or copper pipes with stainless steel as this is a HSE requirement and therefore not justified by CBA.

The breakdown of the volumes/year for the preferred option (replace with stainless steel) is detailed below:

Intervention	**2027**	**2028**	**2029**	**2030**	**2031**
Risers Replace - Stainless Steel	351	350	351	351	351
Risers Corrosion Protection	1	1	1	1	
Cut Off / Isolation	47	47	46	46	47
Material	2027	2028	2029	2030	2031
Steel	310	310	309	309	310
Copper	26	25	25	25	25
PE	63	63	64	64	63

Table 8: Volumes/year for the preferred option

Options Cost Summary Table

Unit Cost

For RIIO-GD3, we have utilised a very detailed costing process. Our goal is to ensure we have the most robust cost driver information to inform our forecasts and reporting to our stakeholders. The process uses cost component information derived from our actual costs in RIIO-GD2, then applied to our planned RIIO-GD3 programme.

The unit cost is broken down into the contributing units. The table in figure 20 below shows the cost difference between a low rise MOB (3-5 floors), a medium rise (6-9 floors) and a high rise MOB (10+ floors).

[redacted]

Figure 19: Differences in forecasted cost for buildings with different heights

It is important to note that the above examples are based on prime cost from the first principle, site specific estimates and variations produced for real riser replacement projects throughout RIIO-GD2.

We use these costs components to derive a cost per riser for high, medium and low rise buildings, which is then applied to workload forecasts

9. Business Case Outline and Discussion

9.1 Key Business Case Drivers Description

The primary driver for the whole life cost savings compared with the baseline scenario is through reduced risk relating to fatalities, injuries and building damage. Costs and inconvenience for consumers as a result of an interruption to a MOB are also key factors that are monetised for CBA.

9.2 Business Case Summary

Our CBAs have been completed in line with Treasury Green Book Guidance and utilise the Ofgem issued model that is compliant with this guidance.

This graph below shows NPV over time for our considered investment options.

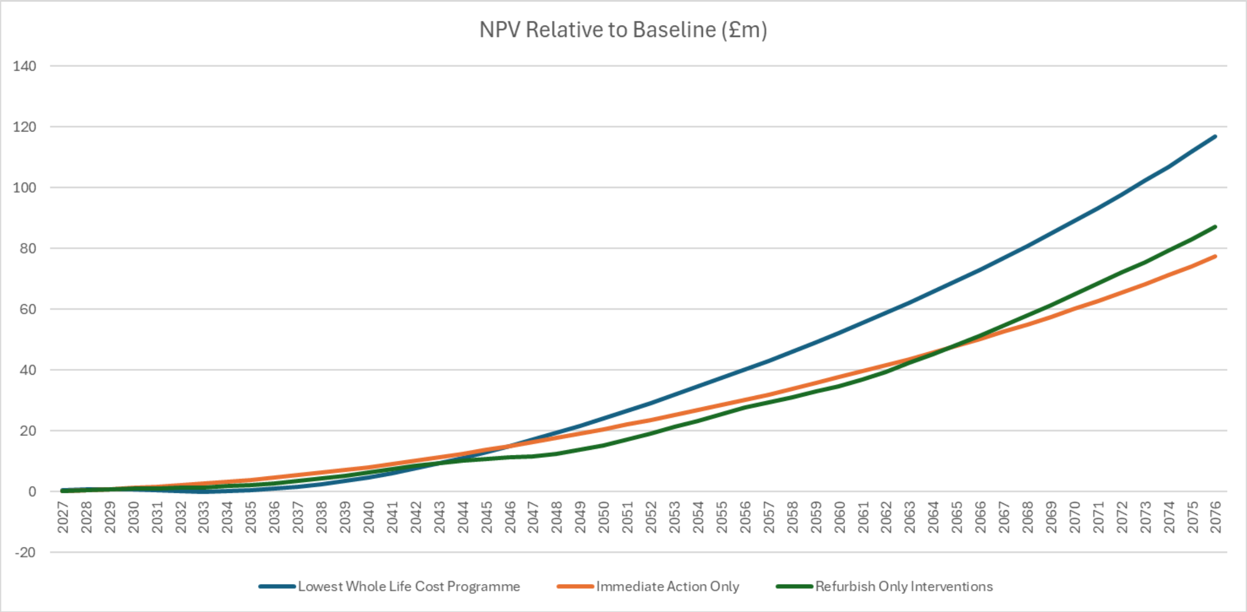


Figure 20: Shows the net benefit relative to baseline costs

The table below is extracted from the Ofgem issued CBA model, populated for our assets and the programmes of work considered. For further detail please see the corresponding CBA models as submitted to Ofgem with the RIIO-GD3 Business Plan.

[redacted]

Figure 21: Shows riser CBA results

It can be seen that our proposed RIIO-GD3 plan pays back by 2035 and has a positive NPV of [redacted]. This has been selected in preference to the refurbishment option and the option to replace high risk risers only as although these discounted options payback sooner, over the medium to long term the pay back is greater.

10. Preferred Option Scope and Project Plan

10.1 Preferred Option

Option 3 is preferred – replace risers with stainless steel. This is proven through the CBA template to be the most cost-effective option in terms of medium to long term payback.

The Corrosion Protection program option has a positive NPV; however the payback is not as great as the preferred option. There are individual risers where we will apply this technique but replacement is the most cost beneficial option and, based on our experience of HSE inspections on risers, this is the option supported by the HSE.

Replacing with stainless-steel involves the full replacement of metallic (1,311 risers), PE (317 risers) and copper risers (126 risers) and associated laterals with new stainless-steel pipework. This option features a workload which has been determined based on the surveyed condition of our asset base, the results of which have indicated which risers are in need of proactive intervention to prevent further deterioration. The workload contains risers supplying both low-rise and high-rise properties and made of steel, PE or copper.

The benefits of this option are a reduction in the risk of the asset population; by reducing the likelihood of gas escapes occurring and the potential unacceptable consequences. The consequences of a gas in buildings incident on an MOB, should there be an ignition, resulting in fire or explosion, could be catastrophic with multiple fatalities due to structural damage to the fabric of the buildings, or the difficulty evacuating large numbers of residents.

This option also delivers compliance with legislation. During RIIO-GD2, the HSE have shown a particular interest in the number of PE riser/lateral systems and the risk of these assets on the network. To respond to this, a new PE riser risk assessment was developed in collaboration with the other UK gas networks. We have now implemented it and it has informed our RIIO-GD3 plan to manage the additional fire risk created by PE risers on a high-rise MOBs. In addition, during the inspection programme in RIIO-GD2, copper inlet pipework has been identified and included in the workload volumes for replacement as this is not a compliant material to be used as part of the gas distribution pipe work on MOBs.

The proactive replacement of risers in poor condition, but prior to failure, also mitigates the risk of unplanned customer interruptions (rather than a minimal duration planned interruption when work is done within a programme), which are measured by Ofgem under GSOP 1 Standard for Supply Restoration, with a target to restore the gas supply within 24 hours. We have experienced cases where the poor condition of metallic risers has given cause to disconnect a gas supply without notice when a riser has leaked, causing an unplanned gas supply interruption.

The costs for this option are derived from historic actual costs and the number of storeys of the property being intervened on.

A list of the risers and CDS sites that have been assessed as in need of future intervention can be found in Appendix 4 and Appendix 5 respectively. It is important to note that these are lists at a point in time when we are still completing a survey programme of our MOBs and CDS sites. As such our intervention programme is designed to be fluid, with a measured risk-based approach, which means that should a higher risk asset be identified (following a survey or a gas leak) an updated risk priority list is created, ensuring that we address the most at risk assets in the population. The priority of intervention for the assets listed in Appendix 4 and Appendix 5 will therefore be continually monitored with yearly workload scoped during the regulatory year prior to project delivery.

The type of intervention (replacement/refurbishment/isolation/buy out) is determined when projects are scoped. As such the workload volume provided in the RIIO-GD3 business plan is a forecast based on actuals during previous years.

As described in this Engineering Justification Framework, the workload volume and associated cost is higher in RIIO-GD3 than in RIIO-GD2. WWU have allocated additional resources to meet the requirements of an increase in workload during the last two years of RIIO-GD2. We plan to maintain workforce levels to meet the continuing trend of workload in this area.

In summary, our preferred programme will improve safety risk from explosions following gas escape, reduce environmental emissions from methane lost to atmosphere and maintain the current low levels of unplanned interruptions of supply to consumers through pipe failures.

10.2 Asset Health Spend Profile

This investment will deliver a monetised risk level of [redacted] for these assets by 2031. This is a reduction in monetised risk of [redacted] compared with the baseline option of reactive only maintenance, [redacted] compared with the option of corrosion protection, and [redacted] compared with the option of intervening on highest risk assets only.

The expected spend profile of the preferred option is as follows:

Year of Spend	Spend (£m)	Volume of Interventions (no. of)
2027	[redacted]	1,733
2028	[redacted]	1,731
2029	[redacted]	1,730
2030	[redacted]	1,731
2031	[redacted]	1,728

Figure 22: Shows the expected spend profile of the preferred option.

2027 Monetised Risk - [redacted]

2031 Without Intervention - [redacted]

2031 With Intervention - [redacted]

10.3 Investment Risk Discussion

10.3.1 Future Energy Scenarios

The future of energy in the UK is not certain over the long term. Future Energy Scenarios (FES) offer a number of pathways to 2050. We have considered these pathways when testing the robustness of our investment plan against future uncertainty, ensuring that it supports all credible pathways and avoids the risk of asset stranding.

The MOB assets identified for proactive intervention have been tested using CBA. This gives a view on the time period over which an investment pays back i.e. at what point in time it becomes lower cost to invest than to not invest. Our test is whether this point in time at which the investment pays back is within the useful lifespan of the asset. If an asset was not expected to be needed as part of the UK energy network until 2040 but not beyond, investment paid back by 2035 remains beneficial to bill payers. If the investment didn't pay back until 2042 then we would consider options to extend asset life within the expectations on us to keep the public safe.

The ongoing role of the gas network and the importance of maintaining resilience and security of supply is widely recognised beyond government, even taking longer term uncertainty into account. For example, all Future of Energy (FES) 2024 scenarios involve at least 20% of homes still on natural gas in 2045, even as many transition to electrification or hydrogen4,5 and NESO's Clean Power 2030 advice on the required gas generation capacity referenced above. As the gas system needs to meet peak demands, substantial infrastructure for safe, reliable supplies will be required even in scenarios where annual throughput may have significantly dropped

All Future Energy Scenarios show a decrease in gas volumes albeit over different time periods and to different scales. If 50% of consumers in a street came off the gas network, the pipes feeding the street would still be required to service the other 50% of consumers, as would the district governors feeding the street, the higher pressure pipes feeding the governor, the PRIs feeding the higher pressure pipes and so on.

This challenge is exasperated by government policy and approach to electrifying heat, where the decision is left to consumers rather than a mandated approach targeted regions. With this approach, it is incredibly unlikely whole areas will leave the gas network in the short and medium term. If it does happen, it will be a much more sporadic move from gas, resulting in a requirement to operate our assets until the last consumer in a region makes a decision to transfer.

Another challenge is FES gives UK wide pathways and does not provide a view and data on the individual GDN regions. This presents significant limitations in its usefulness with very broad assumptions required to influence regional plans.

The chart below shows how previous FES scenarios have not reflected the experienced reality.

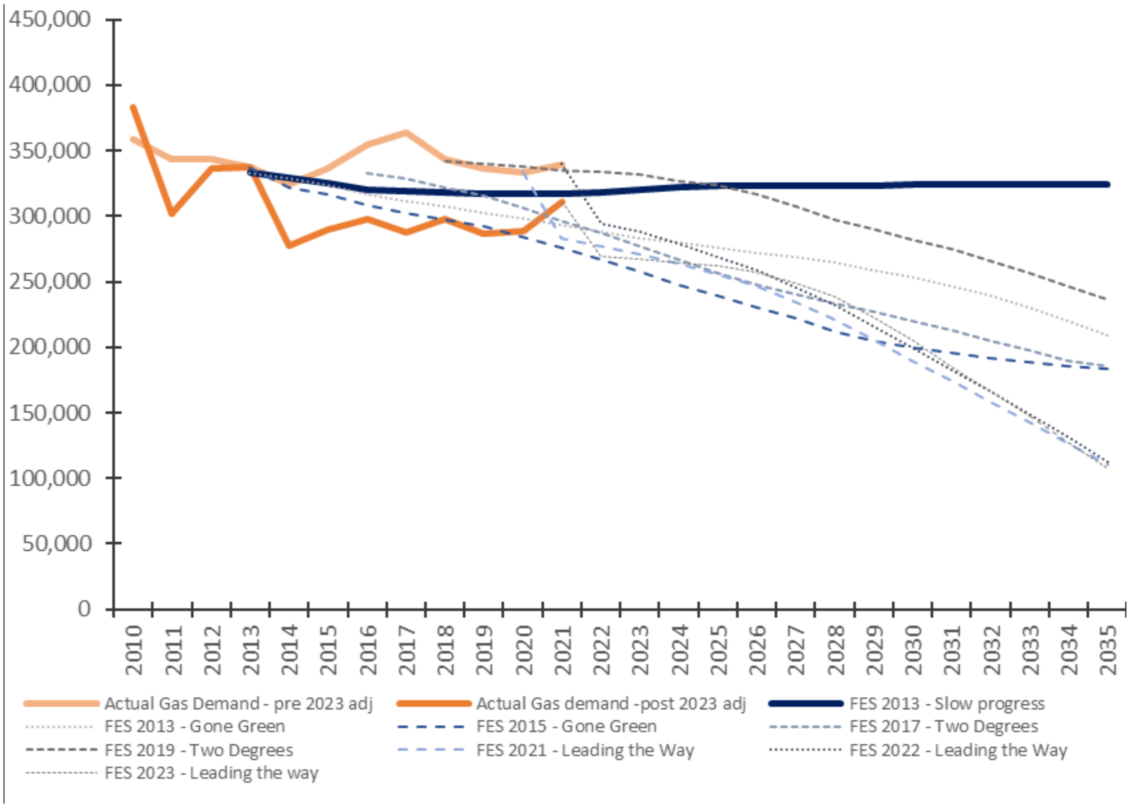


Figure 23: historical residential gas demand against the most optimistic scenario in every 2nd year of publication dating back to 2013

It should be noted that in the 2023 FES scenarios there was an adjustment to historical gas demand figures, as such we have shown historical data both before and after the adjustment to maintain comparability with the original 2013 forecast. ***What is noticeably clear from these graphs is that, to date, the most accurate forecast appears to be the 2013 slow progress. As such it is difficult to have confidence that future forecasts will be any more reliable.***

Due to slower and geographically dispersed take-up of heat pumps, and whilst we wait for the Heat Policy decision, moving to a short payback period cut-off for investments is not compatible with ensuring a safe, resilient, and efficient gas network while we transition to Net Zero. The gas sector collectively believes 25 years as a payback period is more realistic across all scenarios and prudent given the sector’s legislative duties.

To manage sensitivities in delivery costs and benefits, we are using a prudent 20 year period to assess cost and benefits. This means investments paying back within this period can be justified with a high level of confidence.

There is a chance that individual MOBs may opt to move away from gas as an energy source. This risk is minimal based on our experience. That said, as we move to net zero this position could change. To minimise the risk of asset stranding as a result of a change of energy source we engage with building owners and local authority housing associations to understand their future plans. If there is a plan to electrify, we would balance their timelines for this with risk associated with not intervening and tailor our intervention on that building accordingly.

10.3.2 Chosen Workload

The workload has been selected based on thorough analysis of fault and failure data, as well as the latest assessments of health and condition – any changes to workload during RIIO-GD3 would be expected to be primarily driven by building owners and residents

Our AIM risk modelling software, in addition to optimising on whole-life cost, allows for modelling uncertainty in base assumptions and provides confidence bands on key outputs e.g. Monetised Risk:

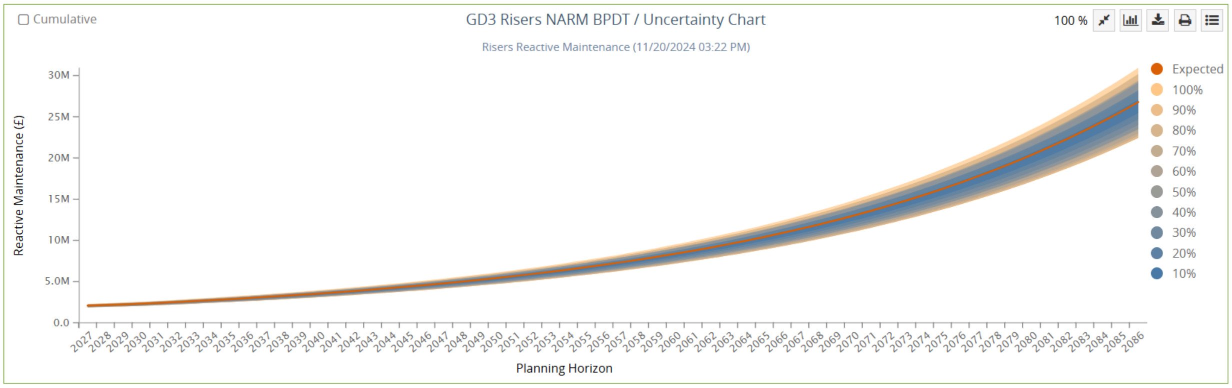


Figure 24: Chart to shows the confidence level in the robustness of our plan

The chart above in figure 25 is an output of the sensitivity analysis provided by the AIM software. This software has tested our planned intervention programme against input sensitivities and has confirmed that within a 90% level of confidence, our plan is robust and would not change due to errors in input data.

10.4 Project Plan

The high level project plan for conception through to completion of all MOB and CDS projects is shown below in figure 26. The cyclical plan shows the survey programmes running alongside the design and build intervention programme, concluding with onsite compliance approval.

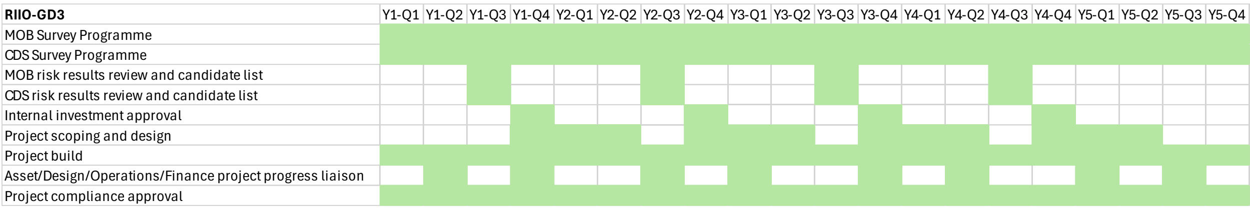


Figure 25: MOB and CDS high level project plan

10.5 Key Business Risks and Opportunities

The table below summarises risks and mitigations related to delivery of our plan for this asset group

Risk Description	Impact	Likelihood	Mitigation/Controls
Programme does not manage risk to required levels	WWU would not be meeting agreed targets for RIIO-GD3	<=10%	We have invested in data and analytics. Probability of failure and deterioration curves have been validated against reality. As long as the physical programme is delivered, this risk is minimal
Risk to delivery timescales	Increased cost to recover programme if falling behind. Benefits to consumers not realised in a timely manner. Wouldn't comply with HSE mandated requirements	<=10%	We have established processes in place to deliver programmes such as this and have successfully delivered in RIIO-GD2. We have a robust workforce resilience strategy as documented in our RIIO-GD3 submission. Delivery of our investment plans are monitored at Exec / CEO level in our organisation
Risk to planned costs	Consumers and WWU paying more than planned for work making it less cost beneficial. If cost is below planned cost, then consumers and WWU benefit from Total Expenditure (Totex) sharing incentive	<=10%	We hold excellent data on these assets, and we scope work well in advance. We have an excellent track record in delivering programmes like these. We operate an insourced delivery model for the bulk of our MOB programme. Therefore, risk is minimal

Table 9: Key Business Risks and Opportunities

10.5.1 Cost Assumptions

The costs for this option are derived from a formula based on the number of storeys of the property being intervened on.

The costs per riser have been derived from our experience of delivering our RIIO-GD1 and RIIO-GD2 riser investment plan and reflect current market conditions. Due to this granular cost assessment, we have a high level of confidence in our forecasts.

10.6 Outputs included in RIIO-GT2/GD2 Plans

Our RIIO-GD2 plan is scoped well in advance and managed through a dedicated PMO function. We carry out resource planning on a 2-year horizon to ensure ability to deliver. For these reasons, risk of non-delivery is minimal and as such, we see no workload carrying over to RIIO-GD3. This is supported by our track record of delivery as evidenced in RIIO-GD2 RRP submissions and supporting narrative.

Appendices

Appendix 1 – RIIO-GD2 MOB Intervention List

Please see 29. Appendix 1

Appendix 2 – Confirmed Riser Population 2024

The sites in this appendix provide details on the MOB population as of 31st March 2024. WWU holds MOB information in different data repositories, so the sites are listed across 4 tabs.

Please see 29. Appendix 2

Appendix 3 – ICS list of CDS Sites

Please see 29. Appendix 3

Appendix 4 – RIIO-GD3 MOB Intervention List

The sites in this appendix have been surveyed during RIIO-GD2 and have been identified for future intervention.

It is important to note that this is a list at a point in time when we are still completing a survey programme of our MOB sites. As such our intervention programme is designed to be fluid, with a measured risk-based approach, which means that should a higher risk asset be identified (following a survey or a gas leak) an updated risk priority list is created, ensuring that we address the most at risk assets in the population. The priority of intervention for the assets listed in Appendix 4 will therefore be continually monitored with yearly workload (including type of intervention) scoped during the regulatory year prior to project delivery.

Please see 29. Appendix 4

Appendix 5 – RIIO-GD3 CDS Intervention List

The sites in this appendix have been surveyed during RIIO-GD2 and have been identified for future intervention.

It is important to note that this is a list at a point in time when we are still completing a survey programme of our CDS sites. As such our intervention programme is designed to be fluid, with a measured risk-based approach, which means that should a higher risk asset be identified (following a survey or a gas leak) an updated risk priority list is created, ensuring that we address the most at risk assets in the population. The priority of intervention for the assets listed in Appendix 5 will therefore be continually monitored with yearly workload (including type of intervention) scoped during the regulatory year prior to project delivery.

Please see 29. Appendix 4

Appendix 6 – Case Studies

Appendix 6 Case Studies

Example 1 – Countisbury Avenue, Cardiff

This is a low-rise MOB, that was scheduled for a full MOB survey during GD2. The assets on this MOB were assessed and the condition factors were put through our risk model to deduce a risk score. The risk score for this MOB was 5.7/10, which falls into our high-risk category. In this case, the decision to replace was driven by risk score, condition assessment, lack of structural supports and evidence of leakage. Our Asset Integrity Team used the site survey information to produce a scope of works that ensured a safe and compliant replacement of the corroded steel system with an external riser and lateral system constructed from stainless steel. The Asset Integrity team worked alongside our Operational Team to cost the scope of the project. This was then programmed into the schedule of our operational team to deliver. To ensure compliance with IGEM/G/5 Edition 3, stainless steel supports were included in the design to be installed, along with a Pipeline Isolation Valve (PIV) for the riser, and a pipe guard. The project was completed in February 2023 and, in line with the governance process we have in place, a final onsite inspection was carried out to ensure that the replacement riser system had been built as designed, and in compliance with IGEM/G/5 Edition 3. The photographs in figure 10a below show the original corroded external pipework then the newly installed stainless-steel system (see figure 10b).

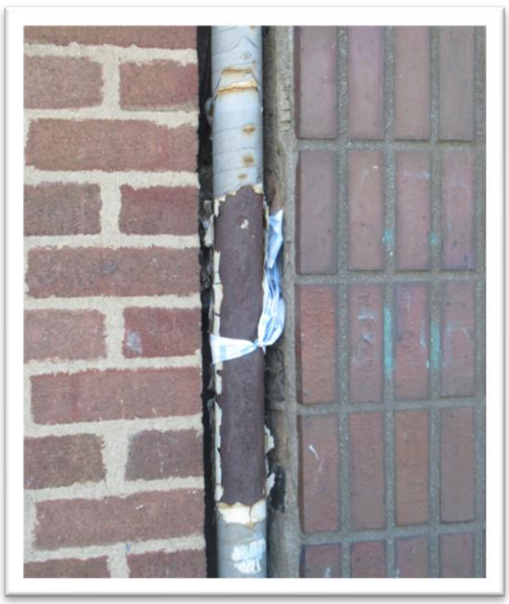


Figure 26: Countisbury Avenue vertical riser on MOB before replacement

Figure 27: Countisbury Avenue MOB after replacement (new vertical)

Example 2 – Hatherleigh Court, Swindon

This is a high-rise MOB, that was also scheduled for survey during GD2. The site survey classified the internal risers as high risk and in need of intervention due to heavy corrosion. In the same manner as the Countisbury Avenue project, our Asset Integrity Team used the site survey information to produce a scope of works that ensured a safe and compliant replacement and worked alongside our Operational Team to cost the scope of the project. A full replacement of the internal steel riser system was scoped and designed. The solution complied with IGEM/G/5 Edition 3 by moving the pipework to the exterior of the building. A new external stainless-steel system, including stainless steel supports, along with a PIV for each riser and a pipe guard was installed in June 2023. The photographs in figure 12 show the corroded pipework and figure 13 shows the extent of the new installation.

Figure 28: Hatherleigh Court, Swindon MOB Riser 1 before replacement

Figure 29: Hatherleigh Court, Swindon MOB Riser 1 after replacement

Example 3 – The Paragon, Bath

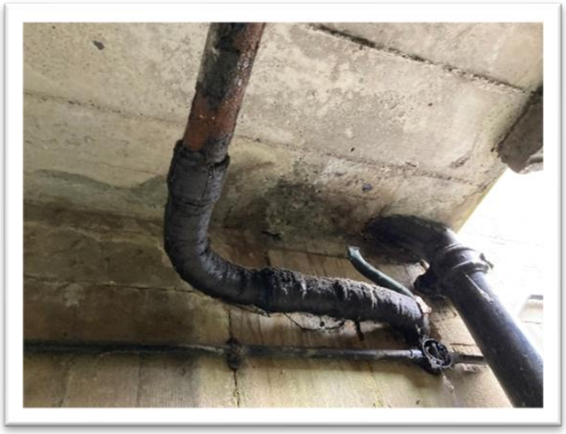


Figure 30: Photograph of The Paragon MOB in Bath and the location of the gas leak

We disconnected the gas supply to the MOB at The Paragon, Bath, following a gas leak on an internal riser (see figure 13). The building is Grade 2 Listed and although it was attempted, we were not successful in gaining planning approval to install a new riser externally, which would have been required to make the installation compliant with IGEM/G/5 Edition 3. A full replacement of the riser system was therefore not possible. We worked with the council to agree a solution that was acceptable to all parties. This involved constructing new supplies to the 3 maisonettes in the MOB via the light-well below pavement level (see figure 15) and permanently terminating the gas supply to the remaining 6 flats and agreeing a buy out with the flat owners.

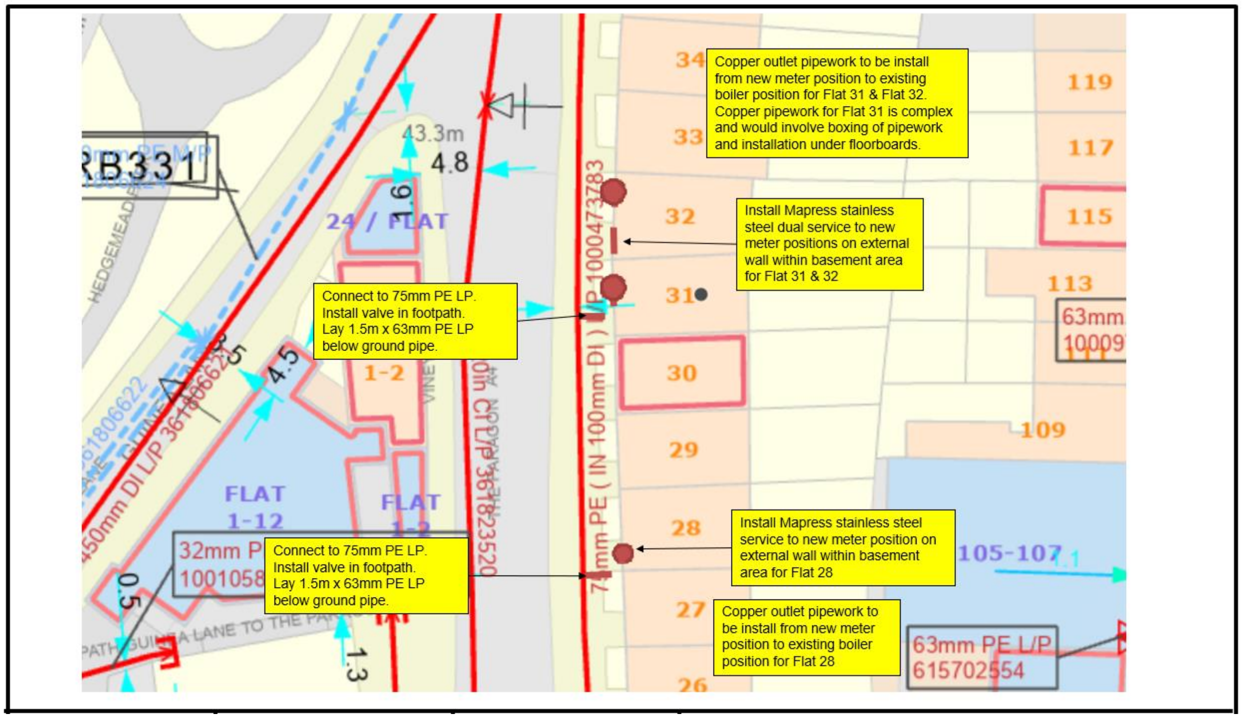


Figure 31: Maisonette design at The Paragon

The buy-out value for each flat covered the cost to the flat owners to purchase electrical alternatives for the functions (cooking, heating, hot water) that were previously supplied by gas. We also worked with National Grid Electricity Distribution to upgrade the electricity supply to the building to accommodate the new load.