Appendix 16A

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GD2 Mains replacement programme

Response to RIIO2 CG Deep Dive Questions

22nd October 2019

WALES&WEST UTILITIES

Appendix 16A

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RIIO2 CG Deep Dive Questions

This paper sets out to answer the questions raised by the RIIO2 CG for deep dive discussion on 31st October 2019. This paper provides further information to support our Wales & West Utilities Business Plan 2021 – 2026, particularly chapters 9 – Cost Efficiency and 16 – The Distribution Network

Tier 1 mains replacement. Please describe for your pipeline population:

1. **your justification for your planned volumes during each year of RIIO-2 and progress towards programme completion.**
2. **your justification for the unit costs you are predicting, and any changes from your RIIO-1 profile.**
3. **the efficiencies and innovations that you have taken into account for RIIO-2, and any additional opportunities or challenges you envisage**
4. **your delivery plan, including the risks and contingencies you have put in place**

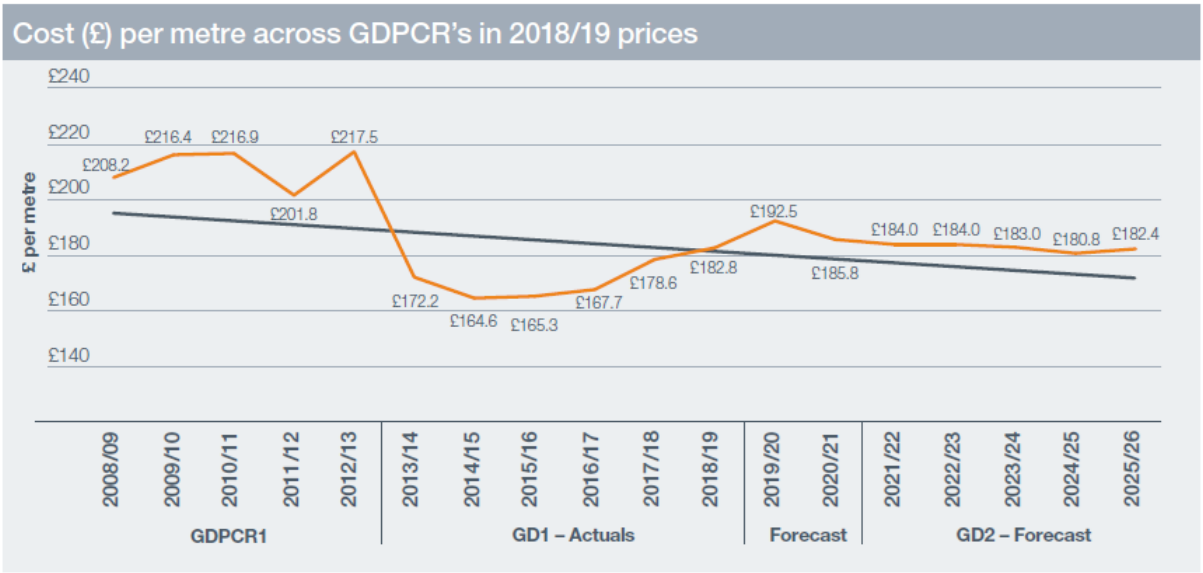
Non-mandatory steel mains replacement (>2"). Please describe for your pipeline population:

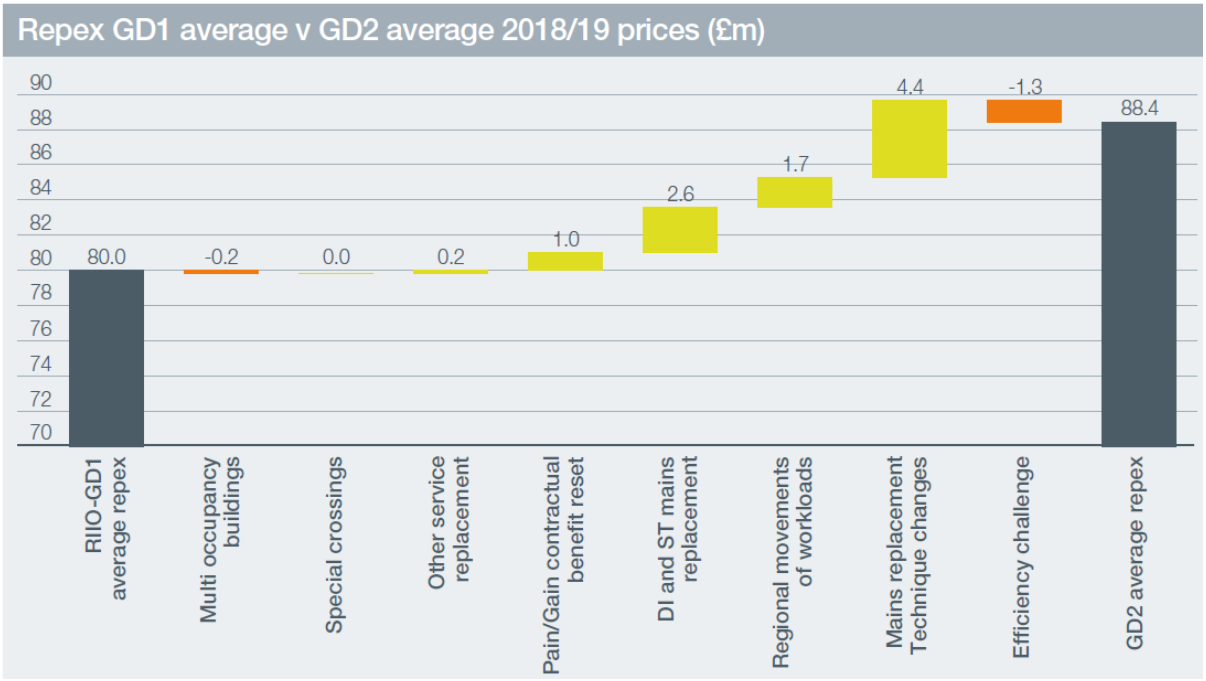
1. **your justification for your planned volumes during each year of RIIO-2 and the intervention methods you have chosen.**
2. **your justification for the unit costs you are predicting, and any changes from your RIIO-1 profile.**
3. **the efficiencies and innovations that you have taken into account for RIIO-2, and any additional opportunities or challenges you envisage**
4. **your delivery plan, including the risks and contingencies you have put in place**

Introduction

Wales & West Utilities replace circa 440km per annum of buried iron and steel mains. The majority of this (324km of iron and 58km of connected<=2" steel) is mandated by the HSE Iron Mains Replacement Programme (IMRP). The remainder is replaced due to high operating cost of repair, significant negative impact on environment from methane emissions as well as the safety risk to the public and our operatives from gas escapes.

The charts below show the movement in the mains replacement unit cost per metre over time and a waterfall of average annual repex costs changes between GD1 average to GD2 average:-





This document provides a deeper dive into these cost movements and describes

- How we derive the programme of works
- Our costing methodology
- Efficiencies and innovation
- Our Delivery Plan

Deriving our Tier 1 replacement programme

Our tier 1 replacement programme is mandated by HSE under the Pipeline Safety Regulations (PSR) section 13a. This states that all iron mains <=8" diameter and within 30m of a building must be decommissioned by 2032.

We have considered phasing the tier 1 programme to 2032 by accelerating the programme to prevent a cliff edge finish. Ofgem has been clear within the repex stakeholder groups that this would have a high bar to justify. We consulted stakeholders and whilst some would like to see earlier completion, other key stakeholders posed significant concerns–

- Local Authorities have told us they are not resourced to support larger programmes of work and have concerns of impact on the public from a ramp up in mains replacement work
- The delivery market has told us it will struggle to resource higher levels of replacement in GD2, particularly the early years

This led us to submit a GD2 plan similar to GD1 with a flat profile of tier 1 replacement work from 2021 to 2026 which will continue out to 2032.

We forecast there will be 3,469km of tier 1 mains to replace in our asset repository at 2021 and the bulk of our annual programme is simply 1/11th of this. (315km per annum)

In addition to the mains in our asset repository, there is an element of dynamic growth. This is made up of 2 elements:

- Iron mains that were previously outside of 30 metres from buildings but have since had properties built within 30 metres
- Iron mains that are discovered through our record error management process

Our experience prior to, and during GD1, is circa 10km per annum of dynamic growth and we have forecast this level going forward.

In summary, our tier 1 programme in GD2 will be 324km per annum. Continuing at this rate through to 2032 will deliver compliance with the HSE Iron Mains Replacement Programme. Delivering a shorter length annually is not acceptable to the HSE. A review of scenarios considered can be found in our Business Plan Chapter 16, Section 9 – Options.

Deriving our >2" Steel replacement programme

Steel mains are not deemed to pose the same high level of safety risk associated with iron due to the typical failure modes releasing lower levels of gas. i.e. mostly pin hole corrosion as opposed to pipe fractures. That said, steel pipes are exhibiting increasing failure rates and are coming under increased scrutiny from HSE. We have held a number of strategy sessions with the HSE and other GDNs in the last 18 months and steel mains have been a consistent agenda item, with HSE challenging the GDNs on our management plans associated with steel pipes.

We have included steel replacement in our GD2 plans based on 2 drivers –

1. Steel pipes in a tier 1 iron project
2. Steel pipes justified by Cost Benefit Analysis (CBA) - mainly due to excessive leakage

We have had a clear steer from general consumers and local authorities to replace whole geographical areas of metallic mains in one visit and avoid leaving metallic pipes that result in further escapes and disruption from unplanned repairs.

However, as mentioned previously, Local Authorities have told us they are not resourced to support larger programmes of work and have concerns of impact on the public from a ramp up in mains replacement work. Also, the delivery market has told us it will struggle to resource higher levels of replacement in GD2, particularly the early years.

We have analysed our GD1 replacement projects to identify the volume of steel in mandatory iron mains projects. This is circa 15km per annum and we have included this level in our GD2 forecast.

Our Cost Benefit Analysis (CBA) assessment shows a clear case to replace steel due to opex costs of repair and the significant environmental impact of methane emissions from steel pipes. The tables below shows CBA payback periods by mains type. Note that 20% of steel replacement pays back in 10 years but almost 98% pays back within 20 years.

	Payback Period			
Tier	**Within 5 years**	**Within 10 years**	**Within 20 years**	**Over 20 years**
Consequential Steel	2.86%	34.84%	96.31%	3.69%
Steel >2"	1.78%	20.14%	97.98%	2.02%
Over 30m	3.07%	14.05%	57.80%	42.20%
Tier 1	2.36%	13.59%	74.43%	25.57%
Tier 2a	7.28%	45.79%	83.04%	16.96%
Tier 2b	3.15%	20.67%	51.12%	48.88%
Tier 3	3.89%	32.78%	80.30%	19.70%

This would lead us to replace the majority of the steel population based purely on a financial assessment. However, stakeholder feedback has resulted in us capping the level of steel replacement at 22km per annum.

Designing an efficient programme for GD2

We have carried out scenario analysis, but the programme planned for GD2 is derived using the following key constraints

- Tier 1 replacement completed by 2032
- Delivery costs held constant to 2032 to prevent increases in future price controls
- Ensuring work is increased where necessary in regions to meet the 2032 target without significant and costly ramp up of resource in future price controls

The programme in our GD2 plan is cost beneficial in the short, medium and long term and is intended to keep delivery cost to consumers flat through to 2032.

Our modelling approach consists of four key steps:

1. A bottom up, pipe by pipe assessment. We have grouped all metallic pipes into efficient projects for delivery using spatial querying and a set of rules. These rules group pipes in close vicinity and of certain types but also cap project sizes to something that is manageable and achievable. These are efficient as the grouping minimises mobilisation and demobilisation time and costs and also keeps connections to a minimum through delivery of the replacement programme.

2. Network Analysis - each project goes through a network analysis process to determine the optimum technique for replacement. This incorporates all relevant innovation and learning from previous projects. We have then costed each project and assessed the benefits in terms of opex, environmental emissions and risk to the public from gas escapes.

3. Programme Optimization - we then load all this data into a programme optimization tool – Asset Investment Manager (AIM). This tool enables us to derive a programme of works with constraints on key parameters.

4. We then assess whether direct labour or our Alliance workforce has the efficient resource available to deliver a particular project. This assessment is part of our overall workload planning process.

Costing our mains replacement programme

We have tested and developed a very detailed costing process and model that uses the concept of cost components to build up a programme cost. Our goal is to ensure we have the most robust cost driver information to inform our forecasts and reporting to our stakeholders.

Workload Identification

- Pipes are identified for the entire GD2 programme out to 2032 when the 30/30 programme completes (excluding dynamic growth)
- These pipes have detailed attributes using spatial queries
    - Existing diameter and material
    - Replacement diameter and method
    - Number and type of services attached to the pipe
    - Region

Additional Parameters

We run the workload through our purpose-built 'Python Programme' which produces the following;

- Connection points of each pipe in the GD2 workload, based on a pre-set criteria, this produces a connection type which is a key cost driver.
- Grid Ref of each activity (Connection, Service, Main Laying) which is then used in a spatial query to identify the surface categories and road classification.

Cost Components

The cost components are produced from first principles using industry and WWU's policies and procedures, providing us with vital safety factors such as minimum excavation size for a given Engineering Operation:-

- WW/PR/ML/1 (Work Procedure for Pipe System Construction)
- WW/PR/GR/1 (Work Procedure for Main Laying - General Requirements)
- WW/PR/SL/1 (Work Procedure for Service Laying)

There are 3 main Cost Components in Mains Replacement;

- Mains Connections – Connection types for all mains arrangements and sizes
- Main Laying – Open Cut and insertion across all diameters
- Services – a suite of service types rolled up into relays of steel services and transfers of PE services

As the components are built from first principles, the sets include very specific cost drivers which include;

- Excavation size
- Pipe & Fittings
- Aggregate Quantities

Outputs

Through multiplying the Workload and Additional Parameters against the specific Cost Component we can estimate the costs at a very granular level by region, this is especially important to take account of the differing rates for activities such as 3rd party services for Reinstatement, Quarry costs etc across our geography.

Summary of cost component model

Cost component	**Method of calculating workload**	**Method of calculating cost**
Pipe and fittings	Based on workload, diameter and connection/service type	Rate per metre/component from current procured contracts
Excavation size	Based on industry policies and procedures - standards	Cost is linked to aggregate quantities
Aggregate quantities	Based on excavation size	Rate per tonne from current procured contracts – including regional rate differences
Connection types	Current working practices for each connection type established	Each connection type has a different complexity of drivers based on pipe and fittings, excavation sizes, aggregates and labour time required.
Services	Based on workload – see design section	Rate per service type based on current working practices
Replacement technique	Based on workload – see design section	Time to excavate for different techniques, aggregate requirements and plant necessary to support technique

Unit costs

Costs are driven from changes in workload, region, and macroeconomic factors. The main impacts moving between RIIO-GD1 and RIIO-GD2 are noted below;

- Start point is the RIIO GD1 efficient cost level
- We have included an efficiency challenge of 0.5% per annum to controllable costs
- Open cut increases from 8% to 20% from GD1 to GD2 – more time required to excavate and backfill work.
- More ductile iron and steel mains workload – more labour time and material costs from working with more complex materials.
- Favourable outsourced contract ending in GD1 – labour costs coupled with supply and demand is pushing up costs of delivery which we are currently protected from.
- Smaller and more diversified projects – leading to less efficiencies and more frequent mobilisation and demobilisation time.
- Regional movements in workload – impact of local quarry fees and travel time to jobs increasing costs.

Efficiencies and Innovation

Using the base unit costs from GD1 ensures we are building in any efficiencies into our future plans. Some of the efficiencies already in our base costs and carried into RIIO-GD2 are detailed below;

- 500m pipe coil trailer – this has allowed us to insert longer lengths of pipe thus reducing the number of excavations/connections required.
- Ductile iron/steel cutter – these materials take longer to cut out than cast iron and this cutter is mitigating some of the increased time to replace this material.
- Vacuum excavator – this allows us to quickly remove materials from excavations saving labour time along with the safety elements improving processes.
- Maximizing insertion techniques – the use of live insertion techniques as opposed to dead insertion, this reduces the customer interruptions to one instead of two. Saving labour time and improves the customer experience.

In addition, there are many innovations that improve the experience for our consumers and the general public.

- Improved communications
- Vulnerable customer support and identification of vulnerable customers in the planning process
- Following customer feedback about communication during our works, we now employ customer support officers who work face to face in the communities we serve both in advance and during replacement projects to support our customers individual needs throughout our work.

Appendix 1 is a case study of these innovations in action on a project in one of the major roads in our geography – Whiteladies Road, Bristol

The delivery plan

We have an excellent track record in delivering mains replacement programmes. We are on track to deliver on our promises in GD1, not only in terms of length abandoned but also the diameter mix set out in the original GD1 plan.

Preparation for GD2 began many years ago and we've gone through a recruitment programme targeted to deliver the tier 1 programme. This includes recruiting 150 new employees across the network to sustain and increase our delivery capacity, including more than 40 new employees in the Cornwall area to deliver our large programme of work in that county.

We are currently engaging with the market and will go through a market testing process for GD2 delivery options in 2020. This includes reviewing an internal model to deliver work with a direct labour workforce.

Our plans for GD2 are very detailed and informed by huge levels of intelligence on the work to be delivered. For every pipe we know the road type, replacement diameter, technique and service numbers. We also know the other pipes in the vicinity that could form an efficient project. This in-depth understanding of the work to be delivered at the planning stage significantly minimises the chance of delivery shocks. The table below lays out key risks and mitigations;

Key delivery risks and mitigations

Risk Description	Impact	Likelihood	Mitigation/Controls
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	<=20%	We have established processes in place to deliver programmes such as this and have successfully delivered in GD1. We have a robust workforce resilience strategy as documented in our GD2 narrative. 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 totex sharing incentive	<=20%	We have an excellent track record in delivering mains replacement programmes. We hold very detailed data on individual pipes and projects which have enabled us to cost at a very detailed level. Our forecast costs reflect the current labour market and all other challenges in delivering this programme
Cancelled schemes	Low impact as relatively easy to substitute other replacement schemes in with similar value	<=20%	There are often challenges relating to delivering mains and service replacement including competing with other utilities to enter areas and local authority works. To mitigate risk we engage with Local Authorities at the earliest opportunity to plan works. we also have mains replacement schemes planned in reserve that can be substituted in at relatively short notice

Appendix 1 – Innovation in action on Whiteladies Road, Bristol