

Diversions Re-opener

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1 Introduction

1.1 Executive Summary

This application is for the purpose of SGN's Diversions policy Re-opener for our Scotland Network. Within this document is a detailed demonstration of our strategic approach and rationale behind seeking approval for diversions projects, specifically Cowdenhill Quarry, Meadowhill Quarry, and diversions associated with Below 7bar Washouts. As well as informing of requirement for additional funding for an ongoing diversion at Pitcairngreen to Huntingtower and a potential loss of development claim at Moorfield Kilmarnock.

In adherence to our licence obligation, we have initiated a Re-opener application under Special Condition 3.20. The primary objective is to secure a funding allocation of [REDACTED] in 18/19 prices for these safety critical diversion projects. This financial request encompasses a spectrum of capital project costs, encompassing engineering design, procurement, project management, contractor expenses, specialist services, and legal costs.

Table 1: Table of Requirements

| Application Section | Licence Condition / Re-opener guidance |
|---------------------|--|
| 1.2,2-5 | Needs Case / Problem statement |
| 1.1 | Alignment with Business strategy |
| 1.4-1.8 | Engineering justifications |
| 1.10 | Stakeholder engagement and whole systems Opportunities |
| 2.5-2.8, 2.15 | Programme delivery |
| 2.5,4.1, 4.3 | Long List and Short list of Options |
| 4, 5 | Methodology and preferred option |
| 2.13-2.14, 3, 4.3 | Cost Information |

1.2 General Background

Licence Condition

As part of the Final determination for GD2, licence condition 3.20 was set for Diversions and Loss of Development Claims with the objective of calculating the DIVt (Diversions policy Re-opener term) which contributes to the Totex Allowance calculation. This condition establishes a Re-opener triggered by the licensee in the presence of significant additional Diversion Costs, Loss of Development Claims, or costs associated with rectifying damage to Network Assets from soil erosion.

As set out in the special conditions, the licensee can seek a direction from the Authority for adjusting the value of the DIVt term during any Regulatory Year within the Price Control Period, specifically for additional:

- (a) Diversion Costs.
- (b) Loss of Development Claims; or
- (c) costs of diverting gas assets due to adverse environmental factors.

This application is time bound to between 25th January 2024 and 31st January 2024, and during such later periods as the authority may direct.

As stated in Table 1, we have adhered to the requirements stated in the licence for the application of a Diversions policy Re-opener and followed the RIIO-2 Re-opener Guidance and Application Requirements Document as closely as reasonably possible.

1.3 Site Specific Background

Detailed information for the projects, Cowdenhill Quarry, Meadowhill Quarry, and Below 7bar Washouts, can be found in their respective Engineering Justification Papers (EJPs) located in the appendices (Appendix A, B & C) which is summarised below. There is also a summary of the washout at Pitcairngreen to Huntingtower where we are seeking additional funding to remediate the damage caused to the reinforcement pipeline. For the loss of development claim at Moorfield Kilmarnock, we are awaiting a legal judgement and has submitted on the basis of 'nil' value. If the judgement goes against us, we are looking to update that value on the basis of the court decision.

Cowdenhill Quarry

We are seeking [REDACTED] (18/19 values) in capital investment to fully fund F05 (pipeline codename) Cowdenhill Quarry Diversion, delivered in RIIO-GD2. F05 involves a 69barg 450mm pipeline running from Glenmavis Offtake in North Lanarkshire to Letham Moss PRS between Stirling and Falkirk. This pipeline serves as the backbone of Scotland's Central Transmission System for the Central Belt and Fife.

This diversion was necessary after the Cowdenhill Quarry encroached to close to the pipeline and where a geotechnical assessment had determined that instability in the quarry face placed the pipeline at risk and necessitated the diversion.

Following SGN reaching an understanding of the extent of the damage to the pipeline, SGN raised an action against the quarry operator and their insurer in 2014 to recover the associated costs. The insurer withdrew from the case early 2017, claiming that the loss was not insurable. The Quarry Operator liquidated the company on the 14th of June 2017.

Neither the quarry operator nor the operator's insurance companies defended the case in court. SGN obtained decree from the court on the 15th of November 2017 for payment of [REDACTED] against the quarry operator. Penalty interest is also due on these sums from the date of decree until payment.

A legal debate occurred in October of 2023 to ascertain the possibility of SGN recovering the costs of these works from the insurance company. SGN are imminently awaiting a report on the outcome of this debate which will influence future actions in regard to options for cost recovery.

After 10 years of legal proceedings, it is uncertain whether cost recovery will be possible. At the conclusion of proceedings, the total allowance sought will be equivalent to the total expenditure less any recovered costs. We will update on the outcome of this report by the re-opener draft determination.

We are submitting this reopener claim under 3.20.4 (a) diversion costs.

The 605m diversion, was completed in FY 22/23 at a direct cost of [REDACTED] (18/19 values) and commissioned in July 2022. The work was necessary to address integrity risks posed by the adjacent Cowdenhill Quarry.

Meadowhill Quarry

We are seeking funding of [REDACTED] (18/19 values) for Project F01, the Meadowhill Quarry Diversion under RIIO-GD2. F01 involves a 69barg 450mm pipeline serving as the backbone of Scotland's Central Transmission System, extending from Westfield PRS in Fife to the Valve Compound north of the River Forth at Inch of Ferryton.

This project is prompted by a 2020 incident, where torrential rain caused a washout between the Black Devon River and Meadowhill Quarry, leading to a complete loss of lateral and bedding support causing the pipeline to be exposed ('free spanning'). The capital investment covers both the short-term intervention (commissioned in FY 21/22) and the long-term permanent diversion (planned for FY 25/26).

The preferred diversion route is to lay 1520m of 450mm pipe. It would be primarily installed by open cut, with the Black Devon River Crossings installed through Horizontal Directional Drills.

We are submitting this reopener claim under 3.20.4 (c) costs of diverting gas assets due to adverse environmental factors.

Pitcairngreen to Huntingtower Diversion Washout

On 8th October 2023 heavy rainfall in Scotland caused significant flooding around the country. It was reported that the rainfall during the 36-hour period was equal in some locations to a months' worth of rainfall.

This volume of rainfall resulted in a significant washout of material, exposing a section of the newly laid replacement 150NB Pitcairngreen to Huntingtower high pressure pipeline, at a location adjacent to the Gelly Burn, Pitcairngreen

The 'T8 Pitcairngreen to Huntingtower – R04 and R05' was a capital project identified for completion within RIIO-GD2 with an allowance value of [REDACTED]. Following the rainfall event, the cost of remediation is anticipated to cost [REDACTED] (all 18/19 values) in addition to the project cost, which is already over the allowances awarded.

Given the timing of the washout and the reopener window, we are currently working on the technical options assessment and propose to submit an updated cost estimate either prior to or as a part of the draft determination. AtkinsRealis are currently commissioned to review the consequences of the event and propose potential solutions and recommendations to address the erosion observed on site.

We are submitting this reopener claim under 3.20.4 (c) costs of diverting gas assets due to adverse environmental factors.

Below 7bar Washouts

We are seeking [REDACTED] (18/19 values) in funding for remediation work required for below 7bar river crossings in Scotland which have/potentially suffered washouts during RIIO-GD2 due to soil erosion. These washouts are split into the following groups:

1. Known Washouts - Complete/Planned

- There have been 10 known washouts where work has been carried out or is currently planned in to repair the damage caused. These sites have primarily been remediated through rock dumping.
- The known costs for this work comes to [REDACTED].

2. Known Washouts – Planning Stage

- There is currently only one washout in Brechin where the remediation process has not been fully planned in.
- A short-term solution to remediate the site is expected to only cost [REDACTED], however following this if it is determined that the pipe requires to be diverted this could increase by at least tenfold.

3. Unknown Washouts

- Following Storm Babet which caused a massive increase in river flow and widespread flooding in the Northeast of Scotland it has been predicted that up to 150 river crossings in

this region will have suffered damage and require remediation. We haven't been unable to fully inspect these sites as many of these sites are still submerged as river levels remain high.

- Costs for unknown washouts have been calculated based on the costs associated with the remediation of washouts already carried out within the GD2 period. This has been based on repair of the site rather than full diversion and as with the above washout at Brechin if it is identified that full diversion is required this cost could increase tenfold.
- We have identified 29 crossings which were located in red weather warning areas of the storm, we expect as many as 80% of these assets to require some amount of remediation work at a cost of [REDACTED].
- There are a further 121 crossing located in the amber region where we expect up to half to require remediation at a cost of [REDACTED].
- The sites requiring remediation from the 150 crossings still to be surveyed will be confirmed by the re-opener draft determination.

Throughout GD2, SGN has faced challenges related to pipes and supporting structures crossing rivers, with heightened issues of riverbank erosion due to increased river flow. This has exposed pipes to river forces, potential debris damage, and environmental conditions beyond design parameters. Pipe bridges and similar structures have also suffered erosion or damage from floodwaters.

Coastal and river erosion pose significant risks, affecting pipes originally designed for burial or above ground installation by altering the intended environment reducing the effectiveness of protective systems.

Remedial work is essential to counteract environmental erosion effects on the network. This is critical to prevent deterioration and potential damage, especially in fast-flowing rivers where exposed pipelines face debris risks and collapse without normal support. Failures, particularly where the pipeline is operated at MP or IP, could be catastrophic, impacting a significant number of customers.

We are submitting this reopener claim under 3.20.4 (c) costs of diverting gas assets due to adverse environmental factors.

Loss of Development Claim 'Moorfield Kilmarnock'

In many of SGN's Deeds of Servitude for pipelines a 'Loss of Development' provision is included which is essentially an obligation to compensate the landowner for justifiable loss of profit from a development that would have occurred if it weren't for the servitude. Generally, the presence of pipelines potentially affects developments in proximity to pipelines in the following ways:

- The Deed of Servitude for the Pipelines constitutes a strip of land centred on the pipeline route and generally of a width of forty feet (approximately 12m). This area is to be unrestricted for access for activities including maintenance, repair, pipe laying etc.
- Building Proximity Distances, HSE's Land Use Planning methodology is used to determine whether to advise against development within proximity to Major Accident Hazard Pipelines or Sites. This methodology includes the definition of consultation zones (inner, middle, and outer) which are of different sizes and have different planning restrictions. Generally, the development of any housing (i.e., normally occupied buildings) within the Inner Zone is disallowed (i.e., the HSE will advise the planning authority against this development).

SGN have received communication about a 'Loss of Development' claim for compensation relating to a parcel of land to West of Kilmarnock which is approximately 4.62 hectares in area. The proposed development is for Housing and associated infrastructure.

Two parallel Major Accident Hazard Pipelines run through the length of the site (reference numbers E25 and E81). There is also further associated pipework to the North of the site which constitutes a buried 'Pigging Facility' for receiving pigs at the end of an In Line Inspection.

The developer has raised a claim against us in the Court of Session for a sum of [REDACTED] (18/19 values). The court case has been sisted (put on hold) pending negotiation. A revised statement of claim from the developer has stated a reduced claim of [REDACTED] (18/19 values). At this stage the claim is being assessed legally and assuming it is legally justified will then require to be properly evaluated to quantify the extent of the loss.

We are currently challenging the claim through appropriate legal processes. There is a risk that the court process does not rule in our favour, and we have to pay a loss of development claim amount. In this instance we would propose to submit a 'zero value' in at this stage and then to update the re-opener to take into account this outcome in the draft determination.

Table 2: Summary of projects.

| Project | Value (£m 18/19) | Basis of reopener |
|--|---------------------|--|
| Cowdenhill Quarry | [REDACTED] | (a) Diversion cost due to quarry encroachment and geological instability |
| Meadowhill Quarry | [REDACTED] | (c) costs of diverting gas assets due to adverse environmental factors. |
| Pitcairngreen to Huntingtower diversion washout | [REDACTED] | (c) costs of diverting gas assets due to adverse environmental factors. |
| Below 7 bar washouts | [REDACTED] | (c) costs of diverting gas assets due to adverse environmental factors. |
| Loss of Development Claim 'Moorfield Kilmarnock' | - [REDACTED] | (d) loss of development claims |
| Total Request | [REDACTED] | |

1.4 Stakeholder Engagement

The Ofgem Re-opener Guidance and Application Requirements Document does not require us to seek stakeholder engagement where there is a statutory obligation, as the below quote shows:

3.17 Stakeholder engagement may not be necessary where there is not a material impact on stakeholders, or where the application is driven by statutory obligations. In these circumstances a brief explanation of why stakeholder engagement was not considered appropriate must be provided.

As part of our ongoing consumer and stakeholder engagement, SGN have maintained the Customer and Stakeholder Engagement Group (CSEG) throughout GD2 as an Independent Stakeholder Group. This group has been established as a forum to both discuss delivery of our RIIO GD2 commitments, future workload proposals for the next regulatory period, customer focused initiatives and stakeholder led interests.

As part of our preparation for this submission, our initial programme of works and proposed plan for the submission of a re-opener was introduced to the CSEG in the March of 2022, it was recognised that this was a mandatory workload, with clear safety drivers. In November 2023 the CSEG were reminded of our plans to submit a Diversions re-opener within the January 2024 window.

2 Problem Statement

As outlined in the introduction, the requirement to undertake this work arises from a combination of third-party negligence and environmental factors. These issues have resulted in large scale diversions and other remediation techniques to address the problems effectively, ensuring the establishment of a safe and secure network in alignment with our License obligations and Pipeline Safety Regulations. Detailed project and engineering information can be found within their respective EJP located in appendices A, B & C. The washout on the diverted Pitcairngreen to Huntingtower pipeline does not have an EJP due to the recency of the event.

2.1 Cowdenhill Quarry

Why are we doing this work and what happens if we do nothing?

F05 is the codename of a 69barg 450mm pipeline, serving as the 'backbone' of Scotland's Central Transmission System with the pipeline supplying energy to over 500,000 customers in the Central Belt and Fife. The need for a 605m diversion surfaced due to integrity risks associated with the adjacent Cowdenhill Quarry, situated approximately 1km northwest of Banknock near Falkirk.

Originating from the Glenmavis Offtake in North Lanarkshire and terminating at Letham Moss PRS between Stirling and Falkirk, F05 crosses farmland adjacent to the former Cowdenhill Quarry. Although the quarry ceased operations in 2011, the excavation activities had brought it within 5 meters of the pipeline as can be seen in Figure 1.



Figure 1: Route of pipeline in proximity to Cowdenhill Quarry (pre-diversion)

SGN conducted a site visit to the quarry in 2011, just prior to its closure, where concerns were raised to the quarry operator about the stability of the face adjacent to the pipeline. Despite requesting a Geotechnical Assessment, the necessary information was not provided, as is required by the Quarries

Regulations for proper quarry management. Subsequently, communication with SGN has been via legal channels after the quarry's closure.

Due to concerns about the loss of the Servitude access strip and visible signs of instability, SGN commissioned [REDACTED] to conduct a detailed assessment of the quarry face's stability based on site boreholes. The findings revealed an unacceptable stability factor of safety, indicating a credible risk of collapse. The loss of this pipeline would have constrained gas supplies from Glenmavis and Drum Oftakes, critical for supplying the Central Belt of Scotland.

To mitigate the risk of pipeline failure, a permanent diversion at Cowdenhill Quarry was implemented. This solution, consistent with SGN's strategy to ensure security of supply, establishes a sufficient separation distance from the quarry face, eliminating any credible risk of influence from future collapse and maintaining SGN's compliance with License Conditions and Pipeline Safety Regulations.

SGN are actively involved in legal proceedings to recover associated costs with the damage to the pipeline's servitude strip caused by extensive quarrying. Cost recovery through this mechanism remains unguaranteed, therefore it may be required to seek allowance for these works from the regulator. In 2017 a court action against the quarry operator, SGN was granted a decree for the sum of [REDACTED]; however, the operating company went into administration. SGN has pursued compensation through claims against the former operator's insurance company, but it is unlikely that cost recovery will be achievable. However, we are awaiting an imminent update on a legal challenge in court which will influence the outcome of possible cost recovery options, we will update on the outcome in the re-opener draft determination.

What is the outcome that we want to achieve?

Our primary goal is to ensure the secure and uninterrupted operation of the pipeline F05. A critical aspect of this involves the diversion of approximately 605m of the pipeline, which is constructed using 450NB 15.9mm ("Heavy Wall") pipe of grade L415MB. The replacement pipeline maintains the same diameter as the existing one and has been constructed with the capability to conduct In-Line Inspections (ILI) along the entire route.

The selection of the new diversion route prioritises the elimination of any credible risk posed to the pipeline by the potential collapse of the quarry face as shown in Figure 2, whilst also minimising the total length of the diversion.

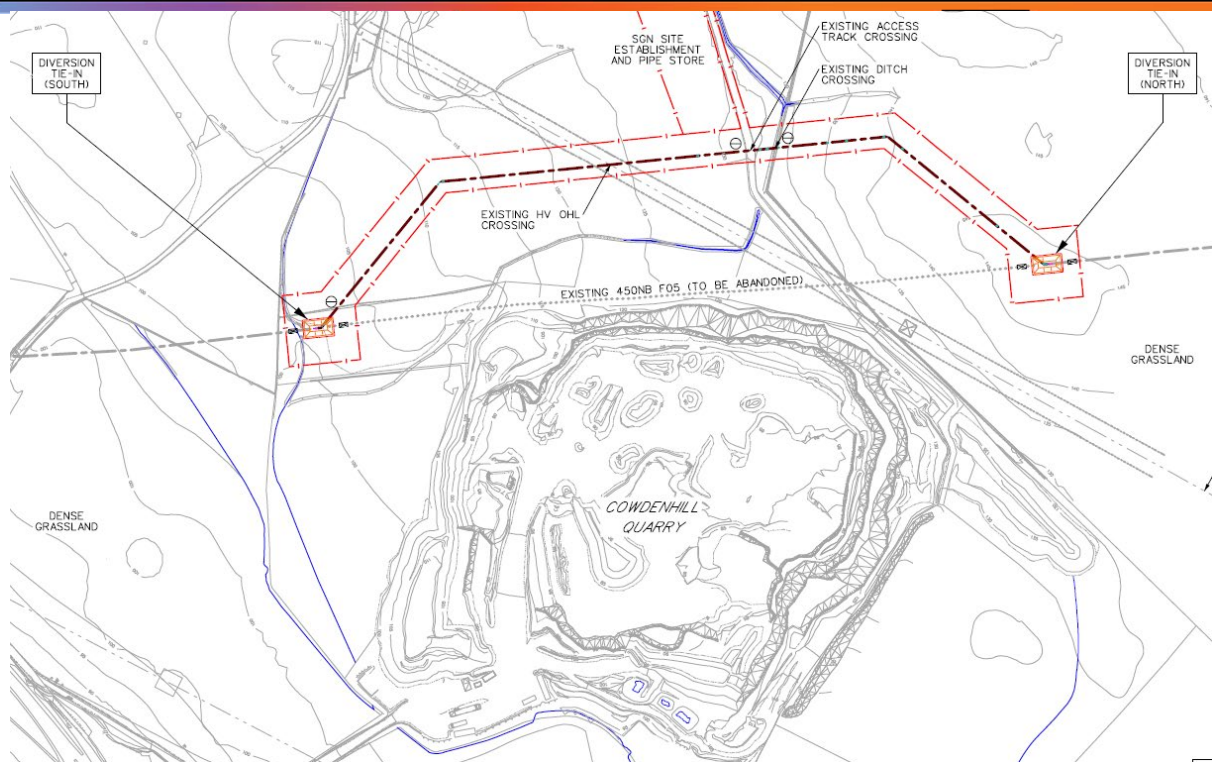


Figure 2: Design drawing of diverted pipeline route

The planning and legal phases of this project had been underway since 2014, with progress contingent on resolving issues related to land access. Unfortunately, implementation was delayed due to the extended period before the Compulsory Purchase Order (CPO) was granted which was only granted in early 2021. The late approval of the CPO prevented the inclusion of the project within the GD2 business plan.

The business case for the construction of the diversion was approved in August 2021. With construction for the diversion commencing in 2022 with commissioning occurring in July of 2022.

How will we understand if the spend has been successful?

The project has successfully achieved the primary benefits outlined in the business case, which include:

1. Successful Pipeline Diversion ('F05'):

- The diversion of pipeline 'F05' has been accomplished, removing the risk associated with the potential collapse of the Quarry Face.

2. Enhanced Resilience of Scotland's Local Transmission System:

- The successful implementation of the project has contributed to an increased resilience of Scotland's Local Transmission System.

3. Reduced Safety and Financial Risks:

- The project has led to a reduction in both safety and financial risks stemming from the potential rupture of the pipeline system.

The expenditures associated with achieving the diversion adjacent to Cowdenhill Quarry fall into three broad categories:

1. Project Delivery Costs:

- This category covers the various costs incurred in the planning, execution, and commissioning of the pipeline diversion project. It encompasses expenses related to engineering, construction, and project management.
2. Costs for Obtaining Compulsory Purchase Order:
 - Acquiring the Compulsory Purchase Order involved specific costs, including legal expenses, administrative fees, and any associated expenditures necessary to secure the required regulatory approvals.
 3. Costs for Pursuing Diversion Expenses:
 - This category includes costs associated with the pursuit and resolution of matters related to the pipeline diversion including legal fees.

What are the spend boundaries?

The project involved the construction of a 605m diversion for the 450mm pipeline F05 adjacent to Cowdenhill Quarry. This physical undertaking was designed to enhance the safety and resilience of the pipeline infrastructure.

All costs reasonably incurred within the framework of RIIO-GD2 are encompassed within the scope of this reopener submission. These costs are associated with the following construction and legal project boundaries:

1. Construction Project Boundaries:
 - Implementation of a 605m x 450mm pipeline diversion, ensuring a safe and adequate separation from Cowdenhill Quarry.
 - Abandonment of approximately 520m of the pipeline deemed at risk, located immediately adjacent to Cowdenhill Quarry.
2. Legal Project Boundaries:
 - Acquisition of the CPO for Servitude Rights concerning the new pipeline route.
 - Efforts to recover costs related to pipeline damage from the Quarry Operator and relevant insurers.

Note, the costs incurred within the RIIO-GD1 period, in connection with F05 Cowdenhill Quarry Diversion, do not fall within the boundaries of this re-opener submission. A total of [REDACTED] was spent within the GD1 period.

2.2 Meadowhill Quarry

Why are we doing this work and what happens if we do nothing?

F01 is the codename of a 69barg 450mm pipeline, commissioned in 1974, which spans from Westfield PRS (located approximately 1km East of Ballingry in Fife) to the North Forth Block Valve Site (situated adjacent to the River Forth near Alloa in Clackmannanshire). This pipeline also forms part of the Central Transmission System in Scotland, as highlighted previously, this pipeline is instrumental in supplying energy for the majority of customers in the Central Belt and Fife.

In 1997, the F01 pipeline underwent a diversion to accommodate an opencast site at "Meadowhill Farm." Subsequently, due to the expansion of the quarry, approximately 175m of the pipeline was situated within a 50m corridor between the quarry edge and the Black Devon River, Figure 3. Since 2004, the quarry has remained disused.



Figure 3: Route of pipeline in proximity to Meadowhill Quarry

Between the 11th and 12th of August 2020, Scotland experienced severe flooding due to torrential rain. This intense rainfall led to the Black Devon River altering its course, diverting into Meadowhill Quarry. Consequently, a 70m span of the pipeline was left exposed after being washed out with a complete loss of lateral and bedding support ("free spanning"). The exposed section was part of the original 1970s pipeline rather than the adjacent 1997 diversion, seen in Figure 4.



Figure 4: Aerial surveillance of the washed-out section of pipe taken on 12th August 2020

In response to this emergency, the pipeline underwent flow stopping, pressure reduction, and cutting/capping. This was achieved by isolating between an isolation valve and an existing stopple connection previously used during the 1997 diversion. Temporary restoration work was also carried out on the Black Devon Riverbank to redirect its flow to its original course instead of continuing into the quarry.

While these emergency measures successfully prevented a complete failure of the Major Accident Hazard Pipeline, additional intervention was deemed necessary within RIIO-GD2 to re-establish the link and ensure the pipeline's long-term integrity and functionality.

As a result of the pipeline's exposure and subsequent loss of lateral and bedding support, recommissioning without retesting proved unfeasible due to the stress incurred. It was therefore decided to replace the impacted section with pre-tested pipe in situ (directly parallel to the washed-out section).

If no further intervention was carried out following the emergency works, it would signify a strategic decision to permanently sever the link within the Central Transmission System in Scotland. This decision carries significant consequences, including:

1. Loss of Resilience:

- Splitting the Central Transmission System would render between 25% and 50% of all Gas Customers in Scotland dependent on the supply from a single Offtake, Glenmavis. In the event of a major failure at Glenmavis, the lack of resilience would lead to widespread loss of supply.

2. Loss of Flexibility:

- A unified Central Transmission System currently allows either Glenmavis Offtake or Drum Offtake to support the network for most of the year. This flexibility is crucial for undertaking major works requiring an outage, leading to substantial cost savings. Additionally, scheduled outages at times required by National Gas for works on their National Transmission System could no longer be accommodated if the network were permanently split.

3. Loss of In-Line Inspection Capability:

- Currently In-Line Inspection is carried out between Glenmavis Offtake and Westfield PRS through sequential pigging of F05, F04, F02, and F01, allowing for the efficient inspection of over 70km of 450mm pipeline as part of one operation. If the network were split, this would no longer be possible. Inspecting the remaining pipeline would require major modification works at Drum Offtake and Alloa PRS, to enable two separate in-line inspections of the remaining 52km.

What is the outcome that we want to achieve?

The full programme of interventions at Meadowhill Quarry features those already implemented, in addition to those that are planned before the end of RIIO-GD2.

Emergency Intervention Implemented Friday 14th August 2020 (RIIO-GD1):

As mentioned previously, following the incident it was necessary to isolate the pipeline and split the network to reduce the risk of failure and mitigate any of the consequences. These emergency works were implemented by flow stopping between the existing stopple connection and valve, splitting the system. This allowed the isolated section to be subsequently pressure reduced and cut/capped, removing the immediate risk of the consequence from pipeline failure.

The bank of the Black Devon was also restored on a temporary basis to restore the previous course of the river instead of it continuing to flow into the quarry. Due to the nature of the incident the Central Transmission System then had to remain split until the short-term intervention could be carried out.

Short Term Intervention Commissioned October 2021:

Following the emergency intervention, it was then necessary to re-establish the link in the intervening period before a permanent diversion could be carried out. There were some primary considerations which determined the eventual solution of replacing the pipeline section in situ and reinstating with engineered backfill. These were:

- The SW/2 implications of having to reinstate the bedding support of the existing pipeline. SW/2 is SGN's Work Instruction for Safe Working near High Pressure Pipelines and heavily restricts the proximity where mechanical excavation can be carried out. These restrictions would have increased the cost of reinstatement. Additionally, the proximity of the quarry face would have increased the associated risk which would have required further mitigation.
- Previous assessment of the stress experienced by the pipeline during the washout did not provide certainty that the pipeline was safe to commission. Further detailed inspection would have been necessary to revalidate the pipeline potentially including hydrotesting. This could have incurred further costs including, pipeline repairs and the risk associated with failure of the hydrotest (which would have necessitated a pipeline replacement anyway).

For these reasons, it was considered the optimal solution to replace the pipeline in-situ, Figure 5. The following outputs formed this intervention:

- Geotechnical Design and construction of the backfill for the pipeline to provide cover and lateral/bedding support.
- Installation of a Ball Valve to enable the previously exposed section to be readily isolated (without requiring stoppling/flow stopping) if heavy rainfall exposes the pipeline in the future.
- Replacement of pipeline section influenced by washout event.
- Commissioning of the pipeline.

The short-term intervention has been implemented and was commissioned in October 2021.

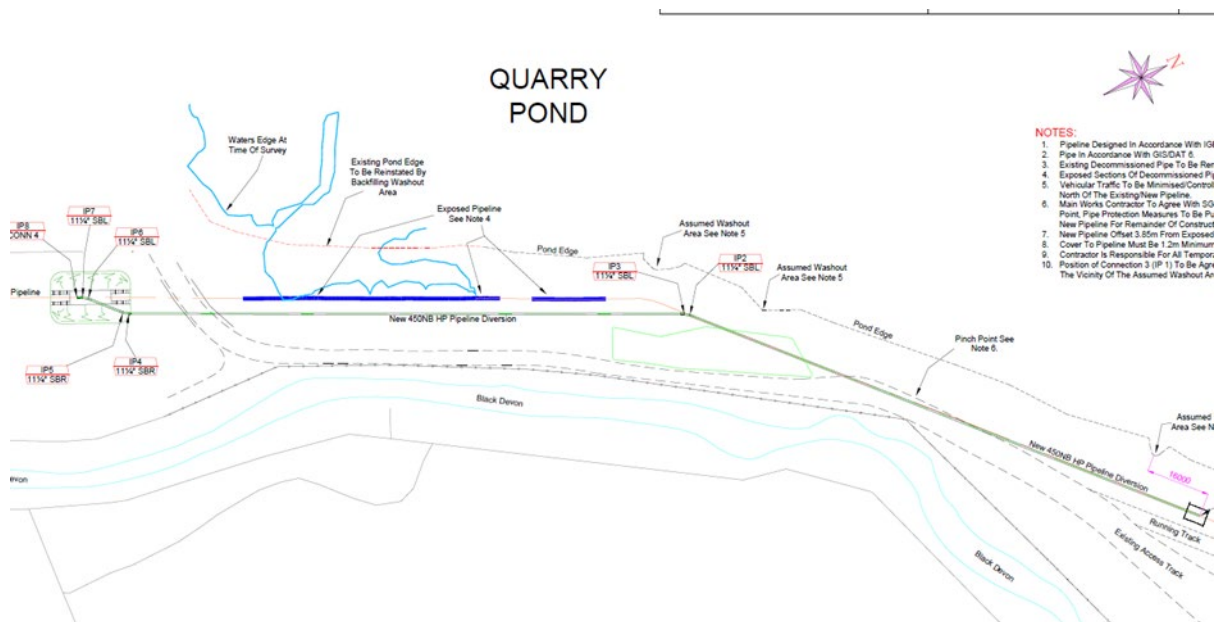


Figure 5: Extract from the design depicting the replacement pipeline section.

Long Term Intervention:

The Long-Term Intervention will take form of a permanent diversion which will remove the pipeline from its present adjacency to the quarry void and Black Devon River.

The preferred diversion route is to lay 1520m of 450mm pipe. It would be primarily installed by open cut, with the Black Devon River Crossings installed through Horizontal Directional Drills.

Most of the planned diversion is routed south of the Black Devon. This necessitates two Horizontal Directional Drills to cross the Black Devon twice.

The option for the Long-Term intervention is discussed in further detail within the 'Options Considered' section of this paper.

How will we understand if the spend has been successful?

The following outputs will determine the success of the interventions that have been delivered in addition to the chosen future intervention:

1. Interventions Already Implemented (Emergency and Short-Term Intervention):

- Risk of pipeline failure and loss of Alloa TRS averted during the emergency intervention.
- Network Security of Supply, Resilience and flexibility have been restored in the short-term following the pipeline replacement.
- The safety and financial risk for the pipeline have also been addressed for the short-term.

2. Future Intervention to be Implemented (Long-Term Diversion):

- Restore network Security of Supply, resilience, and flexibility for the long-term.
- Addressing the safety and financial risk to the pipeline for the long-term.

What are the spend boundaries?

The project covers both the 150m short-term replacement adjacent to Meadowhill Quarry commissioned in FY21/22 and the long-term permanent diversion planned for commissioning in FY25/26. The physical undertakings of both parts were designed to enhance the safety and resilience of the pipeline infrastructure.

All costs reasonably incurred within the framework of RIIO-GD2 are encompassed within the scope of this reopener submission. These costs are associated with the following construction boundaries:

- Implementation of a 158m x 450mm 'in-situ' pipeline diversion, as a short-term solution to re-establish the link.
- Implementation of between 1520m of 450mm permanent pipeline diversion, ensuring a safe, secure and resilient network for the long-term.

A cost uplift of 20% has been applied to account for risk on the remaining work yet to be carried out.

Note, any costs incurred within the RIIO-GD1 period, in connection with F01 Meadowhill Quarry Diversion, do not fall within the boundaries of this reopener submission. A total of [REDACTED] was spent within the GD1 period.

2.3 Pitcairngreen to Huntingtower Diversion Washout**Why are we doing this work and what happens if we do nothing?**

During 2023, SGN embarked on delivery of a PCD specifically aimed to *"Reinforce the Pitcairngreen to Huntingtower pipeline (supplying Huntingtower PRS) by installing a new pipeline and facilities to allow Inline Inspection of the new pipeline."* This project involves the construction of a new 150mm nominal bore (NB) "piggable" pipeline of approximately 4.5km length with corresponding abandonment of approximately 8.5km of the existing 100mm NB pipeline.

Towards the end of the construction period and with approximately 95% of the pipeline laid in a spread located south of land being developed for housing construction, a washout occurred as a result of intensive rain equivalent to one months' rainfall in 24 hours. The rainfall caused the Gelly Burn to overtop approximately 500m north-west of the washout with the resultant deluge of water travelling overland and eventually finding a path back towards River Almond.

The overland deluge resulted in approximately 7000m³ of material being displaced around the new pipeline, exposing the pipeline in two sections, Figure 6. The pipeline is subsequently now incomplete, requires significant civils assessment and rectification, without which the PCD is undeliverable, and the reinforcement required not realised.



Figure 6: Scale of damage caused by washout on Pitcairngreen to Huntingtower pipeline.

In the original project design, the project was necessary to complete reinforcement work and to enable inline inspection. At the time the proposed pipeline location and design took a full assessment of the various environmental and economic factors that could impact the project and the risk of such an event was not considered significant enough to warrant a significant and very costly diversion further away from the burn. The decision was made to route the pipeline close to the existing pipeline to ensure efficiency of delivery and with minimal cost and impact on neighbouring landowners. Whilst the project scope provided for the inclusion of typical construction-based risk such as: inflation impacting material costs; contractor availability; landowner consent and associated cost increases; ground conditions being unfavourable; contaminated land; agricultural and ecological issues on the proposed route (this list is not exhaustive) – upon determination no risk costs were awarded.

The risk of a major weather event was not included within the assessment due to the low probability of it occurring and the high costs that would need to be considered. Had such a risk been included it would be deemed cost-excessive– it was not considered a credible threat and occurred as a result of an unforeseen natural event.

The overland deluge resulted in approximately 7000m³ of material being displaced around the new pipeline, exposing the pipeline in two sections. The pipeline is subsequently now incomplete, requires significant civils assessment and rectification, without which the PCD is undeliverable, and the reinforcement required not realised.

What is the outcome that we want to achieve?

Our primary goal is to ensure that we secure and commission the pipeline as originally intended. A fundamental aspect of the work now required is to assess the ground works required to remediate the significant movement of material around the pipeline route and re-establish ground conditions that secure the pipeline from any repeat occurrence.

AtkinsRéalis has been commissioned to review the context and consequences of the event, as well as proposing potential solutions and recommendations to address the erosion observed on site. These plans will be based on identifying solutions to deal with the issue at source by creating an overflow channel adjacent to the Gelly Burn, as well as plans for remediating the washout out area which will either take the form of full reinstatement or partial reinstatement. During this design process, an assessment will be made around the long-term security of the pipeline and whether it can remain in its current position. Should the process identify a need to move the pipeline from its current position, this will require further negotiation with the landowner as well as additional compensation. The opinion at the moment is that is unlikely the pipeline will need to move, but this will be confirmed in due course.

How will we understand if the spend has been successful?

Primary objective is to return to a position where commissioning of the pipeline and delivery of the reinforcement required is achievable.

What are the spend boundaries?

A definitive figure for the remediation work has not been settled on due to the number of outstanding unknowns. At present the forecast estimate for the washout remediation is [REDACTED]. This brings the total project cost to [REDACTED], with an original project cost of [REDACTED] (compared to an original allowance of [REDACTED]) on the approved budget for the original reinforcement project. While this value is currently an estimate as the full rectification scope is still being designed it should be noted that it includes for the provision of the following:

- Isolation and removal of approximately 100m of newly laid (now exposed) steel high-pressure transmission pipeline. The associated costs of replacing the same.
- Winterisation of the site. What was originally proposed to be a 6-7 month construction window has now extended to 14-15 months spanning the winter months. This includes fencing and additional security measures for the pipeline spread and compound, temporarily backfilling of excavations to ensure safety and the associated costs of re-establishing the site once the solution is settled.
- Demobilisation of resources and remobilisation of the same.
- Design costs for the significant civils work now required in order to re-establish the pipeline within a secure berth.
- Land consents and agreements with landowners who were originally engaged on terms satisfying the original project timescale now doubling.

Approximately 7000m³ of material being sourced and transported to site. Given the locus of the breach occurred within agricultural land there will be associated costs incurred on the logistics of this exercise including the building of temporary roads or hard standing in order to deliver to the required location, execution of the backfilling exercise, including significant heavy plant movement associated with an exercise of this scale.

2.4 Below 7bar Washouts

Why are we doing this work and what happens if we do nothing?

Throughout GD2, SGN has experienced heightened volumes of issues relating to pipes or pipe-supporting structures that cross rivers. This has exposed pipes to river forces, potential debris damage,

and environmental conditions beyond design parameters (cathodic protection schemes, protective coatings, protective barriers). Pipe bridges and similar structures have also suffered erosion or damage from floodwaters.

Without remediation below ground assets that have been compromised by erosion events would be at significant risk of failure. Should failure of such pipes occur, this could potentially result in loss of supply, costly emergency repairs and significant levels of gas venting to the atmosphere. This could also result in an environmental incident (water contamination and damage to trees and wildlife). While the incident could be controlled by closure of both upstream and downstream valves, disruption, and loss of supply to a high number of end users would occur.

The associated cost of managing an incident, restoring customer supplies, providing alternative heating or accommodation as well as business claims for loss of income, highlights the potential cost of this emerging issue.

We continue to gather information relating to above and below ground crossings through our survey programmes as per our management procedures SGN/PM/Maint/14 & SGN/PM/Maint/15. These surveys involve the recording and gathering of information relating to our main and the site conditions as part of our continuing efforts to monitor and manage this risk. Our aim is to proactively identify locations of suspected coastal, or river erosion to work with relevant stakeholders to agree preventative measures that will protect our pipelines and environment.

We are seeking [REDACTED] in funding for remediation work required for below 7bar river crossings in Scotland which have/potentially suffered washouts during RIIO-GD2 due to soil erosion. These washouts are split into the following groups:

1. Known Washouts - Complete/Planned

- There have been 10 known washouts where work has been carried out or is currently planned in to repair the damage caused. These sites have primarily been remediated through rock dumping. The details of these sites can be found within Table 3.
- An example of the work carried out at Dighty Burn is found after the table.

Table 3: Table of completed/planned washout related projects within GD2.

| Crossing | Status | Cost of Remediation | Tier | Diameter | Material | Length (m) |
|--------------------------|----------|---------------------|------|----------|----------|------------|
| Mill Burn, Moffat | Complete | [REDACTED] | MP | 180 | PE | 5 |
| River Annan, Moffat | Complete | [REDACTED] | IP | 3" | Steel | 12 |
| Dighty Burn 1 | Complete | [REDACTED] | IP | 300 | Steel | 12 |
| Dighty Burn 2 | Planned | [REDACTED] | IP | 300 | Steel | 12 |
| Tay, Logierait | Complete | [REDACTED] | IP | 4" | Steel | 73 |
| Cullan | Complete | [REDACTED] | IP | 8" | Steel | 14 |
| River Tweed, Walkerburn | Planned | [REDACTED] | IP | 100 | Steel | 47 |
| Elliot Water 1 | Complete | [REDACTED] | MP | 10" | Steel | 16 |
| Elliot Water 2 | Complete | [REDACTED] | MP | 10" | Steel | 16 |
| Longman Burn, Near Elgin | Planned | [REDACTED] | IP | 180 | PE | 8 |
| Carnochy Burn | Complete | [REDACTED] | IP | 250 | PE | 4 |
| East Haven | Planned | [REDACTED] | MP | 10" | SI | 2 |
| Total | | [REDACTED] | | | | 221 |

Example – Dighty Burn, St Monifeith

In 2019 as part of a Maint/15 survey it was identified that approximately 50 metres of the riverbank on the River Dighty in Monifieth, Scotland had been washed away exposing approximately 3m of an intermediate pressure (IP) pipe crossing the river shown in Figure 7.



Figure 7: Exposed section of IP pipe crossing River Dighty.

Due to scheduling issues in early 2020 caused by the Covid-19 pandemic, work to remediate the issue could not be undertaken until 2022. In the intervening period the effect of the river on the exposed section of pipe was to strip approximately a 3m section of the protective coating.

The IP pipe is part of SGN Grid 13 Perth Dundee IP/MP system. Failure of this pipe would result in the loss of gas to approximately 25000 customers.

Multiple remediation options for the pipe were considered inclusive of replacement of the pipeline, however due to topography this was ultimately deemed impractical. It was ultimately decided that the best course of action was to build a temporary water break to facilitate repairs to the protective coating of the pipe. The integrity of the pipe was then protected by rock dumping to re-establish the riverbed.

Following engagement with the river authorities the riverbank itself was re-established and reinforced to provide long term protection for the pipeline without disrupting the natural course of the river.

2. Known Washouts - Planning Stage

- There is currently only one washout in Brechin where the remediation process has not been fully planned in.
- A short-term solution to remediate the site is highlighted in Table 4 below, if it is determined that the site requires diverting this could increase tenfold or greater.
- An example of the issues surrounding the site and the proposed solution are found in an example after the table, however at this stage the project may be subject to change.

Table 4: Table of known unplanned washouts, currently only one in Brechin.

| Crossing | Status | Cost of Remediation | Tier | Diameter | Material | Length (m) |
|----------|-----------|---------------------|------|----------|----------|------------|
| Brechin | Unplanned | | IP | 250 | Steel | 40 |

Example – Brechin

Between the 18th and the 21st of October 2023 Rivers in the Northeast of Scotland experienced extreme increases in flow due to Storm Babet. This was a 1 in 100-year storm which caused severe damage and disruption across the region.

Among the rivers effected by the storm was the South Esk near Brechin which resulted in the washout of a 250mm Steel IP pipe. This pipe feeds approximately 6700 customers.

The area of washout is located approximately 80 meters from the south bank of the River South Esk. When the river flooded it burst its banks and carved a new channel in what was previously dry land.

The pipe is exposed or near exposed for a length of 40 meters. While exposed, the pipe is vulnerable to impact damage from further flooding and interference from members of the public. To mitigate this, bags have been installed over the line.

The Pipe was previously diverted in 2016 when the threat of flooding was identified however the unprecedented rain fall has meant that this has not proved sufficient. In Figure 8 below the exposed pipe can be seen in the remains of the flood water, with the river itself being approximately 80 meters further north where the pipe then crosses. The damage caused on the landscape can be seen clearer in Figure 9.



Figure 8: Exposed sections of pipe covered in flood water.



Figure 9: Extent of washout on landscape, with stopalls for original diversion in foreground.

The long-term solution for this will most likely require a diversion of the IP line. The short-term solution is to make up the ground level over the pipe using material from the site. Then lay a line of Gabion Baskets along the line of the pipe. The baskets will then be lined by rock armour on either side to prevent movement of the Gabion basket and protect the line. The whole structure will then be covered by locally sourced gravel. This is expected to cost a total of [REDACTED] for the short-term solution.

3. Unknown Washouts

- Following Storm Babet which caused a massive increase in river flow and widespread flooding in the Northeast of Scotland it has been predicted that up to 150 river crossings in this region will have suffered damage and require remediation. We have been unable to fully inspect these sites as many of these sites are still submerged as river levels and flood water remains high.
- The 29 crossings which were located in red weather warning areas of the storm and the 121 crossing within the amber zone are shown in Table 5 below totalling a length of 1.8km.
- The sites requiring remediation from the 150 crossings still to be surveyed will be confirmed by the re-opener draft determination.
- 80% of the crossings in the 'red' weather warning zone are anticipated to require remediation and up to 50% of the crossings in the 'amber' weather warning zone. This is based on the 3 sites in the 'red' area which we have been able to survey all requiring remediation so far.
- The average cost per meter is estimated at [REDACTED] (£18/19 values). This is based on the length of the projects against the average cost per metre of the projects completed within GD2 and is based on repair of the site rather than full diversion. If full diversion is required, this cost could increase tenfold.
- This is considered an upper bound of likely estimates (although until we can access the sites, we cannot be confident in this). We propose to update this estimate as we progress through the reopener and have completed the appropriate site surveys.

Table 5: Table of crossings requiring inspection located within Storm Babet warning zones.

| Storm Babet Zone Warning | Crossings to be Inspected | Total Length (m) | % Predicted Remedial action | Predicted Washed Out (m) | Predicted Cost of Remediation |
|--------------------------|---------------------------|------------------|-----------------------------|--------------------------|-------------------------------|
| Red | 29 | 201 | 80% | 160.8 | |
| Amber | 121 | 1607 | 50% | 803.5 | |
| Total | 150 | 1808 | 56% | 964.3 | |

What is the outcome that we want to achieve?

The outcome we want to achieve is the prevention of any damage to pipelines caused by coastal or river erosion. We want to be able to mitigate any damage to the buried asset, when we identify potential risks where erosion can arise, by installing restorative or preventative measures. These measures will stop any further erosion and prevent our asset from damage.

Where we can, we will identify potential issues and instigate a project to prevent further erosion. However, if an erosion event removes cover quickly or unexpectedly, it may be necessary to both prevent further erosion and at the same time carry out works to restore the cover on the pipe. This returns our asset to a safe position and allows us to monitor the situation going forward in a sustainable way.

SGN will ensure asset integrity and security of supply to customers where increased river flows are a risk to compliance with Pipe Safety Regulation 13.

How will we understand if the spend has been successful?

The success of the investment will be shown from the following:

- SGN will continue to ensure security of supply and increased resilience throughout its distribution network and customers will continue to enjoy uninterrupted supply.
- Outages due to failed crossings / exposed assets near waterways will not occur.
- The project will lead to a reduction in both safety and financial risks stemming from potential damage caused by coastal / river erosion.

What are the spend boundaries?

All costs reasonably incurred within the framework of RIIO-GD2 are encompassed within the scope of this reopener submission.

The spend for this project will primarily be used as part of an ongoing programme to install preventative measures to mitigate against environmental erosion. The money will also be used to restore pipes that have already lost depth of cover due to erosion and need to be remediated before prevention measures can be installed.

Costs incurred for diversion and replacement of the pipeline will also be included in this workload when and where required, however, to date diversionary works associated with river erosion have been avoided through other methods. The primary purpose of this project is to maintain and protect the existing assets.

Note, any costs incurred within the RIIO-GD1 period, in connection with Below 7bar Washouts do not fall within the boundaries of this reopener submission.

3 Options Considered

When considering the most appropriate intervention, we have done so in line with our 4R strategy. This strategy is designed to maximise the asset life and minimise the capital expenditure of intervention and in doing so sets out an order of preference for the intervention type. This order is key in delivering customer value and focuses on the lighter intervention options of repairing and

refurbishing the asset before considering more intrusive interventions such as component replacement and full rebuild. See Figure 10 below for an illustration of our 4R strategy.

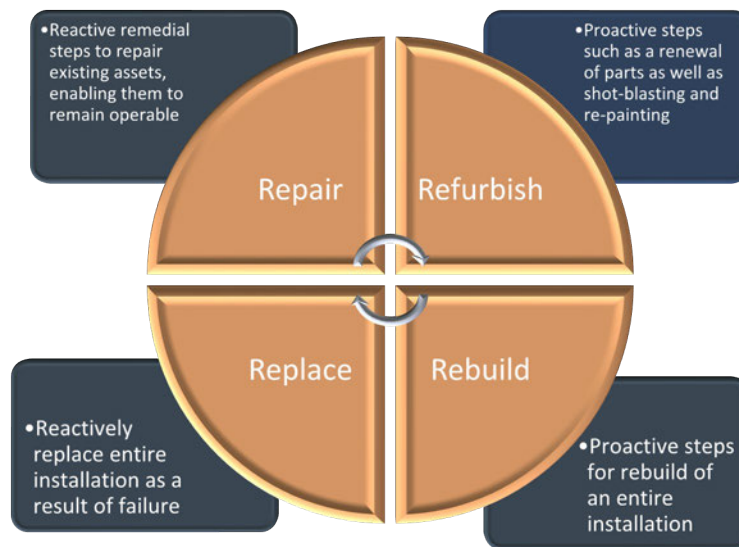


Figure 10: Diagram of SGN's 4R Strategy.

The following sections highlights the thought process involved in selecting the preferred option for each project following the 4R methodology.

For all projects a 'Do Nothing' option has been declared infeasible as we have a requirement under Pipeline Safety Regulations to ensure that our pipelines are not damaged and are running under safe and secure operating conditions.

3.1 Cowdenhill Quarry Options

There were 3 options considered to address the integrity risk to the pipeline F05. The options considered were as follows:

- Option 1 - Do Nothing (Infeasible)
- Option 2 - High Pressure Pipeline Diversion (Preferred Option was delivered and commissioned July 2022)
- Option 3 - Remediate Quarry (Rejected as technically and legally infeasible)

Option 1 - Do Nothing

As stated previously a 'Do Nothing' option has been declared infeasible due to not complying with Pipeline Safety Regulations.

Option 2 - High Pressure Pipeline Diversion (Preferred Option)

This was the option to carry out the permanent diversion of the pipeline for a Capital Investment of [REDACTED] within the years 21/22 and 22/23.

The following are the works carried out within GD2:

- Environmental Works and Construction in Access Road in 21/22
- Construction of pipeline diversion in 22/23

A diversion has been identified as the only permanent solution to the risk of pipeline failure from collapse of the quarry face. It is therefore the recommended option.

Option 3 - Remediate Quarry

This is the option to perform remediation of the quarry without carrying out direct works on the pipeline itself. Two options were considered in [REDACTED] report "Scotland Gas Networks: Geotechnical Design Report for Cowden Hill Quarry" dated 4th February 2014. Both options were rejected as implausible and therefore not costed in detail but are summarised below.

1. Remediate the Slope to protect the pipeline: This is the option to reinforce the superficial deposits through solutions such as surface meshing, grouting and sprayed concrete.
 - This option is rejected as it would not restore the deed of servitude supporting the pipeline which has already been compromised. This would limit the ability to perform maintenance activities on the pipeline. The design would also need to be robust to account for any uncertainty in slope stability. In addition, the reinforcement is a high-risk construction activity requiring specialist contractors.
 - This would also result in SGN taking on a new liability for the integrity of the quarry face itself and include the cost of the ongoing inspection and maintenance of the remediation solution, which would not end even if the pipeline were to be permanently diverted.
2. Backfill the quarry void: This is the option to completely backfill the quarry void therefore removing the instability risk of the face.
 - This option is rejected as the planning applications do not allow the quarry to be backfilled and restored to ground level. On the contrary, the north-western quarry face is due to be listed as a Regionally Important Geological Site further restricting the ability to undertake any backfilling.

3.2 Meadowhill Quarry Options

There were 3 options considered to address the integrity risk to the pipeline F01. The options considered are as follows:

- Option 1 - Do Nothing (Infeasible)
- Option 2 - High Pressure Pipeline Diversion, 'Shorter Route' (Infeasible)
- Option 3 - High Pressure Pipeline Diversion, 'Longer Route' (Preferred Option)

In accordance with the above strategy, the 'Short Term' Intervention has been implemented.

However, it is known that the short-term intervention does not extend the asset life sufficiently for the long term. This is why the proactive step to divert the pipeline is required.

Option 1 - Do Nothing (i.e., Short-Term Intervention Only)

This is the option to take no further action to mitigate the integrity risk to the Pipeline adjacent to Meadowhill Quarry other than the Short-Term Intervention that has already been implemented to a cost of [REDACTED].

As stated previously a 'Do Nothing' option has been declared infeasible due to not complying with Pipeline Safety Regulations.

Option 2 - High Pressure Pipeline Diversion, 'Shorter Route'

An option was explored to carry out a permanent 'Shorter Route' diversion. This would have been a route of approximately 585m in length. It would be primarily installed by open cut, with the Black Devon River Crossings installed through Horizontal Directional Drills.

1. Advantages:

- ## 2. Disadvantages:

- This would be SGN's preferred option if the risks associated with quarry instability did not cause the fundamental issues with constructability.

For the above issues this route is therefore infeasible as a remediation option.

This is the option to carry out a permanent diversion along the 'Long Route' for a Capital Investment of [REDACTED].

This 'Longer Route' represents a diversion of length 1520m shown in Figure 11. It would be primarily installed by open cut, with the Black Devon River Crossings installed through Horizontal Directional Drills.

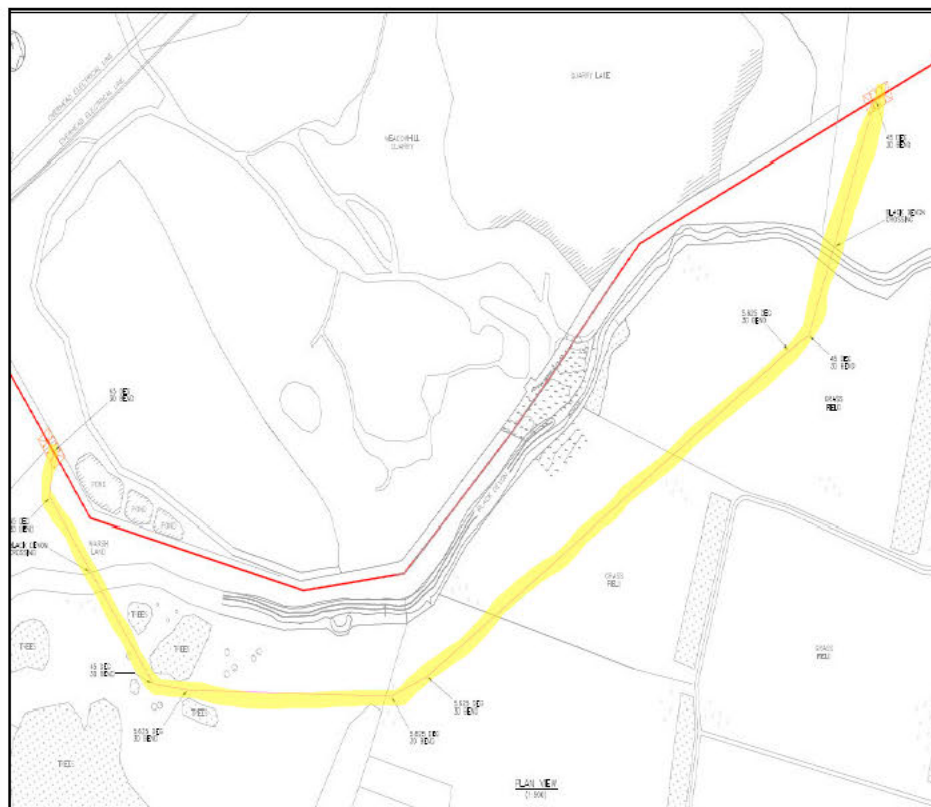


Figure 11: Proposed route of diversion highlighted in yellow.

When compared directly to Option 2, the 'Shorter Route' it had the following advantages and disadvantages:

1. Advantages:

- The longer route has sufficient stand off from the highest risk areas of quarry instability, including the quarry 'tip'.
- The deliverability of the project is less dependent on the actions of the landowner.

2. Disadvantages:

- It is a longer diversion so is of greater cost to Plan, Design, Procure Material and Construct.
- There are more servitude negotiations required.

This is SGN's preferred route as all other options are deemed infeasible.

3.3 Pitcairngreen to Huntingtower Options

There were 4 options considered to address the integrity risk to diverted Pitcairngreen to Huntingtower pipeline. Due to the recent nature of the event option feasibility is still being explored. The options considered are as follows:

- Option 1 – Do Nothing (Infeasible)
- Option 2 – Reinstatement and Reinforcement
- Option 3 – Short Route Diversion
- Option 4 – Long Route Diversion

Option 1 - Do Nothing

As stated previously a 'Do Nothing' option has been declared infeasible due to not complying with Pipeline Safety Regulations.

Option 2 – Reinstatement and Reinforcement (Preferred Option)

Reinstate the approximate 7000 cubic meters of material to re-establish a secure berth for the pipeline and then relay the isolated and removed section of pipeline. Until options are explored in depth this would be SGNs preferred option at an estimated cost of [REDACTED].

Option 3 – Short Route Diversion

Should the re-establishment of a secure berth along existing route be deemed unachievable then reinstatement of the ground would be necessary in addition to a short 'goalpost' style diversion of the HP pipeline.

Option 4 – Long Route Diversion

Should the re-establishment of a secure berth along existing route be deemed unachievable then reinstatement of the ground would be necessary in addition to a diversion of the HP pipeline along a longer circuitous route necessitated by landowner and/or other environmental factors.

3.4 Below 7bar Washout Options

There were 5 options considered to address the integrity risk caused by below 7bar washouts. The options considered are as follows:

- Option 1 – Do Nothing (Infeasible)
- Option 2 – Replace on Failure
- Option 3 – Repair on Failure
- Option 4 – Pre-emptively Replace
- Option 5 – Pre-emptively Repair (Preferred Option)

Option 1 - Do Nothing

As stated previously a 'Do Nothing' option has been declared infeasible due to not complying with Pipeline Safety Regulations.

Option 2 - Replace on Failure

This option explores replacing the underground asset when an erosion event happens, relocating the asset to a safe location. This would utilise techniques such as HDD and open cut lay to replace or effect diversions around the problem area.

This option, when compared to other restorative options, would represent a disproportionate spend. In certain circumstances these techniques would be applicable for the situation, i.e., where the level of erosion was severe, extended for a long distance of pipe length or where the river authority refused access or permission to work.

Replacement of individual pipelines and crossings are high-cost items and would be presented as individual projects.

As this is an unplanned event, we will incur additional Opex cost. Although in some cases there is not always a need to replace the main depending on the damage and exposure caused by the erosion.

Dependant on the specific requirements, but typically HDD take 6 months to plan and put into operation. Pipeline diversions, depending on complexity, can be carried out within the 3-to-6-month timeframe, but it would depend on access and easement requirements.

This option in effect, permits failure to occur before taking action. It is not a credible option for a responsible gas transporter. As this solution requires a significant amount of planning and would be in response to an unplanned event, there will be a significant element of outage affecting customers supplies. Whilst we will be able to monitor and control costs, as it will be part of a project, we won't be able to always manage to maintain supplies if the incident is catastrophic in nature.

Option 3 - Repair on Failure

This option explores the use of techniques such as rock dumps, terracing using large diameter timbers or willow spiling is used with or without material relocation to restore cover and protect banks susceptible to erosion. The application of these techniques would be in line with SEPA and NRA recommendations.

There is no standard equipment for the remediation of erosion as this will be project and site specific. Typical equipment that may be required could include:

- Large rocks and backfill to construct new riverbanks, riverbed, cover for pipe etc.
- Material for river diversion
- CP (cathodic protection) remediation
- Coating repair
- Tree planting (roots help hold soil in position)
- Brash (tree branches), Willow spiling, small trees used to reduce effects of erosion.

Our costs have been derived from costs involved to remediate erosion events that have occurred in GD2. Costs associated with this option will vary according to the site conditions.

This option minimises spend on issue of erosion events but still allows us to respond where situations present themselves.

Rock dumps and other temporary measures can be put in place within days of an event, further works could take up to a couple of weeks to instigate. These measures are often dependant of the level of engagement with SEPA and NRA.

This option in effect, permits failure to occur before taking action. It is not really a credible option for a responsible gas transporter. As this solution requires a significant amount of planning and would be

in response to an unplanned event, there will be a significant risk of outage affecting customers supplies. Whilst we will be able to monitor and control costs, as it will be part of a project, we won't be able to always manage to maintain supplies if the incident is catastrophic in nature.

Option 4 - Pre-Emptively Replace

This option explores replacing the underground asset where an erosion event is likely to happen, to relocate the asset to a safe location. This would utilise techniques such as HDD and open cut lay to replace or effect diversions around the problem area.

Similar to the 'Replace on Failure' option, this would represent a disproportionate spend. In certain circumstances these techniques would be applicable for the situation, i.e., where the level of erosion was severe, extended for a long distance of pipe length or where the river authority refused access or permission to work.

An example of this is the diversion of the R02 pipeline near the town of Dunkeld in Scotland.

Replacement of individual pipelines and crossings are high-cost items and would be presented as individual projects.

As this is a planned and managed event, we will not have any additional Opex cost. Also, we will be able to maintain security of supply. Although in some cases there is not always a need to replace the main depending on the damage and exposure caused by the erosion.

Dependant on the specific requirements, but typically HDD take 6 months to plan and put into operation. Pipeline diversions, depending on complexity, can be carried out within the 3-to-6-month timeframe, but it would depend on access and easement requirements.

As this is a planned managed event, we will be able to monitor and control costs, and as a result there will be no additional cost incurred. However, not all mains will require replacement and as a result this is not a credible option and should not be considered in most instances.

Option 5 - Pre-Emptively Repair (Preferred Option)

This option explores identify potential sites that erosion events would affect our underground assets and put preventative measures to stop events affecting our assets. We could utilise techniques such as rock dumps, terracing using large diameter timbers or willow spiling which is used with or without material relocation to restore cover and protect banks susceptible to erosion. More detail on these techniques are highlighted within Option 3. The application of these techniques would be in line with SEPA and NRA recommendations.

This option prudently manages the spend to prevent erosion events providing protection for our assets and on a site-by-site basis against replacing that asset and represents best value for money.

Certain temporary measures can be put in place within days of an event, but in other cases some of the optimum solutions discussed can take many months to ensure the full benefit. These measures also involve a degree of engagement with SEPA and NRA. On that basis it is felt far more prudent to adopt a proactive approach planning mitigation for those sites where we identify a risk.

As this is a planned managed event, we will be able to monitor and control costs, and as a result there will be no additional cost incurred. Also, as we would not intend to replace mains and crossings, this is an obviously more cost-effective option when considered against the replacement options and as such is our preferred option.

3.5 Options Cost Comparison

The below tables provide a cost comparison between the preferred intervention option and the other alternatives for each of the above sites, detailed breakdowns of the costs can be found within their respective EJP's:

Table 6: Cowdenhill Quarry options cost comparison.
Cowdenhill Quarry

| Option | Total Cost |
|--|------------|
| Option 1 - Do Nothing (Repair on Failure) | Infeasible |
| Option 2 - High Pressure Pipeline Diversion (Preferred Option) | |
| Option 3 - Remediate Quarry | Infeasible |

The above costs in Table 6 do not include the spent within GD1 and only includes the completed work carried out in GD2.

Table 7: Meadowhill Quarry options cost comparison.
Meadowhill Quarry

| Option | Total Cost |
|--|------------|
| Option 1 - Do Nothing (Repair on Failure) | Infeasible |
| Option 2 – 'Shorter Route' | Infeasible |
| Option 3 – 'Long Route' (Preferred Option) | |

The above costs in Table 7 include the short-term intervention captured as and does not include the spent within GD1. A cost uplift of 20% has been also applied to account for risk on the remaining work yet to be carried out.

Table 8: Below 7bar Washouts cost comparison.
Pitcairngreen to Huntingtower

| Completed Remediation | Total Cost |
|---|------------|
| Option 1 – Do Nothing | Infeasible |
| Option 2 – Reinstatement and Reinforcement (Preferred Option) | |
| Option 3 – Short Diversion (also includes necessary reinstatement of material washed out) | TBC |
| Option 4 – Long Diversion (also includes necessary reinstatement of material washed out) | TBC |

The above costs in Table 8 do not include the for the original project and only includes estimated costs associated with the washout.

Table 9: Below 7bar Washouts cost comparison.
Below 7bar Washouts

| Completed Remediation | Total Cost |
|--|------------|
| Option 1 – Do Nothing | Infeasible |
| Option 2 – Replace on Failure | Infeasible |
| Option 3 – Repair on Failure | Infeasible |
| Option 4 – Pre-emptive Replace | |
| Option 5 – Pre-emptive Repair (Preferred Option) | |

The above costs in Table 9 include the already spend on remediation work carried out on below 7bar washouts during GD2 so far.

*The cost for pre-emptive replace is an estimate based on the costs of pre-emptively repairing subject to a x10 multiplier to estimate cost of diverting all pipes instead.

4 Preferred Option

4.1 Cowdenhill Quarry Preferred Option

The delivered option for Cowdenhill Quarry was 'Option 2 – High Pressure Pipeline Diversion' as detailed in this paper a total capital investment and installed cost of [REDACTED].

Major Projects have delivered the Cowdenhill Diversion in accordance with SGN's procurement strategy. The Main Works Contractor for the project was appointed in accordance with a competitive tender.

4.2 Meadowhill Quarry Preferred Option

The preferred option for Meadowhill Quarry is 'Option 3 – Long Route' this is due to no other option being feasible as they do not comply with Pipeline Safety Regulations.

For this option there is a request for funding of [REDACTED].

Major Projects will deliver the Meadowhill Permanent Diversion in accordance with SGN's procurement strategy.

The costs in this submission incorporate both actual costs for delivered interventions in addition to the forecasted costs for the permanent diversion.

4.3 Pitcairngreen to Huntingtower Preferred Option

At the current stage the preferred option for Pitcairngreen to Huntingtower is 'Option 2 - Reinstatement and Reinforcement'.

An estimated request for funding of [REDACTED] which will be confirmed after further optioneering by the re-opener draft determination.

4.4 Below 7bar Washouts Preferred Option

The preferred option is to provide funding of [REDACTED] to cover costs of remediating washouts and mitigate the risk of coastal and river erosion in the future by 'Pre-emptively Repairing' those sites. All sites so far in GD2 have been remediated through pre-emptive repair, however, it cannot be guaranteed this is the case for all unknown washouts.

1. Complete/Planned Washouts

- There have been 10 known washouts where work has been carried out or is currently planned in to repair the damage caused. The known costs for this work comes to [REDACTED].

2. Unplanned Washouts

- There is one washout in Brechin where the remediation process has not been fully planned in, the short-term solution to pre-emptively repair the site is expected to cost [REDACTED].
- However, it is likely that pre-emptive replacement of the site via a full diversion will be required.

3. Unknown Washouts

- There are 29 crossings situated in the red zone of Storm Babet, we expect as many as 80% of these assets to require some amount of remediation work at a cost of [REDACTED]. The sites requiring remediation will be confirmed by the GD3 draft determination.
- There are a further 121 crossing located in the amber region where we expect up to half to require remediation at a cost of [REDACTED].

The funds will be used to install prevention measures to stop erosion occurring at sites identified as high risk and in close proximity to our buried assets. The project will extend the life of the pipelines it

protects and ensure that environmental impact is kept to a minimum whilst ensuring security of supply.

The investment for this project is controlled by contractor framework agreements whereby quotes are obtained from more than one contractor to ensure a high-level confidence will be seen. This allows a fully forecastable level of investment with fully understood market factors and pressures.

5 Business Case Outline

5.1 Business Case Summary

We are obligated to run a safe and secure network as part of our License conditions and as such have requirement to repair our network when impacted by third party or environmental factors resulting in the need for diversion or other remediation techniques to be carried out.

As part of our licence obligation, we would like to take this opportunity within the re-opener window to request funding of [REDACTED] for the last two years of GD2 to recover costs associated with the aforementioned large-scale diversions at Cowdenhill Quarry and Meadowhill Quarry, as well as to tackle ongoing challenges due to an increase in Below 7bar Washouts, including the washout on the Pitcairngreen to Huntingtower diversion.

The request for funding is broken down as follows:

Cowdenhill Quarry

- We are seeking [REDACTED] in funding for project F05 Cowdenhill Quarry Diversion, which was delivered in RIIO GD2.
- The 605m diversion, completed in FY 22/23 with commissioning in July 2022, addresses integrity risks posed by the adjacent Cowdenhill Quarry.
- An update is imminent on a legal challenge in court which will influence the outcome of possible cost recovery options, we will update on the outcome in the re-opener draft determination.

Meadowhill Quarry

- We are seeking funding of [REDACTED] for Project F01, the Meadowhill Quarry Diversion to deliver within RIIO GD2.
- The capital investment covers both the short-term intervention (commissioned in FY 21/22) and the long-term permanent diversion (planned for FY 25/26).
- The preferred diversion route is to lay 1520m of 450mm pipe. It would be primarily installed by open cut, with the Black Devon River Crossings installed through Horizontal Directional Drills.

Pitcairngreen to Huntingtower Washout

- We are seeking [REDACTED] of funding for remediation work caused by damage due to a washout on the newly diverted Pitcairngreen to Huntingtower pipeline.
- The remediation and funding required will be finalised by the re-opener draft determination.

Below 7bar Washouts

We are seeking [REDACTED] in funding for remediation work required for below 7bar river crossings in Scotland which have/potentially suffered washouts during RIIO-GD2 due to soil erosion. These washouts are split into the following groups:

1. Known Washouts - Complete/Planned

- We are requesting [REDACTED] of funding to recover costs associated with the 10 known washouts where work has been carried out or is currently planned in to repair the damage caused.

2. Known Washouts – Planning Stage

- At this stage we are requesting [REDACTED] for the one known washout where the project is still currently at the planning stage.

3. Unknown Washouts

- We are requesting a total of [REDACTED] to survey and repair up to 150 river crossing which are predicted to have been damaged from Storm Babet.
- The sites requiring remediation from the 150 crossings still to be surveyed will be confirmed by the re-opener draft determination where we will provide an update to Ofgem of our plans.

Loss of Development Claim Moorfield Kilmarnock

- Court case currently under review for a loss of development claim for [REDACTED]. We are not seeking funding at this stage and will update on the outcome of the case by the re-opener draft determination.

6 Glossary of Terms

| Acronym | Description |
|-----------------|--|
| DIVt | Term used within the Ofgem price formula |
| RIIO-GD2 | Price control period April 2021-26 |
| EJP | Engineering Justification Paper |
| PRS | Pressure Regulating Station |
| HDD | Horizontal Direction Drilling |
| FY | Financial Year |
| MP | Medium Pressure Pipeline |
| IP | Intermediate Pressure Pipeline |
| HSE | Health and Safety Executive |
| PSR | Pipeline Safety Regulations 1996 |
| CSEG | Customer and Stakeholder Engagement Group |
| | |
| SW/2 | SGN's Safe Working near High Pressure Pipeline Regulations |
| TRS | Transmission Regulation Station |
| SGN/PM/Maint/14 | SGN Management Procedure for Inspection and Maintenance of ≤ 7 bar Above Ground Crossings |
| SGN/PM/Maint/15 | SGN Management Procedure for Inspection and Maintenance of ≤ 7 bar Below Ground Crossings |
| 4R | Strategy of Repair, Refurbish, Replace and Rebuild |
| CP | Cathodic Protection |
| SEPA | Scottish Environment Protection Agency |
| NRA | National Rivers Authority |

7 Appendix A – Cowdenhill EJP

8 Appendix B – Meadowhill EJP

9 Appendix C - Below 7bar Washouts EJP