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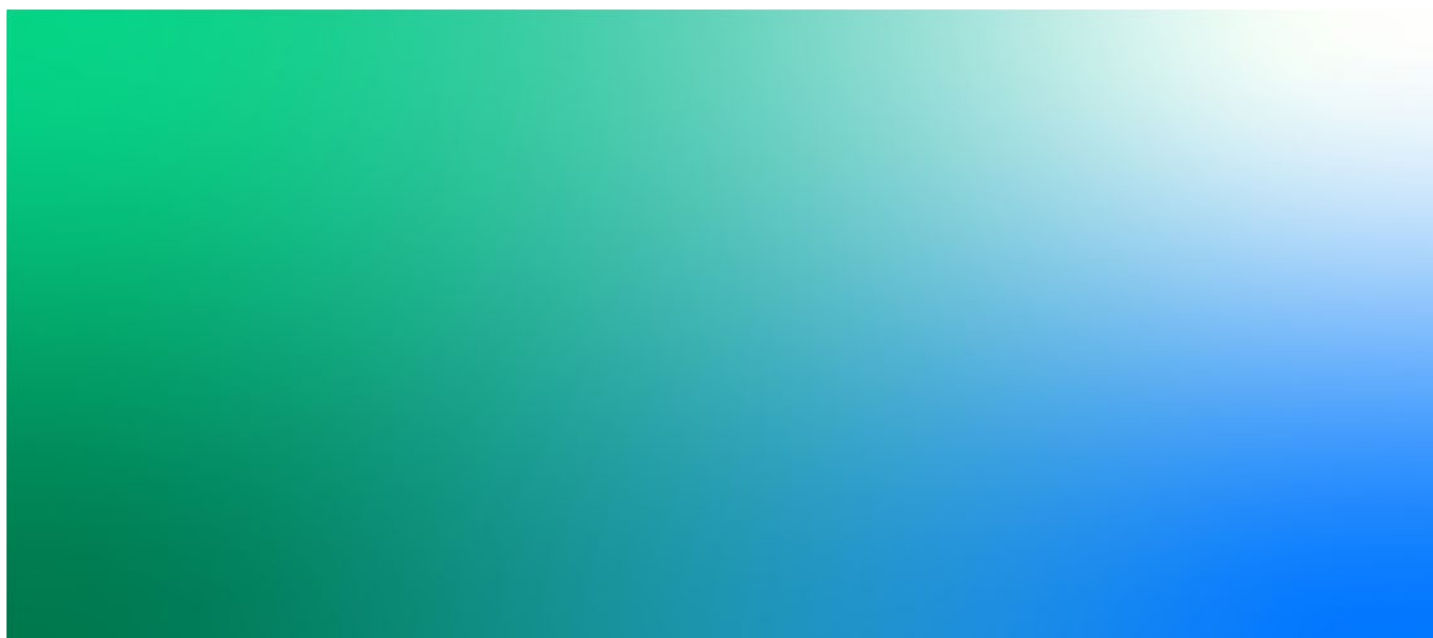
A75 Springholm and Crocketford Improvements

DMRB Stage 1 Environmental Appraisal Report

A75SCI-JAC-EGN-XX-RP-LE-000028

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Appendix A. Figures

1. Introduction

1.1 Purpose of the Report

The purpose of the Environmental Appraisal Report (EAR) is to inform the Design Manual for Roads and Bridges (DMRB) Stage 1 assessment for the A75 Springholm and Crocketford Improvements; hereafter referred to as “the proposed scheme”. This EAR builds upon what was previously assessed for the [Strategic Transport Projects Review 2](#) (hereafter referred to as “STPR2”) and the [South West of Scotland Regional Transport Strategy 2023 to 2042](#) (hereafter referred to as “SWestrans RTS”). It enables an appraisal of key environmental constraints and potential environmental impacts associated with the six DMRB Stage 1 improvement strategies.

The six improvement strategies subject to assessment in this report are broadly defined. They are all sited within an area which will be referred to as the DMRB Stage 1 ‘Assessment Corridor’ as shown on Figure 1-1. The DMRB Stage 1 Assessment Corridor has been defined by considering existing constraints and potential improvement strategies through which road alignments could be developed to realign the existing A75 around Springholm and Crocketford, taking account of relevant road design standards in the DMRB.

The first four chapters of this EAR describe the purpose of the report, the proposed scheme, consideration of alternatives, and the Environmental Impact Assessment (EIA) methodology. The remaining chapters of the report present the assessments for each environmental factor, covering the legislation and policy frameworks, assessment methodologies including assumptions and limitations, study area, baseline conditions, potential for impacts, design mitigation with enhancement measures, and finally likely significant effects. The Cumulative Effects Chapter provides the assessment of potential cumulative effects and the Summary of Assessment Chapter provides a summary of likely construction and operational phase effects for each improvement strategy. The Acronyms and References chapters provide a list of acronyms and references used within this EAR.

1.2 Scheme Background

The A75 Trunk Road in the south-west of Scotland is 159km long and extends from Gretna and the A74(M) in the east, to Stranraer in the west. The route forms an important link for the Loch Ryan port facilities (Cairnryan). The principal towns along the route are Annan, Dumfries, Castle Douglas, Gatehouse of Fleet, Newton Stewart and Stranraer. This background focuses specifically on previous work which identified the need for improvements around Springholm and Crocketford.

In August 1997, The Scottish Office commissioned a Route Action Plan Study for the entire length of the route. The aim of the Study was to bring together options for improvement of the A75(T) in the short, medium and long term, i.e. one to two years, two to five years and five to ten years, all with regard to Value for Money, Safety, and The Environment. The summarised output was titled A75 Gretna to Stranraer – Route Action Plan - Firm Strategy Report, published in October 1999. The short-term schemes identified localised lining, signing and junction improvements. The medium-term schemes, a number of dedicated overtaking sections, whereas the long-term schemes proposed a series of bypasses and dualling schemes. One of the recommendations for the long-term strategy included a Springholm Bypass which could consist of an off-line upgrade to Wide Single 2+1 (WS2+1) to provide guaranteed eastbound overtaking. Additionally, a bypass of Crocketford was appraised as a long-term option but not ultimately recommended to be progressed at that time.

The first Strategic Transport Projects Review (STPR), published in October 2009, recommended that Transport Scotland should implement a targeted programme of measures to improve links to the Loch Ryan port facilities from the Trans-European Road Network. The recommendation was for short to medium term schemes such as physical works aimed at providing safer overtaking opportunities such as WS2+1 sections, climbing lanes and overtaking lay-bys, and improvements to the operation of junctions around Dumfries.

In January 2020, Transport Scotland published the [South West Scotland Transport Study - Initial Appraisal - Case for Change](#). The key aim of the report was to consider the rationale for improvements to road, rail, public transport and active travel on key strategic corridors in the South West of Scotland, including those served by the A75, A76, A77, A701 and A709 as well as the railway corridors to Stranraer and Carlisle via Kilmarnock / Dumfries with a particular focus on access to the Loch Ryan port facilities. Following the development of the Transport Planning Objectives, and a process of option sifting and packaging, 23 multi-modal option packages across the study area were identified for further appraisal through the STPR process. Option Package 15 related specifically to the A75 and was described as the development of capacity enhancement measures on the A75, such as partial dualling, town/village bypasses and improved overtaking opportunities.

The second Strategic Transport Projects Review (STPR2), published in December 2022 by Transport Scotland, presented the Strategic Case for improved access to Stranraer and the Loch Ryan port facilities as Recommendation 40. Within this there are examples of improvement schemes one of which being A75 realignment around Springholm and Crocketford. These are the only two settlements on the A75 corridor not currently bypassed, and also where the speed limit drops to 30 mph.

In March 2024, Scottish Ministers were formally granted funding from the Union Connectivity Development Fund to progress Recommendation 40 from STPR2, specifically to progress initial design and assessment work in relation to the realignment of the A75 around Springholm and Crocketford. The Fund is an outcome of Sir Peter Hendy's Union Connectivity Review (UCR), published in November 2021. Within the UCR there is a recommendation that the UK Government (UKG) offer funding to the Scottish Government in order to support the upgrade of the existing A75 Trunk Road which would improve journeys between Northern Ireland and Great Britain. The UK Government changed following a General Election held in July 2024 and the incumbent UK Government re-confirmed its commitment to funding of the initial design and assessment work.

1.3 Previous Environmental Assessment

As discussed in the Scheme Background section of this chapter, the A75 was considered as part of Recommendation 40 of STPR2, which focused on improving access to Stranraer and the ports at Cairnryan. All STPR2 Recommendations were assessed in the STPR2 Strategic Environmental Assessment (SEA). The STPR2 SEA Environmental Report was publicly consulted on alongside the STPR2 Final Technical Report between December 2022 and February 2023.

The A75 was also included in the SWestrans RTS under the following themes that were included in the RTS and assessed in the RTS SEA:

- Theme 4: Reducing the Impact of Transport on Our Communities. Priority i: Investigate the feasibility of bypasses for Crocketford and Springholm on the A75 as well as other communities on the A7, A75, A76, A77 and A709 including Dumfries.
- Theme 8: Supporting Safe, Effective and Resilient Connections to Loch Ryan and Other Strategic Sites. Priority ii) Enhancements to the strategic road network including the A7, A75, A76, A77 and A709 should be taken forward to improve safety, journey times, diversionary routes and improve access to key locations across the region.

The RTS SEA was published in Autumn 2022 for a 12-week consultation period. The RTS SEA Post Adoption Statement was published in June 2024.

1.4 Legislative and Policy Framework

The following section provides a summary of the planning policies and context for obtaining approval for the proposed scheme. It is important to consider the relevant policies and legislation early in the planning process. This EAR represents an early stage of the decision process and will guide further work and future assessments to meet planning policies and legislation.

1.4.1 National Policies and Legislation

The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017

The legal requirements regarding EIAs for road projects are contained in the Roads (Scotland) Act 1984. This Act was amended by the Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017, in order to transpose Directive 2014/52/EU, which amends the EIA Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

An Environmental Impact Assessment (EIA) is required for specific types of projects and involves the process of collecting data, consulting stakeholders, and evaluating potential environmental impacts to produce an Environmental Impact Assessment Report (EIAR). The purpose of the assessment is to identify and mitigate any likely environmental effects, and to supply the environmental information to decision-makers and statutory consultees to aid in the determination of an application for consent.

Under The Roads (Scotland) Act 1984 as amended, the proposed scheme is likely to be considered to be an Annex II project, and as such it is subject to screening. Therefore, it is not yet determined whether the proposed scheme will require an EIA in accordance with the Regulations.

Environmental assessment standards for road projects are outlined in the [DMRB LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as "DMRB LA 104"), which provides specific guidance on individual environmental topics. In addition, Transport Scotland published [Guidance - Environmental Impact Assessments for road projects](#) which provides advice on key statutory requirements for undertaking EIAs for road projects.

National Planning Framework 4 (2023)

The Scottish Government's [Programme for Government 2022 to 2023](#) emphasises the importance of the [National Planning Framework 4](#) (NPF4) in delivering green, inclusive, and sustainable development across Scotland through to 2045. Adopted in February 2023, NPF4 integrates key policies such as the Infrastructure Investment Plan and the [National Transport Strategy 2](#) (hereafter referred to as "NTS2") Sustainable Travel Hierarchy and Sustainable Investment Hierarchy, embedding sustainable travel and sustainable investment principles into planning. NPF4 promotes a "local living" approach, aiming to create connected, liveable communities with reduced car dependency. The framework identifies the south of Scotland, including the A75 corridor between Springholm and Crocketford, as a regional priority for environmental protection, population growth, and green economic development. It also highlights the Stranraer Gateway as a National Development, supporting regeneration and

strategic transport improvements, including the realignment of the A75, to enhance connectivity and socio-economic outcomes in south-west Scotland.

Climate Change Plan Update (CCPU) (2020)

In December 2020, the Scottish Government published [Securing a green recovery on a path to net zero: climate change plan 2018–2032](#) to reflect the enhanced climate ambitions set out in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019. This plan commits Scotland to achieving net zero greenhouse gas emissions by 2045 at the latest. Aligned with the vision of NTS2, the plan envisions a sustainable, inclusive, safe, and accessible transport system that contributes to a healthier, fairer, and more prosperous Scotland for its communities, businesses, and visitors.

National Transport Strategy 2 (2020)

The NTS2 outlines a 20-year vision for a transport system that is sustainable, inclusive, safe, and accessible, supporting a healthier and more prosperous Scotland. It is built around four key priorities: reducing inequalities, taking climate action, enabling inclusive economic growth, and improving health and wellbeing. Specifically, for the A75, NTS2 emphasises its importance in enhancing Scotland's connectivity for international trade, addressing the lack of direct freight routes to the continent, and ensuring resilience in the transport network. The A75's role as a strategic link between England, Scotland, and Northern Ireland is seen as vital to achieving inclusive economic growth.

Strategic Transport Projects Review 2 (2022)

STPR2 guides transport investment in Scotland to support the goals of the National Transport Strategy 2 (NTS2). It considers the transport needs of communities across all modes -active travel, bus, rail, road, and ferry - for both personal and commercial use. STPR2 is driven by five key objectives: taking climate action, addressing inequalities and improving accessibility, enhancing health and wellbeing, supporting sustainable economic growth and increasing safety and resilience.

Scotland's Road Safety Framework to 2030 (2021)

[Scotland's Road Safety Framework to 2030](#) outlines bold and forward-looking objectives aimed at eliminating road deaths and serious injuries by 2050. To support this vision, the framework identifies five strategic outcomes that define the desired road safety environment. These outcomes are aligned with the five pillars of the Safe System approach: safe road use, safe vehicles, safe speeds, safe roads and roadsides, and effective post-crash response.

Reducing Car Use for a Healthier, Fairer and Greener Scotland (2022)

In January 2022, the Scottish Government and Convention of Scottish Local Authorities (COSLA) introduced a route map to support a 20% reduction in car kilometres, aiming to tackle climate change and promote a healthier, fairer, and more prosperous Scotland. This was detailed in [Reducing car use for a healthier, fairer and greener Scotland](#). The route map was created to support the target of a 20% reduction in car kilometres committed to in the CCPU as a means to help achieve the overall target of achieving net zero emissions by 2045. It notes that a uniform 20% kilometre reduction will not be stipulated in all geographical areas.

This plan emphasizes collaboration across all levels of government and sectors and aligns with STPR2 recommendations for future transport investment. The route map envisions a transformative shift in how people live and travel—encouraging localism, safer streets for walking and cycling, improved access to public and shared transport for longer journeys, and increased use of digital services. Projects will need to consider how to promote alternative transport modes between local villages, showcasing the benefits of reduced car dependency.

1.4.2 Regional Transport and Planning Strategies

SWestrans Regional Transport Strategy 2023-42 (2023)

The SWestrans RTS, published in 2023, is the long-term transport strategy for the south-west of Scotland, developed under the Transport (Scotland) Act 2005. It focuses on addressing transport challenges in Dumfries and Galloway over the next 20 years. A key focus is the A75, which is vital for freight movement to the Stranraer ports, with an estimated £20 million in goods transported west of Dumfries daily.

The strategy highlights the negative impacts of traffic on communities like Crocketford and Springholm, and includes Priority 18, which proposes investigating the feasibility of bypasses for these villages. Another major theme is ensuring safe and resilient access to Cairnryan, with Priority 57 calling for improvements to the strategic road network - including the A75 - to enhance safety, journey times, diversion routes, and regional connectivity.

South of Scotland Indicative Regional Spatial Strategy (2021)

Of the several actions detailed throughout the [South of Scotland Indicative Regional Spatial Strategy](#), a key aim for transport and infrastructure is 'to develop strategic transport and active travel linkages by focussing on strategic travel corridors and sustainable travel hubs'. This is key not only for improving links to and from port destinations but also to improve accessibility between communities, journey quality and provides opportunities to encourage active travel networks.

Dumfries and Galloway Active Travel Strategy 2 (2022-2032)

The [Active Travel Strategy 2022 to 2032](#) (ATS2) outlines a 10-year plan to enhance both the infrastructure and culture of active travel - such as walking, wheeling, and cycling - across Dumfries and Galloway. Accompanied by a Delivery Plan, the strategy aims to better integrate active travel with public transport and improve road infrastructure.

It sets out ten strategic objectives, including, amongst others, enhancing safety on streets and in public spaces, encouraging short trips by walking or cycling and strengthening urban-rural connections.

Dumfries and Galloway Local Development Plan 2 (2019)

Dumfries and Galloway [Local Development Plan 2](#) (LDP2) provides the planning framework for land use and development across villages, towns, and rural areas in Dumfries and Galloway. It promotes sustainable development through key principles such as avoiding flood-prone and high-quality agricultural land, reusing brownfield sites, maximizing existing infrastructure (including public transport), and encouraging mixed communities. Two policies particularly relevant to transport and accessibility are Policy T1 Transport Infrastructure and Policy T2 Location of Development/Accessibility.

Within the LDP2, the Spatial Strategy aims to ensure development occurs in the right places to meet community needs. In addition, in line with transport goals, LDP2 supports STPR (2008–2032) Intervention 11, which focuses on improving links between the A75 and Loch Ryan port facilities to enhance journey time reliability and access to Cairnryan.

Additionally, work is underway on Local Development Plan 3 (LDP3). An Evidence Report was reviewed by the Scottish Government in December 2024, with feedback returned in April 2025. The proposed LDP3 is expected to be submitted in 2027 and adopted later that year.

2. The Proposed Scheme

2.1 Scheme Objectives

The objectives for the proposed scheme, as set out in the [A75 Strategic Assessment Report](#), are as follows:

- Reduce the environmental impacts and severance caused by strategic traffic using the A75 Trunk Road within Springholm and Crocketford, by achieving a reduction in traffic of at least 50%, and enhance placemaking opportunities from year of opening.
- Improve the resilience and reliability of the A75 Trunk Road, including for freight travelling to and from the ports at Cairnryan, by reducing time lost due to slower moving vehicles and incidents locally to increase the average speed and reduce the variation in average speed from year of opening.
- Reduce local accident rates and severity through reducing Killed or Seriously Injured (KSIs) by 65% in line with Road Safety Framework targets, and contribute to improving safety on the A75 trunk road within five years of opening.
- Contribute towards sustainable economic growth locally and for the region by creating potential for local land-use opportunities to increase planning applications over the longer term.
- Increase sustainable travel choices and increase the local sustainable transport mode share by 50%, within a year of opening.

2.2 Scheme Location

The proposed scheme location and improvement strategies (including a 2km buffer) are shown on Figure 2-1. Study areas have been identified for each of the individual environmental factors according to their relevant assessment requirements. The remaining chapters of the report detail information on specific study areas.

The existing A75 between Allanton Roundabout in the south-west and Drummorie Roundabout in the north-east is predominantly surrounded by agricultural land with some pockets of woodland. There are two lochs in proximity to the improvement strategies; Auchenreoch Loch which is directly north of the A75, and Milton Loch which is approximately 1.1km south-east of the A75. Urr Water runs under the A75 approximately 3.4km south of Springholm.

The villages of Springholm and Crocketford are the only two remaining settlements that the A75 trunk road still directly passes through, with Brae situated adjacent to the road. The route also passes to the south of the villages of Shawhead, Kirkpatrick Durham, Old Bridge of Urr

and to the north of the villages of Milton, Hardgate, Haugh of Urr. The town of Castle Douglas is located directly south of Allanton roundabout.

Further detail of the environmental features present, including locations, can be found in the relevant environmental factor chapters and Figure 2-2(A to E).

2.3 Scheme Description

2.3.1 Existing Infrastructure

The existing A75 between Allanton Roundabout and Drummole Roundabout is approximately 18.5 km long and predominantly comprises single carriageway. There are three overtaking sections present within the DMRB Stage 1 Assessment Corridor (two in the westbound direction and one in the eastbound direction), with laybys interspersed along the existing carriageway.

2.3.2 Description of Improvement Strategies

Six improvement strategies have been subject to assessment in this EAR. The development of these improvement strategies involved our technical specialists (engineering, environmental, traffic, economics and other design disciplines), providing advice and highlighting the major and minor constraints within and in proximity to the DMRB Stage 1 Assessment Corridor. The strategies were further refined by the engineering team and the final improvement strategies assessed were as follows.

Improvement Strategy 1

Improvement Strategy 1 is offline and leaves the existing A75 at Allanton Roundabout. It then runs north-west of Springholm, Auchenreoch Loch and Crocketford, before rejoining the existing A75 at Drummole Roundabout. It would involve the construction of a new carriageway between the Allanton and Drummole roundabouts. The total length of the improvement strategy is approximately 19km.

This improvement strategy would include a number of structures over watercourses including Urr Water. In addition, further structures and/or junctions may be required for the existing A75, B795, B794, A712, Core Path IRON/72/1, several C-roads and private accesses. This improvement strategy passes through areas of undulating topography and native woodland. A number of properties lie within the improvement strategy. Improvement Strategy 1 is shown on Figure 2-1.

Improvement Strategy 2

Improvement Strategy 2 is offline and leaves the existing A75 at a location approximately 2.7km south of Springholm. It then runs north-west of Springholm, Auchenreoch Loch and

Crocketford before rejoining the existing A75 at a location approximately 0.8km north-east of the settlement of Brae. It would involve the construction of a new carriageway between the existing A75 / B794 junction and the existing A75 to north-east of Brae. The total length of the improvement strategy is approximately 12.4km.

This improvement strategy would include a number of structures over watercourses. In addition, further structures and/or junctions may be required for the existing A75, A712, Core Path IRON/72/1, several C-roads and private accesses. This improvement strategy passes through areas of undulating topography. A number of properties lie within the improvement strategy. Improvement Strategy 2 is shown on Figure 2-1.

Improvement Strategy 3

Improvement Strategy 3 is online and follows the route of the existing A75 from the south of Springholm to the north of the Crocketford. This includes the sections of existing A75 subject to the 30mph speed restriction. The total length of the improvement strategy is approximately 5.4km.

This improvement strategy would include the widening or replacement of the existing structures over watercourses. In addition, further structures and/or junctions may be required for the A712, several C-roads and private accesses. A large number of properties lie within the improvement strategy. Improvement Strategy 3 is shown on Figure 2-1.

Improvement Strategy 4

Improvement Strategy 4 is offline and leaves the existing A75 at a location approximately 0.8km south-west of Springholm. It then runs to the south-east of Springholm, parallel to the existing A75 for approximately 1.2km, before continuing south-east of Crocketford and re-joining the existing A75 approximately 0.6km north-east of Crocketford. It would involve the construction of a new carriageway between the south-west of Springholm and the north-east of Crocketford. The total length of the improvement strategy is approximately 6.0km.

This improvement strategy would include a number of structures over watercourses. In addition, further structures and/or junctions may be required for the existing A75, several C-roads and private accesses. This improvement strategy passes through areas of undulating topography. A number of properties lie within the improvement strategy. Improvement Strategy 4 is shown on Figure 2-1.

Improvement Strategy 5

Improvement Strategy 5 is offline and leaves the existing A75 approximately 0.4km south of the Ramhill Bridge over Urr Water. It then runs south-east of Springholm and passes south-east of Auchenreoch Loch and Crocketford and north-west of Milton Loch before rejoining the existing A75 near the settlement of Brae. It would involve the construction of a new carriageway between the south of Ramhill Bridge and the south of Brae. The total length of the improvement strategy is approximately 11km.

This improvement strategy would include a number of structures over watercourses including Urr Water. In addition, further structures and/or junctions may be required for the existing A75, the B794, Core Path IRON/72/1, Core Path URR/603/1, several C-roads and private accesses. This improvement strategy passes through areas of undulating topography and native woodland. A number of properties lie within the improvement strategy. Improvement Strategy 5 is shown on Figure 2-1.

Improvement Strategy 6

Improvement Strategy 6 is offline and leaves the existing A75 at Allanton Roundabout. It then follows a route south-east of Springholm, Crocketford and Milton Loch. It also passes to the east of Haugh of Urr, Hardgate and Milton, running parallel to the Old Military Road for the majority of the route, rejoining the existing A75 at the Drummorie Roundabout. It would involve the construction of a new carriageway between the Allanton and Drummorie roundabouts. The total length of the improvement strategy is approximately 17.2 km.

This improvement strategy would include a number of structures over watercourses including Urr Water. In addition, further structures and/or junctions may be required for the existing A75, the Old Military Road, the B794, several C-roads and private accesses. This improvement strategy passes through areas of undulating topography and native woodland. A number of properties lie within the improvement strategy. Improvement Strategy 6 is shown on Figure 2-1.

2.3.3 Construction Operation and Long-Term Management

Following the DMRB Stage 1 Assessment, a DMRB Stage 2 Assessment will be undertaken. DMRB Stage 2 will involve the development and assessment of route options within the improvement strategies taken forward from DMRB Stage 1. The outcome of the DMRB Stage 2 Assessment will be the identification of a preferred route option.

Future progress would require completion of a DMRB Stage 3 Assessment which would involve further design development and assessment of the preferred route option. Statutory processes (including publication of draft Orders, an Environmental Impact Assessment Report and a Public Local Inquiry if required) would require to be successfully completed before

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consideration could be given to a procurement process to appoint a contractor and subsequent construction of the project.

For the purposes of this DMRB Stage 1 EAR, the assumed illustrative opening year is 2035. These dates are used where relevant as the basis of environmental factor assessments.

During construction, it is anticipated that the contractor would require parcels of land to use for site compounds, materials storage for permanent and temporary works and haul roads for vehicles to allow heavy machinery and personnel to move around the site. The areas that would only be affected by temporary works are unknown at the time of reporting this EAR. Any land required by the contractor would be restored to the reasonable satisfaction of the owners of the land.

3. Assessment of Alternatives

3.1 Alternatives Studies

As described in the Scheme Background section of this chapter, the proposed scheme is being progressed based upon the findings and recommendations of a number of previous studies including STPR2 and SWestrans RTS. A full review of these studies is included in the [A75 Strategic Assessment Report](#).

The SWestrans RTS considered multi-modal improvements on key strategic corridors in the south-west, with a particular focus on access to the ports at Cairnryan. STPR2 lists 45 recommendations for transport improvements across all regions of Scotland and across all modes. Through these previous studies a consideration of alternatives has been undertaken. Further detail of the previous studies can be found in the A75 Strategic Assessment Report.

3.1.1 Do Minimum Scenario

While the approach to the DMRB Stage 1 Assessment focusses on major improvements along the A75 in the vicinity of Springholm and Crocketford, it is also necessary to consider the “Do-Minimum” scenario in the quantitative assessment, including economic appraisal, against which the proposed scheme is compared.

The Do-Minimum scenario reflects the most likely transport situation where the proposed scheme is not progressed and no major intervention is assumed to occur. The current road layout is largely maintained as is, with essential road maintenance continuing to be addressed and minor interventions undertaken. This allows the assessment to determine the potential impacts of not progressing the proposed scheme and allows a consistent baseline comparison against which the effects of the proposed scheme can be determined.

Examples of these potential interventions that could be anticipated in the Do-Minimum scenario include improvements to the safety and operation of the route such as updated signing and lining, the installation of additional Variable Message Signs (VMS).

4. Environmental Assessment Methodology

4.1 Introduction

This EAR includes the assessment of the improvement strategies (Improvement Strategies 1-6) which have been assessed as part of DMRB Stage 1. A full description of these improvement strategies can be found in Description of Improvement Strategies.

An outline of the methodologies for each environmental factor is reported within this EAR. These environmental factors are aligned with [DMRB LA 101 - Introduction to environmental assessment \(revision 0\)](#) (hereafter referred to as "DMRB LA 101"), [DMRB LA 103 - Scoping projects for environmental assessment \(revision 1\)](#) (hereafter referred to as "DMRB LA 103") and DMRB LA 104.

The scope of this EAR covers the following environmental factors:

- Air Quality
- Cultural Heritage
- Landscape and Visual
- Biodiversity
- Geology, Soils and Groundwater
- Material Assets and Waste
- Noise and Vibration
- Population and Human Health
- Road Drainage and the Water Environment
- Climate
- Cumulative Effects

4.2 Survey Methods

Although there are methods and requirements specific to the assessment of each environmental factor, the approach set out below is common to all environmental factors and is in accordance with relevant guidance and good practice.

This EAR follows the assessment approach set out in the DMRB LA 104. This document was released in July 2019 and further revised in August 2020. It sets out the requirements for the environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects.

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Existing baseline environmental conditions have been defined in order to identify the presence of environmental resources and receptors that may be affected by the improvement strategies. These resources and receptors have been identified within defined study areas in order to determine their relative importance or sensitivity towards change. Baseline environmental data, information and records were obtained using a combination of sources and techniques including the following:

- Desk study: a study of previously published information has been undertaken as part of the proposed scheme including; published literature, databases, records and schedules relating to environmental designations, national and local planning policy documents, historic and current mapping and aerial photography.
- Site-based surveys: landscape walkover surveys have been undertaken to verify and consolidate information gathered during the desk-based review, and to evaluate the relationships between specific landscape receptors and their wider environmental value.

4.3 General Assumptions and Limitations

Each environmental factor chapter outlines the relevant assumptions and limitations associated with the environmental factor being discussed. Environmental factor specific assumptions and limitations are outlined in each environmental factor chapter. Only landscape surveys have been undertaken during DMRB Stage 1.

Effects that arise during construction, but which may be permanent are identified in the construction phase assessment. Effects that arise during operation are identified in the operation phase assessment. For example, adverse effects from vegetation removal are reported under construction, whilst the beneficial effects of replacement habitat are reported under operation.

The high-level nature of the assessment is reflective of the early stage of design and current level of baseline and survey information. Environmental assessment will adapt and be refined as the proposed scheme progresses through the design stages. For example, additional aspects of environmental factors, or receptors may ultimately be scoped out.

Paragraph 2.6.1 of DMRB LA 104 stresses that the prediction of significant effects does not require absolute certainty. Rather, it is more about taking a reasonable view over likelihood. It is recognised a level of uncertainty is acceptable provided the prediction of likely environmental effects is supported by sufficient evidence. Furthermore, the determination of significance is only expected to be made using readily available information.

It is considered highly unlikely that the proposed scheme would be demolished after its design life as the road is likely to have become an integral part of the infrastructure in the area. In the unlikely event that the proposed scheme is demolished, this would be part of the

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relevant statutory process at that time, including EIA as appropriate. Demolition was therefore scoped out of the assessment.

This EAR has been prepared based on the environmental baseline information available at the time of writing. Further information will become available as the iterative design and assessment process proceeds and the scope of assessment will be kept under review.

Detailed construction methodologies are unknown at present. For example, the location of site compounds is not available at this stage. Where uncertainty exists, a precautionary approach has been adopted.

Mitigation and enhancement opportunities are identified as potential measures, but no specific mitigation design is included, this is reflective of the early stage of the scheme

The proposed scheme would not introduce any sources of radiation and would generate limited amounts of heat from minor elements such as lighting. The assessment of heat and radiation required under the EIA Regulations 2017 is therefore not relevant to the proposed scheme and has been scoped out. This concurs with DMRB LA 104 which reports 'heat and radiation is unlikely to be relevant to the scope of most motorway and all-purpose trunk roads'.

4.4 Significance Criteria

This EAR addresses the requirements of The Roads (Scotland) Act 1984 as amended by The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017, in presenting: "The description of the likely significant effects" of the proposed scheme on the environment, covering "the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project" (refer to Schedule 1A paragraph 6 of The Roads (Scotland) Act (Environmental Impact Assessment) Regulations 2017.

DMRB LA 104 provides advice on typical descriptors of environmental value, magnitude of change (or impact) and significance of effects.

Table 4-1 to Table 4-4 reproduce these descriptors and explain how the significance of effect category is derived. Assessments against these criteria have been made in accordance with the approaches outlined in the DMRB and on the basis of professional judgement. Table 4-1 describes how the value (sensitivity) of receptors (as outlined in DMRB LA 104, Table 3.2N), shall be applied.

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Table 4-1: Environmental Value (Sensitivity) and Descriptions (Ref Table 3.2N of DMRB LA 104)

Value	Typical Descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Medium or low importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

The magnitude of impact on receptors is reported within environmental assessments and the descriptions for magnitude of impact as outlined in DMRB LA 104 Table 3.4N is provided in Table 4-2.

Table 4-2: Environmental Value (Magnitude of Impact) and Descriptions (Ref Table 3.2N of DMRB LA 104)

Magnitude of Impact (Change)	Typical Descriptors
Major Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
Major Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Moderate Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Moderate Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Minor Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.

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Magnitude of Impact (Change)	Typical Descriptors
Negligible Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
Negligible Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

The significance of an environmental effect is typically a function of the 'value' or 'sensitivity' of the receptor and the 'magnitude' or 'scale' of the impact or change. The output of this EAR is to report the likely significance of environmental effects using established criteria as presented in Table 3.8.1 within DMRB LA 104 and reproduced below in Table 4-3.

Table 4-3: Significance Matrix (Ref Table 3.8.1 of DMRB LA 104)

Magnitude of Impact (Degree of Change)	No Change	Negligible	Minor	Moderate	Major
Very High Environmental value (sensitivity)	Neutral	Slight	Moderate or large	Large or very large	Very large
High Environmental value (sensitivity)	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Medium Environmental value (sensitivity)	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
Low Environmental value (sensitivity)	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate

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Magnitude of Impact (Degree of Change)	No Change	Negligible	Minor	Moderate	Major
Negligible Environment al value (sensitivity)	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Table 4-4 illustrates how the DMRB LA 104 describes the significance of effect categories. In arriving at the significance of effect, the assessor considers whether effects are direct, indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, beneficial or adverse.

Table 4-4: Significance Categories and Typical Descriptions (Ref Table 3.7 of DMRB LA 104)

Significance Category	Typical Description
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

The DMRB LA 104, states that the approach to assigning significance of effect relies on reasoned argument and, professional judgement. and taking on board the advice and views of relevant organisations. At DMRB Stage 1 the scheme is at an early stage of design therefore views of relevant organisations have not been sought; this will be completed at the next stages of assessment. The environmental factor chapters provide an assessment of the potential for the proposed scheme to have significant adverse or beneficial environmental

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effects. The significance of an effect is the result of the importance or value of the resource affected, and the magnitude of the impact upon it.

Those effects categorised as moderate, large or very large are typically considered to be significant. Slight adverse and neutral effects are not considered to be significant. Slight and moderate effects can be borderline cases and whether these effects are considered to be significant is based on professional judgement.

Where appropriate, factor-specific criteria and approaches have been adopted from relevant institute guidelines or good practice. Not all the environmental factors use the above matrix-based approach; for some factors, predicted effects may be compared with quantitative thresholds and scales in determining effect significance. Where quantitative measures may not be applied, qualitative criteria derived from the DMRB have been used.

It is important to note, that significance categories are required for positive (beneficial) as well as negative (adverse) effects. The greater the environmental sensitivity or value of the receptor and greater the magnitude of the impact, the more significant the effect. For example, the consequences of a highly valued receptor suffering a major detrimental impact from the proposed scheme would be classified as a significant adverse effect.

5. Air Quality

5.1 Introduction

This chapter describes the methodology followed and potential impacts identified for the air quality assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). This assessment has been undertaken with reference to [Design Manual for Roads and Bridges \(DMRB\) LA 105 - Air quality \(revision 0.1.0\)](#) (hereafter referred to as “DMRB LA 105”) and other relevant standards and guidance set out within this chapter.

5.2 Legislative and Policy Framework

Table 5-1 provides a summary of the legislation and policy that are relevant to this air quality assessment.

Table 5-1: Legislation and Policy Relevant to the Air Quality Assessment

Legislation and Policy	Relevance to the Proposed Scheme
Environment Protection Act (1990) amended by the Pollution Prevention and Control Act (1999).	Part III provides statutory nuisance provisions for dust, which would be generated during construction.
Environment Act 1995, Part IV.	Introduced a system of Local Air Quality Management (LAQM) in the UK. This requires local authorities to review and assess air quality within their boundaries regularly and systematically against Air Quality Objectives (AQOs), appraise development and transport plans against these assessments and make plans to meet the AQOs where these are exceeded.
The Air Quality (Scotland) Regulations 2000, and The Air Quality (Scotland) Amendment Regulations 2002	Legislates for the AQOs for pollutants set out in the 2000 Air Quality Strategy, which was revised in 2007. AQOs exist for a variety of pollutants including oxides of nitrogen (NO _x), nitrogen dioxide (NO ₂), particulate matter (PM ₁₀ and PM _{2.5}). These are established for both the protection of human health and the protection of vegetation and ecosystems.

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Legislation and Policy	Relevance to the Proposed Scheme
The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1)	Updates the 2000 Air Quality Strategy, and sets out how local air quality is managed, through the application of AQOs based on the above Air Quality (Scotland) Regulations 2000 and 2002 Amendments.
Directive 2008/50/EC on ambient air quality and cleaner air for Europe	Consolidates previous European Directives on ambient air quality. These Directives form the basis for UK air quality legislation and were transposed into UK law via The Air Quality Standards (Scotland) Regulations 2010. Although published in 2007, the Air Quality Strategy (AQS) is consistent with The Air Quality Standards (Scotland) Regulations 2010.
The Air Quality Standards (Scotland) Regulations 2010	Transposes the formalised Limit Values (LVs) set out in the European Union (EU) Ambient Air Quality Directive 2008/50/EC to Scottish law.
Cleaner air for Scotland: the road to a healthier future	A national strategy setting out the Scottish Government's proposals for delivering further improvements to air quality for compliance with EU air quality legislation. Commits to aligning the AQOs in relation to PM with the World Health Organisation (WHO) recommendations.
The Air Quality (Scotland) Amendment Regulations 2016	Updates the annual mean PM _{2.5} AQOs from the Air Quality (Scotland) Regulations 2000.
The Environment Strategy for Scotland: vision and outcomes	This provides the framework and policy priorities for Scotland.
Cleaner Air for Scotland 2 - Towards a Better Place for Everyone	CAFS2 supersedes CAFS and sets out actions to improve air quality and how these will be delivered based upon the 2020 Environment Strategy for Scotland.

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EU Directive 2008/50/EC Ambient Air Quality and Cleaner Air for Europe was published to consolidate previous European Directives on ambient air quality. These European Directives form the basis for UK air quality legislation and were transposed to UK law via The Air Quality Standards (Scotland) Regulations 2010. Although published in 2007, the Air Quality Strategy (AQS) is consistent with The Air Quality Standards (Scotland) Regulations 2010.

In 2016, Scotland became the first country in Europe to adopt the 2005 WHO recommended annual mean guideline value of $10\mu\text{g}/\text{m}^3$ for Particulate Matter at 2.5 microns or less ($\text{PM}_{2.5}$). Currently, the Scottish Air Quality Objectives (AQOs) for Particulate Matter at 10 microns or less (PM_{10}) are $18\mu\text{g}/\text{m}^3$ and $10\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$.

Prior to Brexit, the UK Government was responsible to the European Commission (EC) for ensuring that it complied with the provisions of the EU Directive. Although this is no longer the case, the Air Quality Standards (Scotland) Regulations 2010 remain in force and compliance with the Limit Values (LVs) within these regulations is still required.

The AQOs applicable to Local Air Quality Management (LAQM) in Scotland are set out in The Air Quality (Scotland) Regulations 2000 and its associated amendments, whilst LVs are set out in The Air Quality Standards (Scotland) Regulations 2010. AQOs are health-based standards set at a level to provide protection to the whole population. The pollutants relevant to this assessment are NO_x , NO_2 , PM_{10} and $\text{PM}_{2.5}$, which are most likely to be impacted by road traffic at either human health or ecological receptors. The relevant AQOs / LVs for these pollutants are presented in Table 5-2. The AQS also provides a non-statutory objective for NO_x , for the protection of vegetation. This is currently not assessed by Scottish local authorities.

Table 5-2: Relevant Air Quality Limit Values and Air Quality Objectives

Pollutant	Threshold	Averaging Period
NO_x * objective set for the protection of vegetation and ecosystems. This standard does not apply to human health.	$30\mu\text{g}/\text{m}^3$	Annual mean
NO_2	$40\mu\text{g}/\text{m}^3$ to $200\mu\text{g}/\text{m}^3$ (not to be exceeded more than 18 times/yr)	Annual and 1-hour mean

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Pollutant	Threshold	Averaging Period
PM ₁₀	18µg/m ³ to 50µg/m ³ (not to be exceeded more than 7 times/yr)	Annual and 24-hour mean
PM _{2.5}	10µg/m ³	Annual mean

There are no assessment methods available that can produce robust predictions of short-term air pollutant concentrations associated with road traffic emissions. Therefore, compliance with the short-term AQOs/LVs is assessed by following the guidance presented in [Local Air Quality Management Technical Guidance \(TG22\)](#) (hereafter referred to as "LAQM TG(22)"), which provides relationships between the annual mean concentration and the number of periods per year where short-term air quality standards are potentially exceeded. These relationships have been derived from examination of monitoring data across the UK.

The responsibilities of local authorities with respect to meeting AQOs are not the same as the responsibilities of the UK Government for meeting legally binding air quality LVs. Local authorities do have statutory duties for LAQM; however, they are not obliged to ensure AQOs are met, but rather that they are worked towards. Under Part IV of the Environment Act 1995, the UK Government introduced LAQM, which placed duties on local authorities to undertake periodic reviews of air quality in their areas to assess present and likely future air quality against the AQOs. Where these AQOs are not likely to be met, the local authority must designate an Air Quality Management Area (AQMA) and produce an action plan for improvement in air quality.

It is important to recognise the difference between the LVs (for which compliance is determined at a national level by government) and AQOs (for which compliance is determined at a local level by local authorities under the LAQM regime). Whilst the LVs and AQOs for a pollutant may be set at the same concentration value (for example 40µg/m³, as an NO₂ annual mean) the means of determining compliance are fundamentally different, and they must be considered separately.

Compliance with air quality LVs is determined initially via the national monitoring network and national model (the Pollution Climate Mapping (PCM) model). There are important differences between this, and the monitoring/modelling carried out by local authorities to determine compliance with AQOs. Because of these differences, there are many locations across the UK where the national assessment of compliance with LVs, and local assessments of compliance with AQOs, are not in agreement. They are treated separately in this assessment, which is consistent with the advice in the relevant [Planning Advice Note \(PAN\)](#)

[51: Planning, Environmental Protection and Regulation](#) (hereafter referred to as “PAN 51”), discussed below, produced by the Scottish Government (which provide further guidance on specific topics) and with DMRB LA 105.

5.2.1 National Policy

The [National Planning Framework 4](#) was adopted in February 2023. The Framework outlines the Scottish Ministers’ policies and proposals for development and land-use in Scotland and details the long-term spatial strategy, spatial principles, priority actions and National Developments up to 2045. The following policy is related to air quality in the context of the proposed scheme:

- Health and Safety - Policy 23d ‘Development proposals that are likely to have significant adverse effects on air quality will not be supported. Development proposals will consider opportunities to improve air quality and reduce exposure to poor air quality. An air quality assessment may be required where the nature of the proposal or the air quality in the location suggest significant effects are likely’.
- PAN 51 summarises the statutory responsibilities of the environmental protection bodies. The purpose of PAN 51 is to support the existing policy on the role of the planning system in relation to the environmental protection regimes.

5.2.2 Local Policy and Plans

Air quality within Dumfries and Galloway is generally very good as presented in [Dumfries and Galloway 2021 Air Quality Annual Progress Report](#). Therefore, there are no specific local policies or plans related to air quality.

5.3 Assessment Methodology

The following section describes the methodology for the assessment that has been undertaken at DMRB Stage 1. The assessment of the improvement strategies on air quality has been completed with reference to the assessment methodology set out in DMRB LA 105 and Defra’s LAQM TG(22), where applicable.

For the purposes of this DMRB Stage 1 EAR, the assumed opening year for the proposed scheme is 2035, therefore, for the air quality assessment, an opening year of 2035 has been used. There are six improvement strategies, described in full in The Proposed Scheme Chapter of this EAR. The improvement strategies generally run along or in parallel to the existing A75 between Allanton Roundabout in the west and Drummole roundabout at the start of the existing dualled section in the east.

Paragraph 2.10.1 of DMRB LA 105 states ‘the level of assessment is determined by the level of risk and the assessment stage for the project, and at the options selection and preliminary

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design stage, a simple assessment should be sufficient'. Expected reductions in road traffic exhaust emissions over time, together with the low levels of air pollutants in the area (see the Assumptions and Limitations section of this chapter) all suggest it is very unlikely there will be exceedances of either the AQOs or LVs within the air quality study area in the proposed scheme opening year. Therefore, to provide a proportionate level of assessment at this early stage of the design, the DMRB Stage 1 air quality assessment has followed a limited, qualitative assessment approach, using readily accessible data from the data sources listed below to inform the assessment.

5.3.1 Data Sources

- [Data for Local Authority Review and Assessment purposes](#) (hereafter referred to as "LA Data") and [Air Quality Management Areas](#)
- [UK Air Information Resource 2020 NO2 and PM projections data \(2018 reference year\)](#)
- [Dumfries and Galloway 2021 Air Quality Annual Progress Report](#) (hereafter referred to as "Dumfries and Galloway AQ APR")
- [UK Air Information Resource Annual and Exceedance Statistics](#)
- [UK Air Information Resource Background Mapping data for local authorities - 2018](#) and [Air Quality Management Areas interactive map](#)
- [APIS - Air Pollution Information System](#) (hereafter referred to as "APIS")
- [Habitat Data \(and the Habitat Map of Scotland\)](#)

5.4 Assumptions and Limitations

5.4.1 Assumptions

The local authority data on AQMAs and monitoring data used to inform this assessment have been obtained from the most recent publicly available documents and resources.

There was no traffic data for the respective improvement strategies to inform this assessment. Therefore, the study area has been based on a 2km buffer of the outer limit of the improvement strategies (hereafter referred to as the "DMRB Stage 1 Assessment Corridor"), which is a buffer being used by other environmental factors at DMRB Stage 1.

All monitoring data used has been reproduced from third party sources and therefore were assumed to be accurate.

5.4.2 Limitations

Paragraph 2.10.1 of DMRB LA 105 states that 'The level of assessment is determined by the level of risk and the assessment stage for the Project, and at the options selection and

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preliminary design stage, a simple assessment should be sufficient'. Expected reductions in road traffic exhaust emissions over time, together with projected trends in background pollutant concentrations (see the Baseline Conditions section of this chapter) suggest it is unlikely there will be exceedances of either AQOs or LVs within the air quality study area in the opening year (2035). In addition, traffic data and design information (other than broad outline of improvement strategies) were not available at the time of this assessment. As such, and to provide a proportionate level of assessment at this early stage of the design, this assessment has followed a limited, qualitative assessment approach. Therefore, absolute air pollutant concentrations and the magnitude of potential impacts have not been quantified for this DMRB Stage 1 assessment.

The impact of COVID-19 travel restrictions on traffic flows will have affected air quality monitoring data for 2020 and 2021. The use of data in previous years (especially for 2019) are, however, considered likely to have negated the impact of this limitation.

The affected road network is not known at present for this high-level assessment and therefore the extent of the impacts is unknown.

5.5 Study Area

In the absence of traffic data, the study area for the air quality assessment has been based on professional judgement and as such is based on a 2km buffer of the DMRB Stage 1 Assessment Corridor, as it is unlikely there will be significant rerouting in the area. The study area included land within the areas administered by Dumfries and Galloway Council as shown in Figure 5-1. The study area is not exhaustive and could be subject to change once the affected road network (ARN) has been defined at DMRB Stage 2. The DMRB Stage 2 ARN will be defined based on the DMRB LA 105 traffic scoping criteria. The DMRB scoping criteria are based on the change in traffic flows in the opening year between the Do Minimum (DM; without the proposed scheme) compared to the Do Something (DS; with the proposed scheme) as follows:

- Annual Average Daily Traffic (AADT) change greater than or equal to 1,000.
- HDV (Heavy Duty Vehicle) AADT change great than or equal to 200.
- A change in speed band (for definition refer to DMRB LA 105 Appendix A, a band of speeds such as 5 – 20kph).
- A change in carriageway alignment by greater than or equal to 5m.

5.6 Baseline Conditions

5.6.1 Local Air Quality Management (LAQM)

All local authorities are expected to regularly undertake air quality monitoring, assessment and reporting in their administrative area in line with their LAQM duties. No AQMAs have been declared within the 2km buffer or within the boundary of Dumfries and Galloway Council.

5.6.2 Air Quality Monitoring

Local air quality monitoring data from the most recent Dumfries and Galloway AQ APR and [UK Air Information Resource Annual and Exceedance Statistics](#) have been collated. Further updated progress reports and monitoring data will be obtained (if available) at DMRB Stage 2. There is no monitoring within the study area. The nearest monitoring sites are in the centre of Dumfries, over 4km away from the study area. The highest monitored NO₂ concentration within Dumfries and Galloway, in the most recent 5 years (2016-2020) within the Dumfries and Galloway AQ APR was 31.1µg/m³ in 2019 measured at the automatic monitoring site in Buccleuch Street, Dumfries, which is significantly below the 40µg/m³ Air Quality Objective/Limit Value (AQO/LV). More recent data for this automatic monitoring site was available from [UK Air Information Resource Background Mapping data for local authorities - 2018](#) with concentrations ranging from 20-22µg/m³ for the NO₂ annual average. There have been no exceedances of the short-term 1 hourly NO₂ objective since 2016. Some historic PM monitoring noted in the Dumfries and Galloway AQ APR has been undertaken for both PM₁₀ and PM_{2.5} but was discontinued, due to low levels of both pollutants.

Due to the lack of monitoring data near to the improvement strategies, an NO₂ diffusion tube monitoring survey is being undertaken from May 2025 for six months to support the air quality assessment at DMRB Stage 2.

5.6.3 Mapped Background Concentrations

The LA Data provides empirically derived national background maps, as part of the Scottish Air Quality Database project, which provide estimates of background pollutant concentrations at a 1km x 1km grid square resolution. Data for 2018 (the likely base year for the traffic model) were downloaded in March 2025 using a previously available dataset for NO_x, NO₂ and PM₁₀. For 2035 (the opening year for the proposed scheme) and 2024 (as an interim between 2018 and 2035) NO_x, NO₂, PM₁₀ and PM_{2.5} have been obtained for the Dumfries and Galloway Council area from an updated dataset from LA Data.

Scotland specific maps for PM_{2.5} were not available from LA Data for 2018. Therefore, the PM_{2.5} data for 2018 were taken from [UK Air Information Resource Background Mapping data for local authorities - 2018](#) using base year mapped background maps for 2018.

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The range of pollutant concentrations within the Dumfries and Galloway Council area are presented in Table 5-3, 5-4 and 5-5.

Table 5-3: Background Pollutant Concentrations for 2018 ($\mu\text{g}/\text{m}^3$)

Pollutant	AQO/LV ($\mu\text{g}/\text{m}^3$)	Mapped Background Pollutant Concentration Range ($\mu\text{g}/\text{m}^3$) 2018
NO _x * objective set for the protection of vegetation and ecosystems. This standard does not apply to human health.	30	2.5 - 19.5
NO ₂	40 (LV/AQO)	1.8 - 13.5
PM ₁₀	18 (AQO)	6.8 - 12.1
PM _{2.5}	10 (AQO)	4.5 - 7.2

Table 5-4: Background Pollutant Concentrations for 2024 ($\mu\text{g}/\text{m}^3$)

Pollutant	AQO/LV ($\mu\text{g}/\text{m}^3$)	Mapped Background Pollutant Concentration Range ($\mu\text{g}/\text{m}^3$) 2024
NO _x * objective set for the protection of vegetation and ecosystems. This standard does not apply to human health.	30	1.5 - 10.7
NO ₂	40 (LV/AQO)	1.2 - 8.0
PM ₁₀	18 (AQO)	5.3 - 10.5
PM _{2.5}	10 (AQO)	3.1 - 5.9

Table 5-5: Background Pollutant Concentrations for 2035 ($\mu\text{g}/\text{m}^3$)

Pollutant	AQO/LV ($\mu\text{g}/\text{m}^3$)	Mapped Background Pollutant Concentration Range ($\mu\text{g}/\text{m}^3$) 2035
NO _x * objective set for the protection of vegetation and ecosystems. This standard does not apply to human health.	30	1.1 - 12.7
NO ₂	40 (LV/AQO)	0.8 - 9.4

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Pollutant	AQO/LV (µg/m³)	Mapped Background Pollutant Concentration Range (µg/m³) 2035
PM ₁₀	18 (AQO)	4.9 - 10.1
PM _{2.5}	10 (AQO)	2.7 - 5.4

As shown in Table 5-3, 5-4 and 5-5, background pollutant concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} are well within the relevant AQOs/LVs.

5.6.4 Pollution Climate Mapping

The PCM model is run by Ricardo-AEA on behalf of Defra and is designed to assess LV compliance. The PCM model reports on the concentrations of NO₂ and PM in the atmosphere at representative roadside locations that need to be assessed for LV compliance. Modelled PCM concentrations are projected from a base year (2018) and for every year up to 2030, for NO₂. For PM₁₀ and PM_{2.5} results are available for the base year, 2020, 2025 and 2030 (2025 has been used as representative of 2024). As there are no PCM data after 2030, 2030 has been used in place of 2035 to represent the opening year.

Using [UK Air Information Resource 2020 NO₂ and PM projections data \(2018 reference year\)](#), a review of the most recent PCM NO₂, PM₁₀ and PM_{2.5} model projection data, which have a base year of 2018, was undertaken as part of this assessment for all PCM links within the study area. There are two PCM links within the study area, both in Castle Douglas, which are part of the A713 as shown in Figure 5-1. The concentrations for NO₂ for the specific assessment years are shown in Table 5-6, 5-7 and 5-8. It should be noted that there were no Defra reported PCM PM concentrations in the study area, with the nearest PCM links with reported PM concentrations being in Dumfries.

Table 5-6: PCM Links Within the Study Area for 2018 (µg/m³)

Pollutant	Census ID	Projected Roadside Annual Mean Concentration (µg/m³) 2018
NO ₂	802080313	10.4
NO ₂	802080325	8.0

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Table 5-7: PCM Links Within the Study Area for 2024 ($\mu\text{g}/\text{m}^3$)

Pollutant	Census ID	Projected Roadside Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) 2024
NO ₂	802080313	7.3
NO ₂	802080325	5.6

Table 5-8: PCM Links Within the Study Area for 2030 ($\mu\text{g}/\text{m}^3$)

Pollutant	Census ID	Projected Roadside Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) 2030
NO ₂	802080313	5.4
NO ₂	802080325	4.4

Within the study area, there were no PCM links which were predicted to exceed the annual mean NO₂ LV ($40\mu\text{g}/\text{m}^3$) in any year and by 2030 concentrations were less than 25% of the LV. It is also assumed that there is no expected danger of PM LV exceedance in the study area, given historic monitored PM data included in the Dumfries and Galloway AQ APR.

5.6.5 Sensitive Human Receptors

DMRB LA 105 indicates that sensitive human receptors include residential properties, schools, hospitals and care homes. There are a number of residential locations in the study area such as: Castle Douglas, Springholm, Crocketford and Brae, which may be affected by changes in air pollutant concentrations as a result of the proposed scheme. The monitored data and PCM data discussed above are considered to give a reasonable approximation of likely worst-case baseline air pollutant concentrations at human receptors in the study area.

5.6.6 Designated Habitats

Whilst the spatial extent of the ARN is not yet known, there are a number of designated ecological sites within the study area that may need to be taken into consideration as part of the air quality assessments undertaken at DMRB Stage 2 and DMRB Stage 3, including areas of ancient woodland. Designated sites within the study area are discussed further in the Biodiversity Chapter of this EAR and shown in Figure 8-1.

Baseline nitrogen deposition values from APIS within the study area indicate critical loads for some types of woodland have the potential to be exceeded.

5.7 Potential Impacts

5.7.1 Construction

DMRB LA 105 indicates that air quality impacts from dust during construction have the potential to occur within 200m of construction activities. Furthermore, DMRB LA 105 indicates an assessment is required of potential construction traffic impacts on air quality where construction activities are programmed to last for more than two years.

There is no information available regarding likely construction phase activities at this stage. Furthermore, the exact duration of the construction programme for the proposed scheme is not known at present. Construction impacts will therefore be reviewed at DMRB Stage 2 and/or DMRB Stage 3 when more details regarding construction phase activities and vehicle movements are known.

Any potential impacts of dust during construction can, however, be reduced and controlled through the implementation of appropriate mitigation, such as those outlined in [Guidance on the assessment of dust from demolition and construction](#). As such, impacts from dust generating activities are not likely to be significant.

5.7.2 Operation

Descriptions of the potential impacts on air quality for each of the improvement strategies are presented below. Each of the improvement strategies are described in The Proposed Scheme Chapter of this EAR.

All improvement strategies have the potential to cause changes in vehicle emissions on roads both in the immediate vicinity of the strategy and on the wider road network, as a result of changes in traffic flow and speeds. There are no AQMAs located near any of the improvement strategies or within the study area.

All improvement strategies go through or are located within 200m of a number of designated ecological sites, including ancient woodland. Therefore, it is likely that this realignment would affect rates of nitrogen deposition within these designated sites, the impact of which should be assessed using modelling at DMRB Stage 2.

The highest NO₂ annual average PCM model concentration within the study area in 2030 (illustrative of the opening year), is predicted to be 5.4µg/m³, in Castle Douglas. Therefore, there are unlikely to be any compliance issues with the NO₂ LV.

Road traffic emissions are expected to reduce over time due to improvements in the vehicle fleet (such as improved emissions controls and an increased proportion of electric vehicles), meaning that by the opening year of 2035, potential adverse air quality impacts associated

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with changes in traffic flows will be reduced compared to now. It is therefore unlikely, given the low concentrations within Dumfries and Galloway, that there will be any exceedances of AQOs at human receptors with the proposed scheme in place.

5.8 Design, Mitigation and Enhancement Measures

5.8.1 Mitigation Measures – Construction Phase

DMRB LA 105 indicates that the construction dust risk potential of a project shall be used to inform the measures required to support the proposed mitigation. As such, the Environmental Mitigation Plan (EMP) would include measures to reduce construction dust and emissions from construction plant and vehicles. Any mitigation measures would be identified during the DMRB Stage 3 assessment when more advanced design data are available for a preferred route option.

5.8.2 Mitigation Measures – Operational Phase

Given the existing low air pollution levels in Dumfries and Galloway, it is unlikely that there would be any AQO/LV exceedances by that date, however, there may be increases in rates of nitrogen deposition within designated ecological sites containing features sensitive to air pollution. The potential need for any mitigation measures will be identified during the DMRB Stage 2 and/or DMRB Stage 3 assessment when modelling is undertaken. DMRB LA 105 states that 'where the air quality assessment concluded that the Project triggered a significant air quality effect and/or affect the UK's reported ability to comply with the 2008/50/EC in the shortest timescales possible, a Project air quality action plan (PAQAP) shall be included in the air quality assessment'.

If required, mitigation measures set out in a PAQAP should be viable and be provided with a quantification of the change in concentrations associated with the measure. DMRB LA 105 describes the mitigation measures expected to be assessed (including vertical barriers and speed limit adjustments) alongside any other proposed viable mitigation measure.

5.8.3 Enhancement Measures

None identified at the time of reporting.

5.9 Assessment of Likely Significant Effects

5.9.1 Construction Phase

As noted within DMRB LA 105, with the appropriate implementation of good practice dust and air quality mitigation measures, it is unlikely that construction dust would have a significant residual effect in terms of air quality. Similarly, construction traffic data is not yet available, however, given the existing low air pollution levels in Dumfries and Galloway, it is

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considered unlikely that exceedances of AQOs or LVs would occur at human receptors during the construction period. This is due to the expected improvement in emissions from road vehicles and the existing downward trend in measured concentrations combined with the low existing concentrations. Construction phase impacts are therefore scoped out until detailed design information is available, such as at DMRB Stage 3.

5.9.2 Operational Phase

Based on this qualitative assessment for all improvement strategies and given the existing low air pollution levels in Dumfries and Galloway, it is considered unlikely that exceedances of AQOs or LVs would occur at human receptors during the opening year due to the expected improvement in emissions from road vehicles and the existing downward trend in measured concentrations combined with the low existing concentrations.

The risk of the improvement strategies affecting compliance with AQOs within AQMAs in the opening year is considered to be low based given the existing low air pollution levels in Dumfries and Galloway and as there are no AQMAs in Dumfries and Galloway.

The highest PCM model NO₂ concentration within the study area in 2030 (illustrative of the opening year), is projected to be 5.4µg/m³, in Castle Douglas. The risk of affecting compliance with the NO₂ LV in the opening year is, therefore, considered to be low as it is deemed unlikely that exceedances of the NO₂ LV would occur within the study area. The PCM model does not include links within the study area for PM₁₀ and PM_{2.5} as these are unlikely to be exceeded at roadside locations. Therefore, no exceedances of these LVs are anticipated.

Potential increases in traffic associated with the operation of the improvement strategies have the potential to cause increases in rates of nitrogen deposition greater than 1% of the lower critical load at some designated ecological sites within 200m of the ARN where critical loads are currently exceeded. Therefore, there is a risk that the improvement strategies could have significant effects on designated ecological receptors. This would be assessed further at DMRB Stage 2.

Overall, due to expected reductions in vehicle emissions over time, it is assumed that the likelihood of significant operational effects from the improvement strategies on human, AQMA and PCM receptors is low, with the risk being higher at ecological receptors.

At DMRB Stage 2, the assessment will identify the potential risks of significant operational effects of the route options.

5.10 Proposed Scope of Future Assessment

A simple DMRB assessment (based on DMRB LA 105) should be undertaken at DMRB Stage 2 to assess the operational opening year impacts at designated sites within 200m of the ARN. A

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small number of human receptors close to the route options could also be assessed for illustrative purposes using a simple approach. Due to the lack of monitoring data near to the route options, an NO₂ diffusion tube monitoring survey is being undertaken from May 2025 for six months to support the air quality assessment at DMRB Stage 2.

It is proposed to not undertake any construction assessment until DMRB Stage 3.

5.11 Summary

It is unlikely there will be exceedances of AQOs/LV for human receptors, however, there may be significant effects at designated sites (for example ancient woodland) within 200m of the ARN. Therefore, a simple DMRB assessment (based on DMRB LA 105) should be undertaken at DMRB Stage 2 to assess the operational opening year impacts at designated sites within 200m of the ARN. A small number of human receptors close to the improvement strategies could also be assessed for illustrative purposes using a simple approach to show that concentrations at human health receptors will be significantly below the AQOs/LVs.

It is proposed that construction assessment is not undertaken until DMRB Stage 3.

6. Cultural Heritage

6.1 Introduction

This chapter describes the methodology followed and the potential impacts identified for cultural heritage when assessing the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). The assessment has been undertaken in line with the [Design Manual for Roads and Bridges \(DMRB\) LA 106 - Cultural heritage assessment \(revision 1\)](#) (hereafter referred to as “DMRB LA 106”) and other relevant standards and guidance set out within this chapter.

6.2 Legislative and Policy Framework

Table 6-1 provides a summary of the legislation and national policy that are relevant to this cultural heritage assessment.

Table 6-1: Legislation and National Policy Relevant to the Cultural Heritage Assessment

Legislation and Policy	Relevance to the Proposed Scheme
Historic Environment Scotland Act 2014	The Historic Environment Scotland Act 2014 amends three pieces of primary legislation: The Historic Buildings and Ancient Monuments Act 1953; The Ancient Monuments and Archaeological Areas Act 1979; and, The Planning (Listed Buildings and Conversation Areas) (Scotland) Act 1997. It provides increased protection and improved management for Scheduled Monuments and Listed Buildings and sets out Historic Environment Scotland’s (HES) role as national statutory consultee for EIA projects.
Planning Advice Note (PAN) 2/2011 Planning and Archaeology	Planning Advice Note 2/2011 advises that planning authorities should take the relative importance of archaeological sites into account when determining planning applications. It also notes that the preference should be to preserve archaeological sites in situ to protect and enhance the historic environment. Where this is not possible then sites should be excavated, recorded and the results published.

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Legislation and Policy	Relevance to the Proposed Scheme
Historic Environment Policy for Scotland	The Historic Environment Policy for Scotland sets out a series of principles and policies for the recognition, care and sustainable management of the historic environment. It is aimed at promoting an informed and consistent approach to decision making.
The National Planning Framework 4 (NPF4), Policy 7: Historic assets and places	Policy 7 establishes: the need for an assessment to be carried out of projects with potential to have a significant impact on cultural heritage; the need for exceptional circumstances for demolition of listed buildings, and the need to retain the character and special architectural or historic interest or setting; the need to preserve or enhance the setting of conservation areas; the need to avoid impacts on scheduled monuments; and the need to understand and retain non-designated heritage assets.

6.2.1 Local Policy and Plans

Table 6-2 provides a summary of the local planning policies that are relevant to this cultural heritage assessment.

Table 6-2: Local Planning Policy Relevant to the Cultural Heritage Assessment

Local Planning Policy	Relevance to the Proposed Scheme
Dumfries and Galloway Local Development Plan 2 (LDP2)	Policy HE2 sets out Dumfries and Galloway Council's position on development affecting conservation areas. Of relevance to the proposed scheme is the requirement to maintain the quality of views from and into conservation areas. Policy HE3 sets out Dumfries and Galloway Council's position on development affecting designated and non-designated heritage assets. This includes a preference for the preservation of assets in situ, and a requirement to evaluate archaeological remains where there is uncertainty about their location, extent or significance.

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Additionally, work is underway on the Dumfries and Galloway Council Local Development Plan 3 (LDP3). An Evidence Report was reviewed by the Scottish Government in December 2024, with feedback returned in April 2025. The proposed LDP3 is expected to be submitted in 2027 and adopted later that year.

6.3 Assessment Methodology

The assessment of cultural heritage assets has been undertaken in line with the DMRB LA 106.

The assigning of value has been completed in accordance with the [DMRB LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as “DMRB LA 104”).

Assessment of potential impacts is based on Table 3.4N Magnitude of impact and typical descriptions of DMRB LA 104.

6.3.1 Data Sources

Data on designated heritage assets was sourced from [Historic Environment Scotland Designations Map Search](#) including Listed Buildings, Scheduled Monuments, Gardens and Designed Landscapes, Battlefields, Historic Marine Protection Areas, Conservation Areas and World Heritage Sites.

Data on non-designated heritage assets was taken from the Historic Environment Records (HER) made available on the [Spatial Hub](#) (hereafter referred to as “Spatial Hub website”) using information from Dumfries and Galloway Council.

6.4 Assumptions and Limitations

This Environmental Appraisal Report (EAR) has been compiled through desktop review, utilising a variety of sources, including secondary information derived from the HER made available on the Spatial Hub website using information from Dumfries and Galloway Council. As is proportionate for DMRB Stage 1, site visits have not been undertaken to verify the accuracy of the data.

The data held by the HER made available on the Spatial Hub website using information from Dumfries and Galloway Council, is limited to geospatial information on non-designated heritage assets, their name and type. It does not contain any specific detail of the asset.

The potential for impacts on below-ground archaeology is likely to require further assessment as the physical extent of the improvement strategies are developed at further DMRB stages. Additionally, the assessments may be refined further through a programme of investigative survey and fieldwork for the preferred route at DMRB Stage 3.

6.5 Study Area

All designated heritage assets within 1km of the improvement strategies were assessed, with additional designated assets considered on a case-by-case basis, based on professional judgement. This includes Listed Buildings, Scheduled Monuments, Gardens and Designed Landscapes, Battlefields, Historic Marine Protection Areas, Conservation Areas and World Heritage Sites.

All non-designated heritage assets within 500m of the improvement strategies were assessed, with additional non-designated heritage assets considered on a case-by-case basis, based on professional judgement. This includes archaeological remains, historic buildings and data.

The 1km and 500m study areas have been informed by DMRB LA 104 and DMRB LA 106 and are shown in Figure 6-1 and Figure 6-2 respectively.

6.6 Baseline Conditions

The locations of designated cultural heritage assets relative to the proposed scheme are shown on Figure 6.1, and non-designated cultural heritage assets are shown on Figure 6.2.

There are no designated Battlefields, Historic Gardens and Designed Landscapes, Historic Marine Protection Areas, Properties in Care or World Heritage Sites within the 1km study area.

6.6.1 Conservation Areas

There is one Conservation Area within the 1km study area, Kirkpatrick Durham, which is located 200m to the west of Improvement Strategy 1 and 300m west of Improvement Strategy 2.

6.6.2 Listed Buildings

As designated heritage assets, the Category A Listed Buildings have been assigned as high value and Category B and C Listed Buildings assigned medium value in accordance with Table 3.2 Environmental value (sensitivity) and descriptions from DMRB LA 104.

Eighty-six Listed Buildings are present within the designated assets study area. The Listed Buildings are mainly centred within Kirkpatrick Durham Conservation Area, Haugh of Urr village and Castle Douglas town. The majority of these would remain unaffected by the proposed scheme both in terms of physical impacts and also as a result of any change to their setting. High value assets located within the study area and medium value assets located within the improvement strategies are discussed below.

The following Category A Listed Buildings are present within the designated assets study area or included in the baseline based on professional judgement:

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- Haugh Bridge (LB16807) located in the Haugh of Urr, approximately 350m north-west of Improvement Strategy 6.
- Watermill, Old Bridge of Urr (LB10191) located in the Old Bridge of Urr, approximately 220m west of Improvement Strategy 1.
- Greenlaw House (LB3708) located north-west of the town of Castle Douglas, approximately 1.7km west of Improvement Strategy 1.
- Cattle Market, New Market Street, Castle Douglas (LB22976) located in the town of Castle Douglas, approximately 1.7km south of Improvement Strategies 1 and 6.

The following Category B Listed Buildings are located within Improvement Strategies 1, 3, 4 and 6,

- Brooklands, Ornamental Walling opposite Brooklands Lodge (LB9666) located within Improvement Strategies 1 and 2.
- Brooklands Lodge (LB9665) located within Improvement Strategies 1 and 2.
- Drummore Farmhouse, Retaining Wall and Gatepiers (LB9714) located within Improvement Strategies 1 and 6.
- The Galloway Arms Hotel, Castle Douglas Road, Crocketford (LB16805) located within Improvement Strategy 3.
- The Galloway Arms Hotel Annex, Castle Douglas Road, Crocketford (LB16812) located within Improvement Strategy 3.
- The Toll Cottage, Castle Douglas Road, Crocketford (LB9669) located within Improvement Strategy 3.
- Millhouse, Newbank Mill (LB16815) located within Improvement Strategies 3 and 4.
- Weaving Sheds, Newbank Mill (LB16815) located within Improvement Strategies 3 and 4.
- Spinning Mill, Newbank Mill (LB16815) located within Improvement Strategies 3 and 4.
- Weaver's Cottages, Newbank Mill (LB16815) located within Improvement Strategies 3 and 4.

There are no Category C listed buildings within the Improvement Strategies.

6.6.3 Scheduled Monuments

Scheduled Monuments have been assigned a high value in accordance with Table 3.2 Environmental value (sensitivity) and descriptions from DMRB LA 104.

There are six Scheduled Monuments within or close to the 1km study area:

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- Ernespie, two standing stones which form the remains of stone circle 200m east of Erne Hill, Castle Douglas (SM1011) located 1km south of Improvement Strategies 1 and 6.
- Mote of Urr, a hilltop fortified site (SM1134) located 1km south-east of Improvement Strategy 6.
- Doon Hill, Mote of Doon, Doon of Urr, a hilltop fortified site (SM1128) located 1km north-west of Improvement Strategy 1.
- Meikle Cairn, a prehistoric funerary monument, Upper Minnydow (SM1036) located 400m North-west of Improvement Strategy 1.
- Green Island fort, an earthwork fort on a promontory by Milton Loch (SM1074) located 210m south of Improvement Strategy 5.
- East Hill Farmhouse stone circle (SM1022) located 1.7km south-east of Improvement Strategies 1 and 6.

6.6.4 Non-Designated Historic Buildings

There are 127 non-designated historic buildings within the 500m study area surrounding the DMRB Stage 1 Assessment Corridor. Forty of the assets are 'buildings', this includes 23 farmsteads and farmhouses which is expected considering the rural location of the proposed improvement strategies. The assets have been assigned a value of low in accordance with DMRB LA 104.

6.6.5 Non-Designated Archaeological Remains

There are 66 non-designated archaeological remains within the 500m study area including crannogs, burnt mounds, a military road, cairns and enclosures. The assets have been assigned a low or negligible value in accordance with DMRB LA 104.

6.6.6 Archaeological Potential

The available evidence indicates potential for previously unknown archaeological remains within the vicinity of the proposed scheme in areas that have not been subject to previous impact from development. Improvement Strategies 1 and 6 would likely have the greatest impact on previously unknown archaeological remains as they cover the greatest total area. As noted above, a further and more detailed assessment and investigation would be required in later stages of the proposed scheme to fully define the level of risk in relation to this matter.

6.7 Potential Impacts

6.7.1 Conservation Areas

There would be no physical impact on Kirkpatrick Durham Conservation Area, which is located 200m and 300m west of Improvement Strategies 1 and 2 respectively.

There would potentially be some intervisibility between Kirkpatrick Durham Conservation Area and Improvement Strategies 1 and 2, resulting in potential for visual and noise effects in its setting, during construction and operation of these improvement strategies.

6.7.2 Listed Buildings

A total of 10 Category B Listed Buildings are located within Improvement Strategies 1, 3, 4 and 6, and have potential to be physically impacted during construction, in the form of full or partial removal.

There would be no potential direct impacts on the Category A or C Listed Buildings. All improvement strategies have potential to result in indirect impacts on Listed Buildings within the 1km study area.

Indirect physical impacts on historic buildings during construction may include changes to groundwater levels or vibrations caused by engineering activities associated with the proposed scheme. There may be alteration to the setting of historic buildings through the removal of vegetation or associated above-ground elements during construction. Finally, temporary noise, dust, and/or visual intrusion may occur within the setting of historic buildings during construction activities such as groundworks, placement of site compounds, and from increased construction traffic.

During operation of the road there may be indirect adverse and/or beneficial impacts to historic buildings through changes in air quality from pollutants which have the potential to damage historic building materials. There may be visual and/or noise intrusion on the setting of historic buildings where new infrastructure is present in key views from, towards, through and across an asset, especially where the proposed scheme creates changes to the skyline. There may also be beneficial impacts on the setting of historic buildings through improved traffic flow.

6.7.3 Scheduled Monuments

There would be no physical impact on any of the six Scheduled Monuments within the 1km study area from any of the six improvement strategies.

Whilst there would potentially be some intervisibility between the improvement strategies and the six Scheduled Monuments, five of these designated assets (Ernespie, Mote of Urr,

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Doon Hill, Meikle cairn and East Hill Farmhouse stone circle) would retain their prominent positions within the landscape. Green Island fort would retain its defensive waterside position. The visual intrusion of a modern road encroaching more closely than the existing A75 into the visual setting of the prehistoric assets may have an adverse impact, most noticeably for Improvement Strategy 5 which would be approximately 210m north of Green Island fort.

6.7.4 Non-Designated Historic Buildings

Seventeen non-designated historic buildings are located within Improvement Strategies 1, 3, 4, 5 and 6, and would potentially be physically impacted during construction, in the form of full or partial removal.

There may be indirect physical impacts on historic buildings during construction, these may include changes to groundwater levels or vibrations caused by engineering activities associated with the proposed scheme. There may be alteration to the setting of historic buildings through the removal of vegetation or associated above-ground elements during construction. Finally, temporary noise, dust, and/or visual intrusion may occur within the setting of historic buildings during construction activities such as groundworks, placement of site compounds, and from increased construction traffic.

During operation of the road there may be indirect adverse and/or beneficial impacts to historic buildings through changes in air quality from pollutants which have the potential to damage historic building materials. There may be visual and/or noise intrusion on the setting of historic buildings where new infrastructure is present in key views from, towards, through and across an asset, especially where the proposed scheme creates changes to the skyline. There may also be beneficial impacts on the setting of historic buildings through improved traffic flow.

6.7.5 Archaeological Remains

Fifteen non-designated archaeological remains are located within the improvement strategies. With the exception of the findspots, which have usually been removed from their original location, physical impacts as a result of the proposed scheme are anticipated. Potential impacts from construction on archaeological remains are as follows:

- Partial or complete removal of archaeological remains within the footprint of the proposed scheme, in areas of new land take through groundworks associated with construction activities. This includes, but is not limited to, activities such as widening of the existing road boundary, or the creation of new offline sections in addition to any service trenches and drainage features, topsoil stripping for compounds, the excavation of attenuation ponds and landscaping features.

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- Damage to archaeological remains within the footprint of the proposed scheme through their compression during construction, through the movement of machinery or within site compound or spoil storage areas.
- Damage to archaeological remains through changes to groundwater levels caused by engineering activities associated with the proposed scheme. The alteration to the setting of archaeological remains through the removal of vegetation or associated above-ground elements during construction.
- Temporary noise, dust, and/or visual intrusion on the setting of archaeological remains during construction activities such as groundworks, placement of site compounds, and from increased construction traffic.

The potential impacts of the operation of the road on archaeological remains are as follows:

- Indirect adverse and/or beneficial impacts to archaeological remains through changes in air quality from pollutants which have the potential to damage archaeological materials.
- Visual and/or noise intrusion within the setting of archaeological remains where new infrastructure is present in key views from, towards, through and across an asset, especially where the proposed scheme creates changes to the skyline.
- Beneficial impacts on the setting of archaeological remains through improved traffic flow.

6.8 Design, Mitigation and Enhancement Measures

Should the proposed scheme be considered likely to have a direct or indirect significant adverse effect on a heritage asset of medium, high or very high importance, options for the avoidance of impact(s) would be proposed in the first instance. Avoidance may not be possible due to specific design elements being integral to the delivery of the proposed scheme, and/or where the design is avoiding significant effects identified in other topics. Instances where impact(s) cannot be designed out of the proposed scheme or reduced in magnitude would then be mitigated through additional measures.

Measures and changes integrated into the design of the proposed scheme could include:

- Amendments to the proposed scheme where reasonably practicable during both initial and detailed designed phases.
- Preservation in situ of heritage assets using engineering solutions to avoid physical impacts to historic building fabric and/or archaeological remains.
- Consideration of the elements of a heritage asset that contribute to its cultural significance (value), and the wider historic environment.

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Measures for the mitigation of impact(s) could include:

- Erecting temporary screening and other barriers during construction to protect heritage assets from possible damage and to potentially reduce adverse change(s) to setting.
- Ensuring that the creation of dust is controlled through dampening down construction areas.
- Monitoring of heritage assets with a high importance located close to construction areas to ensure vibration or settlement from construction-related activities do not exceed levels which would result in damage to the heritage asset.
- Archaeological excavation, informed by previous desktop review, field survey and/or archaeological monitoring or archaeological evaluation, to enable the preservation by record of recorded and unrecorded in situ archaeological remains.
- Accurate recording of heritage assets where relevant such as historic buildings or structures prior to their demolition or alteration to enable preservation by record of their original form.

Any mitigation or reduction of impacts proposed would not outweigh the impact to an asset but would potentially reduce it.

It should be noted that some of these measures themselves may impact the historic environment and therefore good practice measures designed to limit common construction impacts must also be embedded within the design and any proposed mitigation. This could be achieved through the implementation of a Code of Construction Practice (COCP).

Opportunities for enhancement of the historic environment would be investigated as the design of the proposed scheme develops.

6.9 Assessment of Likely Significant Effects

Significant effects are those with a residual significance of effect which has been assessed in line with DMRB LA 104 to be moderate or greater.

6.9.1 Construction Phase

Conservation Areas

Because of the distance of Kirkpatrick Durham Conservation Area from the improvement strategies there would be no physical impacts on the Conservation Area and as such no significant effects are predicted.

Listed Buildings

In accordance with Table 3.8.1 Significance Matrix from DMRB LA 104 the value of Category A Listed Buildings have been assessed to be high, and the value of Category B and C Listed Buildings have been assessed to be medium.

The Category B Listed Buildings are at greater risk of change as they are located within the improvement strategies, therefore they will be discussed in greater detail. The potential magnitude of impact on them would be moderate resulting in moderate adverse significance of effect. As shown in Table 6-3.

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Table 6-3: Assessment of Potential Construction Effects on Listed Buildings Within the Improvement Strategies

HES Unique Identifier	Name	Category	Improvement Strategy	Value	Magnitude of Impact	Significance of Effect
LB9666	Brooklands, Ornamental walling opposite Brooklands Lodge	B	1, 2	Medium	Moderate	Moderate Adverse
LB9665	Brooklands Lodge	B	1, 2	Medium	Moderate	Moderate Adverse
LB9714	Drummore Farmhouse, Retaining Wall and Gatepiers	B	1 and 6	Medium	Moderate	Moderate Adverse
LB16805	The Galloway Arms Hotel, Castle Douglas Road, Crocketford	B	3	Medium	Moderate	Moderate Adverse
LB16812	The Galloway Arms Annex, Castle Douglas Road, Crocketford	B	3	Medium	Moderate	Moderate Adverse

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HES Unique Identifier	Name	Category	Improvement Strategy	Value	Magnitude of Impact	Significance of Effect
LB9669	The Toll Cottage, Castle Douglas Road, Crocketford	B	3	Medium	Moderate	Moderate Adverse
LB16815	Millhouse, Newbank Mill	B	3 and 4	Medium	Moderate	Moderate Adverse
LB16815	Weavings Sheds, Newbank Mill	B	3 and 4	Medium	Moderate	Moderate Adverse
LB16815	Spinning Mill, Newbank Mill	B	3 and 4	Medium	Moderate	Moderate Adverse
LB16815	Weavers Cottage, Newbank Mill	B	3 and 4	Medium	Moderate	Moderate Adverse

Scheduled Monuments

In accordance with Table 3.8.1 Significance Matrix from DMRB LA 104 the Scheduled Monuments have a high value, and the potential magnitude of impact on them would be negligible, resulting in a slight adverse significance of effect. This effect is not deemed to be significant.

Non-Designated Historic Buildings

In accordance with Table 3.8.1 Significance Matrix from DMRB LA 104 the value of the non-designated Historic Buildings is assessed as low. Most of the buildings would potentially be subject to a major magnitude of impact, resulting in a moderate adverse significance of effect. These effects are deemed to be significant as they would result in partial or full removal of the buildings.

For a few of the buildings, the improvement strategies run through the driveway to the buildings and would only impact their historic settings. As such the magnitude of impact on these building would potentially be negligible, resulting in slight adverse significance of effect. These effects are not deemed to be significant as they would not harm the fabric of the buildings.

Table 6-4 presents the non-designated Historic Buildings of moderate adverse significance.

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Table 6-4: Assessment of Potential Significant Construction Effects on Non-Designated Historic Buildings within the Improvement Strategies

HER Unique Identifier	Name	Description	Improvement Strategy	Value	Magnitude of Impact	Significance of Effect
MDG16606	Bogie Bridge	Bridge	1	Low	Major	Moderate Adverse
MDG23695	Moolance House, West Gate Lodge	Gate Lodge	1	Low	Major	Moderate Adverse
MDG18240	Crocketford, Ashmount	Building	3	Low	Major	Moderate Adverse
MDG22161	Crocketford, Castle Douglas Road, Anvil House	Blacksmiths Workshop	3	Low	Major	Moderate Adverse
MDG18239	Crocketford, Anvil House (Former Smithy)	Building	3	Low	Major	Moderate Adverse
MDG21588	Crocketford Village	Village	3	Low	Major	Moderate Adverse
MDG17282	Springholm, New Village Hall	Village Hall	3	Low	Major	Moderate Adverse

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HER Unique Identifier	Name	Description	Improvement Strategy	Value	Magnitude of Impact	Significance of Effect
MDG17283	War Memorial, New Village Hall, Springholm	War Memorial	3	Low	Major	Moderate Adverse
MDG21617	Springholm Village	Village	3	Low	Major	Moderate Adverse
MDG9794	Newbank Mill / Springholm Mill	Watermill	3 and 4	Low	Major	Moderate Adverse
MDG27087	Bettyknowes Farmstead	Farmstead	5	Low	Major	Moderate Adverse
MDG8656	Ramhill Bridge	Road Bridge	5	Low	Major	Moderate Adverse
MDG16601	Whinnyhill Farmstead	Farmstead	6	Low	Major	Moderate Adverse
MDG16194	Forge Tree, Hopehead	Named Tree	6	Low	Major	Moderate adverse

Non-Designated Archaeological Remains

Significant effects on non-designated archaeological remains would result from the removal of the majority of the archaeological remains that form each asset. Whilst this effect has been assessed as part of the construction phase of the proposed scheme, once removed archaeological remains cannot be reinstated or replaced, making the change permanent.

Potential significant effects on seven non-designated archaeological remains from the construction of one or more improvement strategies have been assessed and are presented in Table 6-5 below.

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Table 6-5: Assessment of Potential Construction Effects on Non-Designated Archaeological Remains within the Improvement Strategies

HER Unique Identifier	Name	Description	Improvement Strategy	Value	Magnitude of Impact	Significance of Effect
MDG5477	Crocketford Hill	Settlement	1, 2	Low	Major Adverse	Moderate Adverse
MDG4147	Moat Hill / Marlmount	Possible Motte; Moat	2	Low	Major Adverse	Moderate Adverse
MDG4743	Chapelton	Pit; Ditch; Findspot; Findspot; Site	2, 5	Low	Major Adverse	Moderate Adverse
MDG4150	Chapelton 2	Chapel	2	Low	Major Adverse	Moderate Adverse
MDG13038	South Park, Springholm	Burnt Mound	4	Low	Major Adverse	Moderate Adverse
MDG16614	Barfil	Field	5	Low	Major Adverse	Moderate Adverse
MDG4518	Milton Park, Urr Water	Enclosure	6	Low	Major Adverse	Moderate Adverse

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The impact of the construction of additional laydown, compound, welfare or storage areas has not been assessed as the size, type and location of these areas has not yet been determined.

6.9.2 Operation Phase

It has been assumed that no significant physical impacts would occur on historic assets during operation of the proposed scheme. Any groundworks undertaken for maintenance are assumed to be within the road boundary where, if archaeological remains had been present, they would have previously been removed during construction.

The potential for indirect physical impacts on heritage assets, such as through vibration or through changes to air quality, would be addressed at DMRB Stage 2 when further information is available. However, it has been assumed that good practice mitigation would limit the potential for these impacts and no significant effects would result.

6.10 Proposed Scope of Future Assessment

Future cultural heritage assessment of the proposed scheme should include a more detailed heritage assessment using updated HER data direct from Dumfries and Galloway Council and Historic Land use data, available from HES.

Once more design information is available, the potential impact of any storage areas, welfare sites, compounds or haul roads should be assessed. Even if these areas are to be used temporarily, there is the potential that topsoil stripping could remove or truncate known or unknown archaeological remains.

6.11 Summary

Table 6-6 shows the heritage assets that have potential to experience likely significant effects during construction of the proposed scheme. The table also shows a comparison of the numbers of heritage assets within each improvement strategy. At DMRB Stage 2, the location of these heritage assets will be taken into consideration during design development with the aim of avoiding or reducing impacts.

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Table 6-6: Number of Cultural Heritage Assets Potentially Experiencing Likely Significant Effects during Construction for each Improvement Strategy

Likely Significant Adverse Effects	Improvement Strategy 1	Improvement Strategy 2	Improvement Strategy 3	Improvement Strategy 4	Improvement Strategy 5	Improvement Strategy 6
Number of Category B Listed Buildings potentially impacted	3	2	7	4	0	1
Number of non-designated Historic Buildings potentially impacted	2	0	9	1	4	2
Number of non-designated Archaeological Sites potentially impacted	1	6	2	2	3	3

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At this stage no significant impacts are anticipated during construction or operation to the Conservation Area or Scheduled Monuments.

Cultural Heritage assets are considered to be an irreplaceable resource and as stated in DMRB LA 106, the 'need for development' should be balanced against the requirement to 'protect and enhance our national cultural heritage resource' in line with national and local legislation, policy and good practice guidance.

7. Landscape and Visual

7.1 Introduction

This chapter describes the methodology followed for the landscape and visual impact assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”) improvement strategies. This assessment has been undertaken in accordance with the [Design Manual for Roads and Bridges \(DMRB\) LA 104 – Environmental assessment and monitoring \(revision 1\)](#) and [DMRB LA 107 – Landscape and visual effects \(revision 2\)](#) (hereafter referred to as “DMRB LA 104” and “DMRB LA 107” respectively) and other relevant standards and guidance set out within this chapter.

7.2 Legislative and Policy Framework

A review of relevant legislation, planning policies and landscape designations at DMRB Stage 1 has been undertaken and is detailed below in Table 7-1.

Table 7-1: Legislation and Policy Relevant to the DMRB Stage 1 Assessment

Legislation and Policy	Relevance to the Proposed Scheme
National Planning Framework 4	The National Planning Framework 4 (NPF4) was adopted in February 2023. The Framework sets out the Scottish Ministers’ policies and proposals for the development and use of land in Scotland and details the long-term spatial strategy, spatial principles, priority actions and National Developments up to 2045. ▪ The vision set out in NPF4 is to plan future places in Scotland in line with six overarching spatial principles. These principles will play a key role in delivering on the United Nations (UN) Sustainable Development Goals (SDGs) and Scotland’s national outcomes. By applying these spatial principles, Scotland’s national spatial strategy will support the planning and delivery of sustainable, liveable and productive places. NPF4 identifies regional spatial priorities for five broad regions of Scotland which will inform the preparation of regional spatial strategies (RSS) and Local Development Plans (LDPs) by planning authorities. ▪ NPF4 [IP6] [NC7] policies 4 (Natural Places), 6 (Forestry, Woodland and Trees), 7 (Historic Assets and Places), 8 (Green Belts), and 14 (Design, Quality, and Place) collectively reflect the Scottish

Legislation and Policy	Relevance to the Proposed Scheme
	Government's ambitions and vision for landscape-impacting developments. ▪ The policies aim to protect, restore, and enhance Scotland's natural assets through sustainable management and nature-based solutions, ensuring the protection and expansion of forests, woodlands, and trees. Development proposals that enhance woodland cover are supported, while those causing significant ecological harm are opposed unless they provide substantial public benefits with compensatory planting. Historic environment assets are to be safeguarded and revitalised to support cultural identity and economic value, promoting their sustainable reuse. Additionally, a design-led approach is advocated to create high-quality, sustainable, and adaptable places that enhance the well-being and distinctiveness of communities.
Dumfries and Galloway Local Development Plan 2	Dumfries and Galloway Local Development Plan 2 (LDP2) was adopted in October 2019. The plan covers all of Dumfries and Galloway, and "provides the planning framework guiding the future use and development of land in towns, villages and the rural area. It also provides an indication of where development, including regeneration, should happen and where it should not." ▪ Policy OP1: Development Considerations outlines the specific considerations development will be assessed against where relevant to the scale, nature and location of the proposal (...). ▪ "a) General Amenity: (...) compatible with the character and amenity of the area and should not conflict with nearby land uses. ▪ "c) Landscape: Development proposals should respect, protect and/or enhance the regions' rich landscape character, and scenic qualities, including features and sites identified for their landscape qualities or wild land character" as identified on NatureScot Landscape Character Type Map 2019. Any development proposals should also "reflect the scale and local distinctiveness of the landscape". ▪ "f) Sustainability: (...) limit the impacts of climate change, support resilience, and promote sustainable development by: (...). ▪ integrating with existing infrastructure where possible.

Legislation and Policy	Relevance to the Proposed Scheme
	▪ avoiding areas of significant flood risk. ▪ using sustainable drainage systems (SuDS). ▪ supporting reduction in carbon emissions through: (...) passive aspects of design including consideration of location, layout, orientation, massing, materials, detailed design, topography, and vegetation (...). Historic environment policies: ▪ Policy HE2: Conservation Areas. ▪ “The council will support development within or adjacent to a conservation area that preserves or enhances the character and appearance of the area and is consistent with any relevant conservation area appraisal and management plan (...). Natural Environment policies: ▪ Policy NE6: Sites of National Importance for Biodiversity and Geodiversity. ▪ Policy NE7: Forestry and Woodland. ▪ “The following policy will apply to those woodland/forestry felling, planting and replanting proposals which do not require planning permission but where the Council acts as a consultee to Forestry Commission Scotland” (Forestry and Land Scotland (FLS)). ▪ “Proposals should seek to ensure that ancient and semi-natural woodlands and other woodlands with high nature conservation value are protected and enhanced.” ▪ Policy NE8: Trees and Development. ▪ “The Council will support proposals that: promote additional tree planting; protect and enhance ancient woodland sites; maintain trees, woodlands (in particular ancient and semi-natural woodlands), and hedgerows (...) and require developers to incorporate, wherever feasible, the existing woodland resource into their schemes; show how existing trees will be appropriately protected during the construction period. ▪ “If it is demonstrated to the satisfaction of the Council that it is not possible to retain the woodland resource then an appropriate replacement planting scheme will be required to be agreed by the

Legislation and Policy	Relevance to the Proposed Scheme
	council. Any such replacement planting scheme should (...) be located within the site." ▪ "Where the works to a protected tree or trees forms part of a development proposal, the applicant should also demonstrate that: The benefits (...) will outweigh the loss or potential harm caused by the works (...); the development has been designed and located in order to minimise potential adverse impacts on the protected tree or trees." Community Services and Facilities: ▪ Policy CF2: Green Networks. ▪ "Proposals that add to and/or enhance green networks or connections to them will be supported." ▪ Policy CF3: Open Space. ▪ "Within settlements, there will be a presumption against the development of open space identified for protection on the inset maps. Supplementary guidance for the protection of open space in villages has been prepared. Development of open space for a purpose unrelated to use as open space will not be allowed unless: the open space can best be retained and enhanced through the redevelopment of a small part of the site; or an adequate and acceptable replacement for the open space lost as a result of the development can be provided and/or paid for by the applicant in an equally convenient and accessible location within the locality; and alternative sites have been considered and no other appropriate site can be identified.

7.3 Assessment Methodology

7.3.1 Overview

The methodology used in this assessment follows the standards set out in DMRB LA 104 and DMRB LA 107, in addition, the methodology also follows the principles set out in the [Guidelines for Landscape and Visual Impact Assessment Third Edition](#).

The landscape and visual impact assessment comprises a proportionate high-level assessment to identify potential likely significant effects on landscape character and elements, and visual receptors that may be affected by the construction and operation phases

of the proposed scheme. Effects that are unlikely to be significant are not detailed but are summarised concisely within the landscape and visual impact assessment. Given that the assessment looks at improvement strategies with no specific route alignments developed at this stage, the assessment is qualitative, identifying potential significant effects. The assessment does not attempt to determine detailed levels of effect significance. The assessment of whether effects are potentially significant relies upon common sense, familiarity with similar schemes, experience and professional judgement, supported by reasoned argument.

7.3.2 Assessment of Landscape Effects

A desktop review has been undertaken as part of the assessment for this DMRB Stage 1 Environmental Appraisal Report (EAR) to identify national and local landscape designations and key characteristics of the landscape from published landscape character assessments. In addition, a preliminary site survey has been carried out to gather additional data on the local characteristics of the landscape.

7.3.3 Assessment of Visual Effects

For this DMRB Stage 1 EAR, a landscape walkover survey was undertaken in March 2025 to identify potential local visual receptors along with a high-level qualitative desktop review of potential effects based on their position in relation to the improvement strategies.

7.3.4 Data Sources

For this DMRB Stage 1 EAR, data was gathered from:

- [Dumfries and Galloway Local Development Plan 2 \(LDP2\)](#).
- Relevant Landscape Character Type Areas from [Scottish Landscape Character Types Map and Descriptions](#): LCT 169 Drumlin Pastures, LCT 175 Foothills, 161- Pastoral Valley, 172 Upland Fringe, 160 Narrow Wooded Valley.
- [Ordnance Survey Data](#).
- Photographic Surveys.

7.4 Assumptions and Limitations

7.4.1 Assumptions

The landscape and visual assessment described in this chapter is a high-level consideration of the improvement strategies, to support further route refinement and identification.

While elements of the proposed scheme within the improvement strategies would potentially be visible in long-range views from some locations beyond the study area, potential impacts on visual receptors and landscape beyond a distance of approximately 2km are not taken into consideration within this report.

To present the worst-case scenario, this assessment focuses on potential impacts predicted during construction and in the winter year of opening without the benefit of any mitigation measures. Landscape mitigation measures will be developed when detailed landscape and visual assessment of the preferred route option is undertaken at DMRB Stage 3.

7.4.2 Limitations

This landscape and visual assessment is only based on material available at the time of writing and as such it is subject to the following limitations:

- The assessment is based upon a high-level review following an assessment of environmental constraints and published material available at the time.
- The assessment undertaken is qualitative and intended to identify where there is potential for significant effects to occur to help differentiate between improvement strategies. No evaluation of receptor sensitivity, magnitude of change or significance of effects is undertaken.
- The route alignment design and construction methodology are not sufficiently developed to provide details regarding the extent and nature of effects. Therefore, at DMRB Stage 1 assumptions are based on professional judgement.
- The DMRB Stage 1 EAR is a desktop review with a site visit undertaken in March 2025 to verify its accuracy.

7.5 Study Area

The study area comprises an area extending 2km from the DMRB Stage 1 Assessment Corridor which represents the outer limit of the improvement strategies and is shown in Figures 7-1 to 7-3. The study area covers locations from where there is potentially a view towards the proposed scheme that could be influenced by the proposed works and resulting changes, and the full extent of any Landscape Character Types (LCT) likely to be affected within the 2km buffer. The topography within the study area is gently undulating with minor variations formed by small hills and ridges. There is a moderate rise in landform to the north and south allowing for some longer-range views across the area. The study area will be refined through the assessment process to ensure that all significant landscape and visual effects are identified.

The baseline conditions describe the context of the study area based on a review of data across approximately 2km from the DMRB Stage 1 Assessment Corridor.

7.6 Baseline Conditions

The landscape and visual baseline conditions have been described for the current year (2025), following a desktop review of published sources of information and field survey work in March 2025. Baseline conditions have been informed by aerial photographs and OS data, collating information on topography, surface water features, landcover, land use, landscape pattern and the locations of potential visual receptors.

7.6.1 Designations

Table 7-2, Figure 7-1 and Figure 7-2 details the statutory designations that are located within the 2km study area or are located within close proximity:

Table 7-2: Landscape and Landscape Related Designations Within and Close to the 2km Study Area

Designation	Description
National Scenic Area (NSA)	There is no NSA within the study area. The Nith Estuary NSA is located approximately 3.5km south of the study area but it is unlikely that any of the improvement strategies would have a significant effect on it.
Site of Special Scientific Interest (SSSI)	The following are located within the study area: ▪ Milton Loch SSSI ▪ Torrs Moss SSSI
Conservation Areas	The following is located within the study area: ▪ Kirkpatrick Durham Conservation Area
Garden and Designed Landscapes (GDL)	There are no GDLs within the study area. Threave Gardens are located approximately 1.5km SW of the study area but it is unlikely the improvement strategies would have a significant effect on it.
Scheduled Monuments (SM)	The following are all located within the study area: ▪ East Hill Farmhouse, Stone Circle ▪ Green Island, Milton Loch, Fort ▪ Meikle Cairn, Minnydow, Cairn ▪ Doon of Urr, Doon Hill, Mote of Doon

Designation	Description
	- Ernespie, Castle Douglas, Remains of Stone Circle - Motte of Urr, Motte
Ancient Woodland Inventory (AWI)	There are numerous scattered areas of AWI, located within the study area and within improvement strategies. Most of these are of plantation origin with some semi-natural.
Local Landscape Character Area (LLA)	The eastern end of the study area is partially within the Terregles Ridge designated LLA. “Terregles ridge contains and forms the western setting to Dumfries, separating the Nith Valley from the contrasting drumlin landscapes stretching west to Castle Douglas. - The ridge is dissected by the Old Water and other tributaries of the Nith to create a very diverse landscape of transitional uplands and steep sided valleys concentrated within a small area. - It is criss-crossed by lanes serving scattered farms and hamlets and traversed by major through routes. It is readily accessible from the adjacent well populated lowlands and forms part of the setting to Dumfries and the Drumlin Pastures to the west. (...)the three contrasting landscape types exhibits its own internal diversity. The Upland Fringe has an attractive knolly topography with areas of enclosed improved pastures and rough grazing, interspersed with gorse knolls and scattered woodlands, whilst the Foothills have a wilder landscape of open heather moorland, bracken and rock outcrops. The Intimate Pastoral Valleys include the valley floor pastures and arable lands of the Cluden which are flanked by a mosaic of grasslands, heather, bracken, native woodlands and plantation forestry, as well as the wild moorland landscape of Glenkiln reservoir with its sculptures, and the steep sided wooded lower Cairn valley.”

7.6.2 Landscape Context

The study area extends across five LCTs namely Upland Fringe, Pastoral Valley, Foothills, Drumlin Pastures and Narrow Wooded River Valley. The prevalent LCT within the study area is Drumlin Pastures which is characterised by a gently rolling landform with distinctive rounded hills and hollows. These rounded hills are usually topped with gorse and other scrubby vegetation. The landscape is dominated with pastoral farmland, delineated with hedgerows, ditches, walls and trees. Scattered farmsteads and settlements mostly occupying the higher ground. The Narrow Wooded River Valley LCT follows the course of the Urr Water, cutting across the Drumlin Pastures in the southern part of the study area. The high ground of the northern fringes of the study area overlaps areas of Foothills and Upland Fringe LCTs separated by a small area of Pastoral Valley LCT, and which partially overlap with the Terregles Ridge LLA.

The Terregles Ridge LLA does not overlap with any of the improvement strategies so would not be directly affected but as it occupies higher ground there are likely to be views from it towards Improvement Strategies 1 and 6 which end at the Drummole Roundabout approximately 600m away from the designation boundary.

The topography of the study area is undulating lowlands and hills with higher elevations to the north and south of the study area. The lowlands are interspersed with shallow valleys with a network of watercourses and water bodies. The largest water bodies within the study area are Auchenreoch Loch, Milton Loch and Lochrutton Loch. The largest watercourse within the study area is the Urr Water. The landscape is characterised by an irregular patchwork of field/agricultural land defined by differing boundaries including trees, hedgerows, ditches and dry-stone walls. Interspersed between the field network are numerous small, scattered woodland areas of both conifer plantation and broadleaf species.

The main settlements within the study area include the villages of Crocketford, Springholm, Kirkpatrick Durham, Haugh of Urr and the town of Castle Douglas. Most of these settlements aside from Castle Douglas intersect with improvement strategies. Additionally, there are numerous smaller settlements and individual dwellings scattered across the study area.

Various core paths are present within the study area along with the National Cycle Network (NCN) 7 cycle route which follows the Old Military Road through the study area from south-west to north-east, roughly in parallel with the A75.

7.6.3 Potential Receptors

Table 7-3 and Table 7-4, and Figure 7-3 detail the potential visual and landscape receptors within the study area.

Table 7-3: Potential Visual Receptors

Type of Viewer	Potential Visual Receptors
Residents	Residential properties in Castle Douglas, Springholm, Crocketford, Kirkpatrick Durham, Haugh of Urr, Old Bridge of Urr, Lochfoot, Brae, Clarebrand, Hardgate, Milton and number of scattered residential properties within study area.
Road users	B795, B794, A712, Old Military Road and sections of the A75 to be de-trunked as part of the proposed scheme.
Walkers, cyclists	Core paths and NCN7.
Visitors	Galloway Tourist Route.
Workers	Farm, commercial properties, shops and offices.
Public, transient	The Inn on the Loch, Galloway Arms Hotel, Brandedleys Caravan Park and other holiday rentals within study area.
Pupils, visitors, workers	Springholm Primary School, Springholm Nursery, Hardgate Primary School, Lochrutton Primary School, Shawhead Primary School, Castle Douglas High School and Castle Douglas Primary School.

Table 7-4: Potential Landscape Receptors

Landscape Receptor	Description
Landscape Character Types (LCT)	LCT 169 Drumlin Pastures LCT 175 Foothills LCT161 Pastoral Valley LCT 172 Upland Fringe LCT 160 Narrow Wooded Valley
Local Landscape Area (LLA)	Terregles Ridge
Conservation Area	The Kirkpatrick Durham Conservation Area
Biosphere Reserves	Galloway and Ayrshire Biosphere Reserve
Site of Special Scientific Importance (SSSI)	Milton Loch and Torrs Moss
Scheduled Monuments (SM)	There are six SM within the study area.

Landscape Receptor	Description
Ancient Woodlands	There are numerous areas of Ancient Woodland within the study area with the largest concentrations close to the north-east boundary of the DMRB Stage 1 Assessment Corridor, north-west and south-east of Auchenreoch Loch and in clusters along the Urr Water valley.
Watercourses	There are a number of rivers and inland waterbodies within the study area including: ▪ The Urr Water and its tributaries ▪ Auchenreoch Loch ▪ Milton Loch ▪ Lochrutton Loch ▪ Various minor watercourses and small lochs
Hills	Several hills and undulating landform in the study area: ▪ Improvement Strategy 1: Tarbreoch, Knockwalloch, Crocketford Hill and Hill Head. ▪ Improvement Strategy 2: Knockwalloch, Crocketford Hill and Drum (nr Bettyknowes Plantation). ▪ Improvement Strategy 3: Slopes of Shot Hill. ▪ Improvement Strategy 4: Shot Hill. ▪ Improvement Strategy 5: Barfil Hill, Cairny Hill, Longshot Hill, Shenrick Hill and Tan Hill. ▪ Improvement Strategy 6: Barnbackle Hill, Mill Hill, Burnfell Hill, Fell Hill (nr Black Plantation), Horse Hill (nr Crofthead), Park Hill, Red Brae and Tarbreoch Hill.
Tree Preservation Order (TPO)	No data available at time of writing of the report.

7.7 Potential Impacts

7.7.1 Construction Phase Impacts

Activities likely to cause impacts on both landscape and visual receptors during construction include (but not limited to) the following:

- Movement of construction plant.

- Earthworks operations.
- Removal of existing screening vegetation.
- Construction compounds.
- Establishment and use of haul roads for construction traffic.
- Temporary lighting needed for the works.
- Creation and maintenance of stockpiled soils and materials.
- Demolition operations.
- Diversion of watercourses.

7.7.2 Operational Phase Impacts

Scheme elements with the potential to cause impacts on both landscape and visual receptors during operation include (but may not be limited to) the following:

- Alterations to landscape character.
- Visual impacts and reduced tranquillity (through movement, noise and light pollution from vehicles on the new section of road).
- Loss of screening vegetation increasing visibility of traffic.
- Introduction of new/revised signage.
- Changes to landform, pattern and land use.
- Introduction of new/revised roads and structures.
- Loss or damage to landscape features.
- Severance/diversion of watercourses and drainage patterns.

7.8 Design, Mitigation and Enhancement Measures

7.8.1 Mitigation Measures

In order to mitigate landscape and visual effects as far as reasonably practicable, mitigation will be considered and incorporated where possible during all iteration of the road design. As the assessment is in a preliminary phase it is not possible to identify specific mitigation measures for each improvement strategy. The following have been identified as potential mitigation measures:

- Existing landform and topography – the naturally undulating character of the landscape provides a natural screening effect.

- Native hedgerows and dry-stone walls – characteristic of the Drumlin pastures LCA and existing landscape pattern.
- Tree planting – ‘pockets’ of tree planting are characteristic of the landscape. Careful selection of new planting will have a residual mitigation on visibility of the proposed scheme. Tree planting will compensate for any removal of screening removal and connect fractured habitat corridors.
- Refinement of the horizontal and vertical alignment of the route and the position of the junctions to reduce the impacts of the proposed scheme on views, landform, vegetation, field pattern and landscape features.
- Selection of native plant material of local provenance.
- Enhancing the natural habitat of local wildlife by planting with appropriate species diversity.

7.8.2 Enhancement Measures

No specific enhancement measures were identified at this stage. As the proposed scheme progresses, the assessment will look to identify opportunities for enhancement, and this will be reported in future DMRB stages. Wherever possible, potential landscape improvement opportunities will aim to provide high quality biodiversity enhancement.

7.9 Assessment of Likely Significant Effects

7.9.1 Construction Phase

Construction activities are likely to have a significant effect for all improvement strategies due to the rural location of the proposed scheme. Works would include the construction of permanent elements such as realigned carriageway, improvements to side roads, any structures and culverts, and associated earthworks. Temporary elements such as haul roads, temporary storage areas and compounds, and associated changes to the existing landform, although these elements would be expected to be reinstated as part of the works. Construction operations would likely cause changes to the landform in addition to removal of existing screening vegetation which would likely increase road prominence in the landscape.

Table 7-5 presents a summary of the likely significant effects on landscape and visual receptors during construction phase.

Table 7-5: Potential Significant Effects on the Landscape and Visual Receptors During Construction Phase

Type	Receptor	Potential Effects
Landscape/Townscape	Terregles Ridge LLA	None of the improvement strategies would directly and adversely affect the landscape of Terregles Ridge. Potential (indirect) non-significant effects on views from the LLA towards construction in Improvement Strategies 1 and 6 west of Drummole Roundabout.
Landscape/Townscape	LCT 169 Drumlin Pastures, LCT 161- Pastoral Valley, LCT 172 Upland Fringe, LCT 160 Narrow Wooded Valley LCT 175 Foothills Townscape of Springholm and Crocketford	Changes that would have an impact on landscape character includes removal of trees and, severance of boundary features including hedges and drystone walls, exposed earthworks and alteration to natural landform and introduction of construction traffic affecting the tranquillity of the rural landscape. None of the improvement strategies would directly affect LCT 161, LCT 172 and LCT 175 (all of which lie to the north of Improvement Strategy 1). However, Improvement Strategy 1 runs close to the boundary of the Foothills – Dumfries and Galloway LCT and has the potential to result in indirect effects (on views). Improvement Strategies 1, and 6 would have the most significant effects on the Drumlin Pastures LCT (LCT 169) due to their length, earthworks required to construct the road and new structures and established vegetation loss. Improvement

Type	Receptor	Potential Effects
		Strategy 2 would also have significant effects on LCT 169, but to a lesser degree than the longer Improvement Strategies 1 and 6. Improvement Strategy 3 would be likely to have the least significant adverse effect as much of the route follows the existing A75 corridor. Improvement Strategies 1 and 6 would cross the Urr Water Valley offline potentially significantly affecting the Narrow Wooded Valley LCT (LCT 160). Improvement Strategy 5 would also cut through LCT 160 but would be likely to have lesser impact as it would be on or close to the line of the existing A75 at and south of the Urr Water Crossing. Improvement Strategy 2 would merge with the existing A75 close the northern edge of LCT before the Urr Water crossing so would have a lesser effect than Improvement Strategy 5. Improvement Strategies 3 and 4 would have no direct effect on LCT 160. Improvements Strategies 1, 2, 4, 5 and 6 would all result in beneficial effects along the existing A75 corridor within the settlements of Springholm and Crocketford. Improvement Strategy 3 would potentially require the demolition of buildings along the A75 corridor within Springholm and Crocketford, which, along with increased severance caused by carriageway widening would be likely to

Type	Receptor	Potential Effects
		have significant adverse effects on the townscape of the two settlements.
Landscape/Townscape	Kirkpatrick Durham Conservation Area	The proposed scheme is unlikely to have a significant direct effect on the Conservation Area but the temporary adverse effects during construction in Improvement Strategies 1 and 2 would be likely.
Landscape/Townscape	Galloway and Ayrshire Biosphere Reserve	All improvement strategies are unlikely to have a significant effect on the Biosphere Reserve. The likely effects include a change of rural landscape character and severance of habitat/wildlife corridors and greenspaces. Improvement Strategies 1, 2 and 5 would likely have the most impact due to improvement strategy length. Improvement Strategy 4 is shorter than Improvement Strategies 1,2 and 5 and therefore is likely to have less of an impact on the Biosphere Reserve. Improvement Strategy 3 would be unlikely to have a significant effect on the rural landscape character within the Biosphere Reserve as the route follows the existing A75 alignment. Improvement Strategy 6 is mostly outside the Biosphere Reserve boundary.
Landscape/Townscape	Ancient Woodland Inventory (AWI)	Improvement Strategies 1, 2 and 3 may have a significant effect on some areas of AWI, depending on the route alignment.

Type	Receptor	Potential Effects
		Improvement Strategies 4, 5 and 6 would not have a direct adverse effect on AWI areas.
Landscape/Townscape	Other trees, hedges and boundary features	All improvement strategies would require removal of other trees, hedgerows and boundary features such as dry-stone walls. Improvement Strategies 1, 2, and 6 would be likely to have the most adverse effect, due to their length and rural location. Likely effects would include changes to landscape pattern, rural landscape character and severance to habitat corridors and green networks to accommodate temporary access and storage compounds for construction sites. Improvement Strategy 3 would be likely to have the least significant effect as much of the proposed improvement strategy follows the existing A75. Improvement Strategy 4 would have a greater effect than Improvement Strategy 3 and lesser effect than the other options. Improvement Strategy 5 would have a more significant effect on trees, hedges and boundary features than Improvement Strategies 3 and 4 due to its greater length and rural location. However, its effects would be less significant than those of Improvement Strategy 1, 2 and 6.

Type	Receptor	Potential Effects
Landscape/Townscape	Hills	All improvement strategies would require significant earthworks associated with cuttings and embankments to the surrounding hills and undulating landform. Improvement Strategy 1 would have direct adverse effects on hill at Knockwarley Plantation, Tarbreoch Hill, Knockwalloch Hill, Crocketford Hill, Hillhead Brae and Drum and Hanging Brae. Improvement Strategy 2 would have a direct adverse effect on Moat Hill, Knockwalloch Hill, Crocketford Hill, Hillhead Brea and Drum. Improvement Strategy 4 would have a direct adverse effect on Shot Hill. Improvement Strategy 5 would have a direct adverse effect on Barfil Hill, Cairny Hill, Longshot Hill, Shenrick Hill and the lower slopes of Tan Hill. Improvement Strategy 6 would have a direct adverse effect on Barnbackle Hill, Round Hill of Newark, East Hill, Hawthorn Hill, Drumwhin, Knowlie, Cairn Hill and Corse Hill. Improvement Strategies 1, 2 and 6 would be likely to have the most significant effects on the landform due to their location and length. Improvement Strategy 3 would have the least significant effects on the landform as much of the proposed improvement strategy follows the existing A75, with minimal earthworks likely to be required. Improvement Strategies 4 and

Type	Receptor	Potential Effects
		5 would be likely to have to greater impact than Improvement Strategy 3, but less than the other options.
Landscape/Townscape	Watercourses, waterbodies and blue-green infrastructure	All improvement strategies cross various minor watercourses. Improvement Strategies 1, 5 and 6 would cross Urr Water potentially resulting in significant temporary effects Construction in Improvement Strategy 3 would potentially have a temporary adverse effects on the setting of Auchenreoch Loch.
Visual	Residents – Springholm, Crocketford, Clarebrand, Haugh of Urr, Old Bridge of Urr, Kirkpatrick Durham, Lochfoot, Brae, Milton, Hardgate	Improvement Strategy 1 would likely have an adverse effect on residents of Brae, Kirkpatrick Durham, Old Bridge of Urr, Clarebrand and individual properties near alignment. Residents of Crocketford and Springholm would experience a beneficial effect. Improvement Strategy 2 would likely have an adverse effect on residents of Brae, Kirkpatrick Durham and individual properties near the alignment. Residents of Crocketford and Springholm would likely experience a beneficial effect. Improvement Strategy 3 would likely have a significant adverse effect to residents of Crocketford, Springholm and individual properties near the alignment. Improvement Strategy 4 would likely have a significant adverse effect on residents of Crocketford, Springholm and individual properties near the alignment.

Type	Receptor	Potential Effects
		Improvement Strategy 5 would be likely to have a significant adverse effect on be residents of Crocketford, Springholm, Hardgate and individual properties near the alignment. Improvement Strategy 6 would have a significant adverse effect on residents of Haugh of Urr, Hardgate, Milton and Lochfoot. Improvement Strategies 1, 2 and 6 would likely have the most significant adverse effects due to their location on higher ground and proximity to settlements and dwellings. Improvement Strategy 6 would be highly visible to residents of Hardgate and Haugh of Urr. The length of each improvement strategy would also have a higher adverse effect on the rural character of the landscape. Improvement Strategy 3 would have the most significant visual effects on properties along the A75 corridor within Crocketford and Springholm as a result of carriageway widening, including potential demolition of properties alongside the existing A75, which would potentially open up views to the widening works from neighbouring areas. As it is the shortest route and much of it is on the line of the existing A75, this improvement strategy would have the least visual effects on rural receptors outwith Springholm and Crocketford.
Visual	Road Users	Users of roads intersecting and adjacent to the improvement strategies would be likely to have full or partial views of the

Type	Receptor	Potential Effects
		temporary works. Likely effects include altered traffic flows within and around study area affecting the rural character. This is across all improvement strategies. Improvement Strategies 1 and 6 would be likely to have the greatest effect due to length of route, followed by Improvement Strategies 2 and 5. Improvement Strategies 2 and 3 would have the least effect, although demolition of properties in Springholm and Crocketford which may be required for Improvement Strategy 3 has the potential to result in adverse effects on views experienced from the A75.
Visual	Recreation users – core footpaths and NCN7	Users of core footpaths would be likely to experience full or partial views of construction works. Visibility is likely from all improvement strategies. Users of the NCN7 would be likely to experience significant effects on views of works associated to Improvement Strategy 6. Likely effects include removal of screening vegetation, increased traffic from road diversions that would affect the rural character of the area. The most significant effects would likely result from the Improvement Strategies 1 and 6 as they cover the greatest total area, followed by Improvement Strategies 2 and 5. Improvement Strategies 3 and 4 would have the least effect.

Type	Receptor	Potential Effects
Visual	Visitors/Tourists	Users of the Galloway Tourist Route (A711) are unlikely to experience any significant effects. Visitors/Tourists would likely experience full or partial views of all improvement strategies. Likely adverse effects include increased traffic and removal of screening vegetation that would affect the rural character. Visitors/Tourists at Brandedleys Caravan Park would likely experience significant adverse effect from construction in Improvement Strategy 4 (likely to have the most significant effect passing through the rural landscape at close range) and Improvement Strategy 5. Views from parts of the caravan park would also be gained of construction in Improvement Strategies 1 and 2.
Visual	Workers	Workers, in particular those associated with farming/agriculture, are likely to experience significant adverse visual effects from the introduction of construction works into the rural landscape. The most significant effects experienced in rural locations would be likely to result from the Improvement Strategies 1 and 6 as they have the greatest total area, followed by Improvement Strategies 2 and 5. Improvement Strategies 3 and 4 have the least effect on workers in rural locations. However, demolition of properties in Springholm and Crocketford which may be required for Improvement Strategy 3 would result in adverse effects on views from workplaces within the two settlements.

7.9.2 Operation Phase

All improvement strategies are likely to have a significant effect on receptors during the operational phase due to the rural location of the proposed scheme. Such effects would arise from a permanent change to landform and pattern due to a new alignment of the existing A75 corridor. A new alignment will result in new road infrastructure, signage and lighting, affecting the rural character and views of the landscape, in addition to changes in traffic flow through the study area. Proposed mitigation measures will likely have a residual effect on landscape and visual receptors. Table 7-6 presents a summary of the likely significant effects on the landscape and visual receptors during operational phase.

Table 7-6: Likely Significant Effects on the Landscape and Visual Receptors During Operational Phase

Type	Receptor	Potential Effects
Landscape/Townscape	Terregles Ridge LLA	Potential (indirect) effects on views from the LLA towards Improvement Strategies 1 and 6 approximately 600m west of Drummole Roundabout. Other improvement strategies are unlikely to have any notable effect on views due to distance.
Landscape/Townscape	LCT 169 Drumlin Pastures LCT 175 Foothills LCT 161 Pastoral Valley LCT 172 Upland Fringe LCT160 Narrow Wooded Valley Townscape of Springholm and Crocketford	Adverse effects would likely result from changes in landform and landscape pattern synonymous with the LCT and loss of important elements including tree cover, hedgerows and drystone walls. These effects would arise from new infrastructure, alignment and associated works such as embankments and cuttings to accommodate new road layout. This is likely across all improvement strategies. The most significant effects on the rural landscape would be likely to result Improvement Strategies 1 and 6 as they have the greatest total area, followed by Improvement Strategies 2 and 5. Improvement Strategies 3 and 4 have the least effect. Improvements Strategies 1, 2, 4, 5 and 6 would all result in beneficial effects along the existing A75 corridor within the settlement of Springholm and Crocketford. Improvement Strategy 3 may require the demolition of buildings along the A75 corridor within Springholm and Crocketford, which, along with increased severance caused by carriageway widening

Type	Receptor	Potential Effects
		would have significant adverse effects on the townscape of the two settlements.
Landscape/Townscape	Kirkpatrick Durham Conservation Area	Potential effects on the rural landscape setting of the Conservation Area due to views of Improvement Strategies 1 and 2 introducing new infrastructure, traffic and change in landform and landscape pattern closer to the Conservation Area.
Landscape/Townscape	Galloway and Ayrshire Biosphere Reserve	Improvement Strategies 1, 2 and 5 are in majority located within the Galloway and Ayrshire Biosphere Reserve and would be likely to have the most significant effects due to their length and locations. Improvement Strategy 4 is almost entirely located within the Biosphere Reserve, but effects would likely to be less significant than those for Improvement Strategies 1,2 and 5 due to this option partially following the existing A75 corridor. Improvement Strategies 3 and 6 would be likely to have the least significant effects. Improvement Strategy 3 would be seen within the existing A75 corridor and Improvement Strategy 6 cross the biosphere reserve in a small section north-east from Haugh of Urr.
Landscape/Townscape	Ancient Woodland Inventory (AWI)	Improvement Strategies 1 and 2 are likely to have the most significant direct effects due to the three areas of AWI being located within these improvement strategies. Improvement Strategies 3,4,5 and 6 would neither directly or significantly affect areas of AWI.

Type	Receptor	Potential Effects
Landscape/Townscape	Other trees, hedges and boundary features	Due to their length, Improvement Strategies 1 and 6 would be likely to have the greatest adverse impact on the landscape pattern, caused by alteration and potential removal of hedgerows, dry stone walls and other boundary features. Improvement Strategies 3 and 4 would have the least significant impact on these features as these routes are the shortest and affect fewer boundaries. Removal of these boundary features is likely to have an adverse effect on the landscape pattern and character, and result in the severance of habitat corridors and green networks.
Landscape/Townscape	Hills	All improvement strategies would result in a permanent alteration to landform in the surrounding topography due to the installation of earthworks and cuttings. Improvement Strategy 1 would likely result in significant alterations in landform to Knockwarley Plantation, Tarbreoch Hill, Knockwalloch Hill, Crocketford Hill, Hillhead Brae and Drum and Hanging Brae, including the topography nearby. The changes to topography are likely to impact the setting of the rural landscape to the North. Improvement Strategy 2 would likely result in significant alterations to the landforms of Moat Hill, Knockwalloch Hill, Crocketford Hill, Hillhead Brea and Drum, including the topography nearby. Improvement Strategy 4 would likely result in a permanent adverse alteration to Shot Hill.

Type	Receptor	Potential Effects
		Improvement Strategy 5 would likely result in significant and permanent alterations in landform to Barfil Hill, Cairny Hill, Longshot Hill, Shenrick Hill and the lower slopes of Tan Hill, and surrounding slopes and undulations. The permanent alterations in the topography would likely have an adverse effect on the rural character of the landscape to the South. Improvement Strategy 6 would likely result in the most significant effects resulting from permanent alterations in landform to Barnbackle Hill, Round Hill of Newark, East Hill, Hawthorn Hill, Drumwhin, Knowlie, Cairn Hill and Corse Hill, and surrounding slopes and undulations. The changes in landform would likely have an adverse impact to the rural landscape setting exacerbated by the elevated position of this improvement strategy. Permanent alteration to the landform caused by Improvement Strategies 1 and 5 would likely have the second most significant adverse impact due to the hilly terrain, elevation and route length. This is followed by Improvement Strategy 2 with Improvement Strategies 3 and 4 causing the least significant impact.
Landscape/Townscape	Watercourses and waterbodies and blue-green infrastructure	All improvement strategies cross various minor watercourses potentially severing blue-green infrastructure, impacting local valley landforms and requiring new structures. Improvement Strategies 1, 5 and 6 cross the Urr Water. Improvement Strategy 3 would adversely affect the setting of Auchenreoch Loch. Improvement Strategy 4

Type	Receptor	Potential Effects
		would be likely to have the least adverse effects and Improvement Strategy 6 the greatest.
Visual	Residential properties in – Springholm, Crocketford, Clarebrand, Haugh of Urr, Old Bridge of Urr, Kirkpatrick Durham, Lochfoot, Brae, Milton, Hardgate and numerous scattered farmsteads and private houses	All improvement strategies apart from (online) Improvement Strategy 3 would have a beneficial visual effect on views from properties in Springholm and Crocketford which currently overlook the A75 through diverting traffic to an offline route. Improvement Strategy 1 would have adverse effects on residents of Crocketford with rural views to the north, Brae, Kirkpatrick Durham, Old Bridge of Urr, Clarebrand and individual properties near alignment. Improvement Strategy 2 would likely have adverse effects to residents of Brae, Kirkpatrick Durham and individual properties near alignment. Improvement Strategy 3 would be likely to have significant adverse effects on residents of Crocketford, Springholm along the existing A75 corridor due to widening of the carriageway and potential demolition of properties, potentially opening up views to the road from neighbouring areas. Improvement Strategy 4 would likely have an adverse effect on east facing rural views experienced by residents of Crocketford, Springholm and individual properties near the alignment. Improvement Strategy 5 would likely have a significant adverse effect to rural views experienced by residents in southern parts of

Type	Receptor	Potential Effects
		Crocketford, in Springholm on the east side of the existing A75, Hardgate and individual properties near the alignment. Improvement Strategy 6 would have a significant adverse effect to residents of Haugh of Urr, Hardgate, Milton, Lochfoot and individual properties near the alignment. Improvement Strategy 6 would be likely to have the most significant adverse effects due to its elevated position, proximity to settlements and length. Although Improvement Strategies 1, 2 and 5 do not pass through settlements, they are close in proximity and likely to adversely impact views of the rural landscape. Improvement Strategy 1 is the longest route, and likely to be visible to many individual properties and settlements. Improvement Strategy 3 would be likely to have the greatest adverse visual effects on residents of Springholm and Crocketford but the least impact on views from other settlements and scattered rural residential properties.
Visual	Road Users	Likely effects on views to the A75 experienced from local roads and new views from offline A75 routes to the surrounding landscape. The greatest impacts on views from local roads are likely to be associated with the longer improvement strategies (Improvement Strategies 1 and 6) with the least impacts resulting from Improvement Strategies 3 and 4. There would likely be benefits for road users on Improvement

Type	Receptor	Potential Effects
		Strategies 1, 2, 5 and 6 as new views of the rural landscape would likely be experienced.
Visual	Users of core footpaths and NCN7	Likely significant effects would result from changes to alignment, landform and screening vegetation. Scale of visibility will be dependent on improvement strategy. Users of core footpaths are likely to be significantly affected across all improvement strategies. Users of the NCN7 would be likely experience significant adverse effects from Improvement Strategy 6. Improvement Strategies 1-5 are unlikely to have any effect on the NCN7 due to screening from the natural topography. The most significant effects for core path users would be likely to result from Improvement Strategies 1, 2, 5 and 6 due to changes in landform, the visual prominence of the new routes and their intersection/ crossing with core paths. Improvement Strategies 3 and 4 are likely to have the least effect on core footpath users due to minimal change from existing A75 alignment.
Visual	Visitors/Tourists	Visitors are likely to experience an increase or decrease in visibility from a new alignment and changes to landform depending on the improvement strategy. Visitors/tourists to Brandedleys Caravan Park would experience a significant adverse effect from Improvement Strategy 4. Improvement Strategies 1, 2 and 6 would likely have the most beneficial effect for visitors and tourists as views to the surrounding rural landscape would be gained. This beneficial effect

Type	Receptor	Potential Effects
		would also be gained from Improvement Strategy 5 but to less extent due to a lower elevation in the landscape and proximity to the settlements of Crocketford and Springholm. Visitors to Springholm and Crocketford are likely to experience adverse visual effects as a result of the carriageway widening, potential demolition of properties along the A75 corridor and alterations to townscape required for Improvement Strategy 3.
Visual	Workers	Workers, in particular those associated with farming/agriculture, are likely to experience adverse visual effects. The most significant effects would be likely to result from Improvement Strategies 1 and 6 as they would have the greatest effect on workers in rural areas, followed by Improvement Strategies 2 and 5. Improvement Strategies 3 and 4 have the least effect on workers in rural areas, however, Improvement Strategy 3 would be likely to have significant effects on views experienced from workplaces within Springholm and Crocketford.

7.10 Proposed Scope of Future Assessment

A scoping exercise will be undertaken at DMRB Stage 2 to determine which aspects of the landscape and visual receptors would be scoped in for further assessment. The next stage of assessment will align with DMRB LA 104 and DMRB LA 107 and other relevant guidance. A comparative assessment of the proposed route options during construction and operational phases will be undertaken at DMRB Stage 2.

The recommended methodology for the DMRB Stage 2 assessment is to further review baseline conditions, particularly those which effect the proposed route options. This will involve further review of relevant LCAs and policy, in addition to using OS and topographical information. Further site surveys will be required to identify visual and landscape receptors in relation to the existing baseline conditions.

7.11 Summary

All six improvement strategies have been assessed with regards to their potential impacts on landscape and visual receptors. Each improvement strategy presents differing levels of potential impact to landscape and visual receptors. All improvement strategies would result in changes to the rural landscape character and views from residential properties, active travel routes, local roads and other locations within the surrounding landscape.

Improvement Strategy 6 is the second longest and would likely have the most significant adverse effect to landscape and visual receptors south of the existing A75. Significant effects would result from permanent changes to the landform on high ground including several hills, impacts on the landscape pattern, severance and loss of woodland (including native woodlands), habitat corridors and green networks (including along the Urr Water and various minor watercourses) together with the introduction of the new road infrastructure and traffic into the rural landscape. There is also potential for indirect effects (on views) of this improvement strategy from Terregles LLA. The length of the improvement strategy, its elevated position in the landscape and its proximity to numerous individual properties and several settlements, most notably Hardgate and Haugh of Urr, would be likely to result in significant visual effects. Parts of this improvement strategy run close to NCN7 so would likely have adverse visual effects on cyclists. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route resulting from reductions in traffic including improved townscape and visual amenity within Springholm and Crocketford.

Similar in length to Improvement Strategy 6, Improvement Strategy 1 would also be likely to have a significant adverse effect on both landscape and visual receptors. Significant effects would result from permanent changes to the landform and pattern on high ground with several hills and surrounding topography permanently altered, impacts on the landscape

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pattern, severance and loss of woodland (including AWI), habitat corridors, green networks (including along the Urr Water and various minor watercourses) and boundary features including drystone walls together with the introduction of the new road infrastructure and traffic into the rural landscape. This improvement strategy would result in loss and severance of AWI woodlands and likely impacts on undulating landform north of Auchenreoch Loch. There is also potential for indirect effects (on views) of this option from Terregles LLA. The length of the improvement strategy, its partly elevated position in the landscape proximity to settlements including Brae, Kirkpatrick Durham, Old Bridge of Urr, Clarebrand, Crocketford and numerous individual properties to the north of the existing A75 would be likely to result in significant visual effects. The rural setting north of Auchenreoch Loch would be affected, with the visual receptors at The Inn on the Loch impacted, though there would be benefits on the south side of the loch from reduced traffic on the existing A75. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 2 would be likely to have a significant adverse effect on both landscape and visual receptors. Significant effects would result from permanent changes to the landform and pattern on high ground with several hills and surrounding topography permanently altered, impacts on the landscape pattern, severance and loss of woodland (including AWI), habitat corridors, green networks and boundary features. The central section of this improvement strategy, which follows the same route as Improvement Strategy 1, would result in loss and severance of AWI woodlands and likely impacts on undulating landform north of Auchenreoch Loch. Residents of Kirkpatrick Durham, Brae and north facing properties in Crocketford and rural properties would be likely to experience adverse visual effects. The rural landscape north of Auchenreoch Loch would be affected, with the visual receptors at The Inn on the Loch impacted, though there would be benefits on the south side of the loch from reduced traffic on the existing A75. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 5 is considered likely to have broadly similar overall levels of landscape and visual effects to Improvement Strategy 2, but with the most significant landscape and visual effects likely to result from the route crossing high ground of Barfil Hill, Cairny Hill, Longshot Hill and the northern slopes of Tan Hill. This improvement strategy would also result in changes to the landscape pattern and severance and loss of woodland, habitat corridors, green networks and boundary features. Visual receptors in Springholm, Crocketford and Hardgate as well as rural properties would likely be affected by views of this improvement strategy. The reduction/ removal of traffic on the existing A75 alongside Auchenreoch Loch would improve the landscape setting of the loch and enhance visual amenity. This improvement strategy would result in beneficial landscape and visual effects

along the existing A75 route including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 4 is considerably shorter than Improvement Strategies 1,2, 5 and 6 and closer to the existing A75. This improvement strategy, which follows the lower valley slopes and valley floor avoiding hills and AWI woodland, and severing a relatively small number of field boundary features/ green corridors would have less significant adverse landscape effects than Improvement Strategies 1,2,5 and 6, while providing improved townscape and visual amenity in the bypassed settlements of Springholm and Crocketford. However, it would potentially affect the landscape setting of a group of listed buildings at Newbank Mill. The reduction/ removal of traffic on the existing A75 alongside Auchenreoch Loch would improve the landscape setting of the loch and enhance visual amenity. There is the potential for significant effects on rural views currently experienced from residential properties in Springholm, Crocketford and Brandedleys Holiday Park.

Improvement Strategy 3 is online and would therefore result in the least adverse effects on the rural landscape and visual effects on rural properties but would have significant adverse effects on the townscape and visual amenity within Springholm and Crocketford. Visual effects on residents, workers and visitors in the two villages during construction are likely to be significant, as a result of widening and potential demolition of properties along the existing A75. During operation, visual effects are likely to be significantly worse than those currently experienced, due to road widening and removal of existing screening features, including buildings which currently screen the existing A75 from neighbouring areas, particularly as space for mitigation measures would be limited.

Improvement Strategy 3 would be likely to have the least adverse effects on the rural landscape and least visual effects on scattered rural properties of all the improvement strategies but the most significant effects on the townscape and visual receptors along the existing A75 within Springholm and Crocketford. Of the remaining (offline) improvement strategies, Improvement Strategy 4 would be likely to have the least adverse landscape and visual effects, followed by Improvement Strategies 2 and 5, then Improvement Strategy 1 and Improvement Strategy 6 likely to have the greatest adverse effects.

8. Biodiversity

8.1 Introduction

This chapter describes the methodology followed and potential impacts identified for the biodiversity assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). This assessment has been undertaken with reference to [Design Manual for Roads and Bridges \(DMRB\) LA 108 - Biodiversity \(revision 1\)](#) and [DMRB LD 118 - Biodiversity design \(revision 0\)](#) (hereafter referred to as “DMRB LA 108” and “DMRB LD 118” respectively) and other relevant standards and guidance set out within this chapter.

8.2 Legislative and Policy Framework

Table 8-1 and 8-2 provides a summary of the international and national legislation relevant to this biodiversity assessment.

Table 8-1: International Legislation Relevant to the Biodiversity Assessment

International Legislation	Relevance to the Proposed Scheme
The Convention on Biological Diversity (CBD)	The CBD was adopted in 1992 at the international Conference on Environment and Development (the ‘Earth Summit’) and entered into force in 1993. The CBD is an international and legally binding treaty that commits signatories to three main goals of: conserving biodiversity; sustainable use of biodiversity; and the fair and equitable sharing of the benefits arising from the use of genetic resources.
The Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention or CMS)	The CMS was adopted in 1979 and entered into force in 1983. The CMS is an international and environmental treaty of the United Nations, and acts as a framework Convention to conserve and protect migratory species, their habitats, and their migration routes, notably those that cross international borders. The UK ratified the CMS in 1985 and established protection of Appendix I species in the Wildlife and Countryside Act 1981 (as amended).
The Convention on the Conservation of European Wildlife and Natural	The Bern Convention was adopted in 1979 and entered into force in 1982. The Bern Convention is an international and legally binding treaty that aims to conserve and protect wild plant and animal species and their natural habitats, to

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International Legislation	Relevance to the Proposed Scheme
Habitats (the Bern Convention)	increase cooperation between parties, and to regulate exploitation of migratory species. The UK ratified the Bern Convention in 1982 and transposed the obligations into UK law through the Wildlife and Countryside Act 1981 (as amended) and, in Scotland, the Nature Conservation (Scotland) Act 2004 (as amended).
The Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention)	The Ramsar Convention was adopted in Ramsar, Iran (1971), and entered into force in 1975. The Ramsar Convention is an international treaty that provides the mechanism for protecting wetland sites of global importance through their designation as wetlands of international importance or Ramsar sites. The UK ratified the Ramsar Convention and designated its first Ramsar sites in 1976.
The Habitats Directive (92/43/EEC)	The EU Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) was adopted in 1992 and is the means by which the European Community (EC) would meet its obligations as a signatory of the Bern Convention. The Directive introduces a range of measures including the protection and surveillance of habitats and species. The habitats listed in Annex I of the Directive, and the species listed in Annex II, are to be protected by means of a network of sites. These are designated by EU Member States as Special Areas of Conservation (SACs) and, along with Special Protection Areas (SPAs) classified under the Birds Directive after 1994, form a network of protected areas known as Natura 2000 (now referred to in Scotland as European Sites and in England and Wales as National Site Network sites).
Water Framework Directive (2000/60/EC)	The Water Framework Directive (WFD) is an EU directive to establish a framework for the protection of all waterbodies. The main aims are to: prevent deterioration and enhance status of aquatic ecosystems, including groundwater; promote sustainable water use; reduce pollution; and contribute to the mitigation of floods and droughts. Under the WFD, Scotland comprises one singular River Basin District (RBD) (the Scotland RBD) and shares the Solway-Tweed RBD with England.

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Table 8-2: National Legislation Relevant to the Biodiversity Assessment

National Legislation	Relevance to the Proposed Scheme
The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) (the Habitats Regulations)	The UK was a Member State of the EU when this legislation was formalised. Following the UK's withdrawal from the EU, this legislation has now been transferred into domestic 'retained EU law'. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) (the Habitats Regulations) transpose the EC Habitats Directive into national law. The Habitats Regulations cover the requirements for: - Protecting sites that are internationally important for threatened habitats and species (European sites) via Habitats Regulations Appraisal (HRA). - A legal framework for species requiring strict protection (European protected species). Under the Regulations it is an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2 of the Regulations; or to pick, collect, cut, uproot, destroy, or trade the plants listed in Schedule 4. These actions can, however, be made lawful through the granting of licences by the appropriate authorities.
The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019	The Habitats Regulations remain in place post 31 December 2020 with only minor changes being introduced by the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. The Regulations extend to Scotland only.
The Wildlife and Countryside Act 1981 (as amended in Scotland)	The 1981 Act applies to the terrestrial environment and inshore waters. Part 1 of the Act details a large number of offences in relation to the killing and taking of wild birds, other animals and plants. The Act also governs provision of site protection measures under the statutory designation of Sites of Special Scientific Interest (SSSIs).
Protection of Badgers Act 1992 (as amended for Scotland)	The Protection of Badgers Act 1992, as amended by the Wildlife and Natural Environment (Scotland) Act 2011, protects badgers and their setts. Offences under the Act include: wilfully taking, injuring or killing a badger; cruelty to a badger; intentional or reckless interference with a badger

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National Legislation	Relevance to the Proposed Scheme
	sett; sale or possession of a badger; and marking or ringing of a badger. Interference with a badger sett includes: damaging or destroying a sett or any part of it; obstructing access to a sett; disturbing a badger while it is in a sett; causing or allowing a dog to enter a badger sett.
The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003	The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 protects both Atlantic salmon and sea trout, the seaward migrating life form of brown trout. This Act makes it an offence to knowingly injure, disturb, destroy, buy or sell Atlantic salmon eggs, smolt, fry, parr or alevin; and obstruct the migratory passage of any life stage of Atlantic salmon or sea trout individuals.
Nature Conservation (Scotland) Act 2004	This Act places duties on public bodies in relation to the conservation of biodiversity. It also amends and strengthens existing nature conservation legislation and increases protection for SSSIs. In addition, the Act places a duty on every public body to further the conservation of biodiversity and requires Scottish Ministers to designate one or more strategies for the conservation of biodiversity, such as the Scottish Biodiversity Strategy. It also requires Scottish Ministers to publish a list of habitats and species considered to be of principal importance for biodiversity: the Scottish Biodiversity List (SBL).
The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008	As mentioned above, under the WFD, Scotland comprises one singular RBD (the Scotland RBD) and shares the Solway-Tweed RBD with England. An Eel Management Plan was created for Scotland in 2010. Eel protection measures are enshrined in Scots law by the Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008.
Wildlife and Natural Environment (Scotland) Act 2011	The Wildlife and Natural Environment (Scotland) Act 2011 (referred to as the WANE Act) amended wildlife laws in Scotland, including the Wildlife and Countryside Act 1981 and the Protection of Badgers Act 1992. It primarily covers management for game species, but also provides a

National Legislation	Relevance to the Proposed Scheme
	mechanism for the management of non-native species (NNS). The WANE Act expanded the Biodiversity Duty placed on public bodies by the Nature Conservation (Scotland) Act 2004 by introducing a requirement for all public bodies to report on their compliance with the Biodiversity Duty.

8.2.1 National Policy

National Planning Framework 4

The Scottish Government published the [National Planning Framework 4](#) (hereafter referred to as “NPF4”) in February 2023 and updated in October 2024. The NPF4 was published with the Scottish Government’s intention to tackle the current ‘climate emergency’ and ‘biodiversity crisis’. To achieve this the Scottish Government have stated that ‘our approach to planning and development will play a critical role in supporting nature restoration and recovery’. NPF4 considers that ‘Scotland’s future places will be net zero, nature-positive places that are designed to reduce emissions and adapt to the impacts of climate change, whilst protecting, recovering and restoring our environment’.

The national spatial strategy will support the planning and delivery of:

- Sustainable places, where we reduce emissions, restore and better connect biodiversity.
- Liveable places, where we can all live better, healthier lives.
- Productive places where we have a greener, fairer and more inclusive wellbeing economy.

NPF4 has a number of policies associated with improving biodiversity and helping to secure positive effects for biodiversity; policies of relevance include:

- Policy 1 Tackling the climate and nature crises – states that ‘when considering all development proposals significant weight will be given to the global climate and nature crises’. Any future development plans will have to address these crises by promoting nature recovery and restoration in the area resulting in zero carbon and nature positive places.
- Policy 3 Biodiversity – ensures that developments will secure positive effects for biodiversity. The policy states developments ‘will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them’. It further states that ‘development proposals for national or major development, or for development that requires an Environmental Impact Assessment will only be supported where it can be

demonstrated that the proposal will conserve, restore and enhance biodiversity, including nature networks so they are in a demonstrably better state than without intervention’.

Adverse impacts, including cumulative impacts of developments on biodiversity, nature networks and the natural environment will be minimised. Policy 3 seeks to tackle biodiversity and address Policy 1 through reversal of biodiversity loss, safeguard ecosystem services and build resilience.

- Policy 4 Natural places – outlines requirements for development proposals to identify, protect and lessen impacts on protected species, habitats and sites. Policy 4 states that ‘The planning system should protect, restore and enhance [Scotland’s] natural assets; make best use of nature-based solutions’. The policy aims to protect and restore natural places and that natural assets are managed in a sustainable way that maintains and grows their essential benefits and services. Enhancing or restoring these natural places is one area that a development could secure positive effects on biodiversity.
- Policy 6 Forestry, woodland and trees – aims to protect and expand forests, woodland and trees. It states that ‘area of existing woodland or land identified as being suitable for woodland creation (under the Forestry and Woodland Strategy) (FWS), as being suitable for woodland creation will only be supported where the enhancement and improvement of woodlands and the planting of new trees on the site [...] are integrated into the design’. Developments should seek to enhance, expand and improve woodland and tree cover, which could contribute to positive effects on biodiversity.

Scottish Biodiversity Strategy and Scottish Biodiversity List

The [Scottish Biodiversity Strategy to 2045](#) (hereafter referred to as “SBS”) published in 2024 sets out a clear strategy for Scotland to be Nature Positive by 2030, and to have restored and regenerated biodiversity across the country by 2045. This commitment to protect at least 30% of our land and sea for nature by 2030 (30x30 Target) is included together with the development of Nature Networks. This 30x30 commitment aligns with Target 3 of the CBD.

The SBS identifies six objectives which shaped the development of actions and are contained within the Scottish Biodiversity Delivery plan 2024 to 2030 as Priority Actions. These are:

- Accelerate ecosystem restoration and regeneration.
- Protect nature on land and at sea, across and beyond protected areas.
- Embed Nature Positive farming, fishing and forestry.
- Protect and support the recovery of vulnerable and important species and habitats.
- Invest in nature.
- Take action on the indirect drivers of biodiversity loss.

The [Scottish Biodiversity List](#) (SBL) is the statutory list of animals, plants and habitats considered by the Scottish Ministers to be most important for biodiversity conservation in Scotland. The publication of the SBL satisfies the requirements of the Nature Conservation (Scotland) Act 2004, which places a duty on public bodies to further the conservation of biodiversity. This list is in the process of being updated to align with the new SBS.

8.2.2 Local Policy and Plans

Local Biodiversity Action Plan

The [Dumfries and Galloway Local Biodiversity Action Plan](#) (LBAP) has six overall aims and nine central objectives. The overall aims are:

- AIM 1: Biodiversity conserved and re-created at the landscape and seascape scale.
- AIM 2: Genetic diversity conserved.
- AIM 3: Biodiversity incorporated into all relevant decision-making.
- AIM 4: Biodiversity awareness, understanding and engagement improved.
- AIM 5: Natural processes allowed to operate wherever practicable.
- AIM 6: Local distinctiveness enhanced.

The central objectives are:

- Objective 1: Ensure no net loss of priority habitats and species during the lifetime of the plan.
- Objective 2: Ensure that more data relating to Dumfries and Galloway is collected, collated and made available, to assist in the promotion, enjoyment, understanding and enhancement of biodiversity.
- Objective 3: Maintain and enhance a network of designated biodiversity sites.
- Objective 4: Recognise the value of ancient habitats.
- Objective 5: Minimise the impact of non-native species on biodiversity.
- Objective 6: Reintroduce or translocate species in Dumfries and Galloway where appropriate.
- Objective 7: Increase wildlife tourism in Dumfries and Galloway.
- Objective 8: Highlight the geological diversity of Dumfries and Galloway, and its close relationship to biodiversity.
- Objective 9: Biodiversity incorporated into relevant strategies in Dumfries and Galloway.

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The LBAP also lists priority habitats where actions have been identified. Those which may be of relevance to the proposed scheme include (but are not limited to) are listed in Table 8-3.

Table 8-3: Dumfries and Galloway Priority Habitats of Potential Relevance to the Proposed Scheme

Priority Habitat Category	Priority Habitat Types Relevant to the Proposed Scheme
River and lochs	Lowland Rivers and Backwaters Lowland Burns and Ditches Eutrophic Lochs Mesotrophic Lochs
Wetlands	Swamps Reedbeds Marshes Fens
Grasslands and fields	Neutral Grasslands Agriculturally Improved Grasslands Arable Fields Traditional Field Boundaries
Woodlands and trees	Native Woods Native Ash Woods Native Wet Woods Native Oak Woods Native Birch Woods Veteran Trees Conifer Plantations Broadleaved and Mixed Plantations
Other	Roads and Verges

In addition to Table 8-3 above, the LBAP also lists a large number of priority species across a wide range of plants and animals.

8.3 Assessment Methodology

The following section describes the methodology for the assessment that has been undertaken at DMRB Stage 1. The assessment of the improvement strategies on biodiversity

has been completed with reference to the assessment methodology set out in DMRB LA 108 and LD 118. In addition to DMRB guidance, other policy documents and published guidance considered in the preparation of this chapter include good practice guidance for ecological assessment, including the [Guidelines for Ecological Impact Assessment \(EclA\)](#) in the United Kingdom.

8.3.1 Data Sources

A desktop review was undertaken to review any existing relevant literature and to identify any statutory and non-statutory designated sites of nature conservation interest that may be of relevance, and to obtain information on the occurrence of protected species and/or species of conservation interest. In addition, information on the quality (condition assessment) of watercourses was collated for locations within the study area.

Information for the desktop review was obtained from the following online resources:

- [UK Lakes Portal](#)
- [Galloway Fisheries Trust](#)
- [Scotland's Environment Map](#)
- [Scottish Forestry Map Viewer](#)
- [NatureScot SiteLink](#)
- [National Biodiversity Network Atlas](#) (OGL, CCO and CC-BY licences only) (hereafter referred to as "NBN Atlas")
- [SEPA River Basin Management Plan for Scotland \(2021-2027\)](#) (hereafter referred to as the "RBMP")
- [Fishbrain Map](#)

8.4 Study Area

The study area comprises the area within the six improvement strategies as well as covering locations where there is a potential for impacts to occur. For nationally statutory designated sites (for example SSSIs) and the NBN Atlas species search, a 2km buffer from the DMRB Stage 1 Assessment Corridor was deemed sufficient. The study area is shown in Figure 8-1. For European and Ramsar sites, for which there is no limit for an impact assessment, the nearest sites to the improvement strategies were identified.

8.4.1 Assumptions and Limitations

This chapter presents a preliminary ecological assessment of the improvement strategies for the proposed scheme. This has been based on desktop review of publicly available resources

only. No field surveys have been undertaken to inform this assessment. Field surveys will be required in future to confirm ecological features and inform design and construction, as described in the Proposed Scope of Future Assessment section of this chapter.

Data supplied by the NBN provides useful baseline information on the species that have been recorded within a local area. This data often includes surveys undertaken by third parties on an 'ad hoc' basis; and often data may not be available on NBN for up to one year after surveys are undertaken. Absence of species records therefore cannot indicate absence of that species from an area. Additionally, some data (such as those uploaded with a CC BY-NC licence) cannot be used for commercial purposes, therefore some records are excluded from this report.

An assessment of the level of effect (minor, moderate, major) has not been provided at this stage due to the early stage of improvement strategy optioneering and the lack of improvement strategy-specific species information. However, some initial guidance is provided in the Assessment of Likely Significant Effects section of this chapter.

8.5 Baseline Conditions

8.5.1 Designated Sites

Table 8-4 and Figure 8-1 and Figure 8-2 identify statutory and non-statutory designated sites in the vicinity of the proposed scheme. Data sources include the [MAGIC Map Application](#) and [NatureScot SiteLink](#).

Table 8-4: Statutory and Non-Statutory Designated Sites

Designation	Relevance to the Proposed Scheme
Special Protection Areas (SPAs)	- Loch Ken and River Dee Marshes SPA lies 2.5km south-west of the DMRB Stage 1 Assessment Corridor. - Solway Firth SPA lies 7.8km south-east of the DMRB Stage 1 Assessment Corridor.
Special Areas of Conservation (SACs)	- Solway Mosses North SAC lies 7.2km south-east of the DMRB Stage 1 Assessment Corridor. - Solway Firth SAC lies 7.8km south-east of the DMRB Stage 1 Assessment Corridor.
Ramsar Sites	- Loch Ken and River Dee Marshes Ramsar site lies 2.5km south-west of the DMRB Stage 1 Assessment Corridor. - Solway Firth Ramsar site lies 7.8km south-east of the DMRB Stage 1 Assessment Corridor.

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Designation	Relevance to the Proposed Scheme
Sites of Special Scientific Interest (SSSIs)	- Milton Loch SSSI lies within the study area. Designated as a eutrophic loch and for its beetle assemblage. Milton Loch lies partially within Improvement Strategy 5 and 0.9km north-west of Improvement Strategy 6. - Torrs Moss SSSI lies within the study area, 2km south of the DMRB Stage 1 Assessment Corridor. Designated as a basin fen.
National Nature Reserves (NNR)	None identified within the study area or within 500m of the DMRB Stage 1 Assessment Corridor. Caerlaverock NNR stretches along the north coast of the Solway Firth, 12.1km south-east of the DMRB Stage 1 Assessment Corridor.
Local Nature Reserves	None identified within the study area or within 500m of the DMRB Stage 1 Assessment Corridor.
Ancient Woodland Inventory (AWI)	There are numerous scattered areas of AWI habitats, located within the study area. The majority of these AWI habitats are of plantation origin with some semi-natural. The proposed scheme could impact some of these AWI habitats.
Local Nature Conservation Sites	Two sites are located within the study area: - Lochrutton Loch Local Wildlife Site (LWS), 0.5km south-east of Improvement Strategy 6; and - Merkland Moss LWS, 0.8km south-east of Improvement Strategy 6.

8.5.2 Habitats

Notable habitats within the study area are outlined in Table 8-5 below, Data sources include the [MAGIC Map Application](#), [Fishbrain Map](#) and [UK Lakes Portal](#). AWI and woodland recorded in the Native Woodland Survey of Scotland (NWSS) on the [Scottish Forestry Map Viewer](#) are displayed on Figure 8-2. Watercourses within the study area, as listed on the RBMP, are presented in Table 8-6.

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Table 8-5: Key Habitats Identified Within the Study Area

Habitat	Relevance to the Proposed Scheme
Native woodland (as listed in the NWSS)	Native woodland, and Nearly-native woodland of various types including Wet woodland, Upland birchwood, Upland mixed ashwood and Lowland mixed deciduous woodland.
Groundwater Dependent Terrestrial Ecosystems (GWDTE)	GWDTEs are defined as wetlands which critically depend on groundwater flows or chemistry. GWDTE may be present in the area surrounding the Milton Loch SSSI, as the SSSI citation states 'The site also contains a number of wetland habitats including willow carr of grey willow (<i>Salix cinerea</i> and <i>Salix caprea</i>). The marsh area contains globeflower <i>Trollius europaeus</i>'. No other areas of GWDTE have been identified at this stage. However, as outlined in the Geology, Soils and Groundwater Chapter of this EAR, a full assessment of GWDTE has not been undertaken and the current results rely on an initial desk-based screening assessment. Field surveys will be conducted during later assessment stages, if required.
Watercourses	Watercourses across the study area are classified by SEPA as either Good or Moderate. All watercourses discharge into the Solway Firth either via the River Nith or the Urr Water.
Freshwater lochs	Auchenreoch Loch is a small (32ha) freshwater loch located within the study area, adjacent to the existing A75 and is generally shallow with low alkalinity. A total of 108 taxa including insects, molluscs and spiders have been reported. The loch also supports northern pike (<i>Esox lucius</i>), European perch (<i>Perca fluviatilis</i>) and brown trout (<i>Salmo trutta</i>). Milton Loch is a large (58ha) freshwater loch located to the east of Improvement Strategies 1 – 5, and west of Improvement Strategy 6; it is a generally very shallow with high alkalinity. A total of 188 taxa including insects, molluscs and spiders have been reported. Milton Loch contains populations of water beetles including Nationally Scarce species <i>Hygrotus quinquelineatus</i>, <i>Ilybius fenestratus</i>, <i>Oulimnius troglodytes</i> and <i>Gyrinus aeratus</i>. The loch also supports northern pike and European perch. Lochrutton Loch is a large (51ha) freshwater loch located within the study area; it is generally shallow with high alkalinity. A total of 156

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Habitat	Relevance to the Proposed Scheme
	taxa including insects, molluscs and spiders have been reported. The loch also supports northern pike, European perch and common roach (<i>Rutilus rutilus</i>).

Table 8-6: Watercourses within the Study Area, as Listed on SEPA's RBMP

SEPA Watercourse	Condition	Improvement Strategies that Intersect Watercourse
Lochfoot Burn	Moderate	Improvement Strategies 1 and 6
Cargen Pow/Bogrie Lane	Moderate	Improvement Strategies 1, 2 and 5
Spottes Burn	Good	Improvement Strategies 3, 4 and 5
Urr Water	Good	Improvement Strategies 1, 5 and 6
Under Brae Lane	Good	Improvement Strategy 6
Culloch Burn (u/s Milton Loch)	Good	Improvement Strategy 5
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	Good	Improvement Strategy 6

8.5.3 Protected and Notable Species

The desktop review identified a number of protected and notable species within the study area, results are presented in Table 8-7 to 8-11.

Table 8-7: Protected and Notable Mammals of Relevance to the Proposed Scheme

Species - Mammals	Relevance to the Proposed Scheme
Badger	No records of badger (<i>Meles meles</i>) within the study area were returned by the NBN Atlas. However, three incidental sightings of dead badgers as a result of road traffic accidents, have been recorded during site visits in spring 2025.
Bats	Four species of bats have been recorded within the study area since 2010. NBN Atlas records consist of: - Common pipistrelle (<i>Pipistrellus pipistrellus</i>), 323 records - Daubenton's bat (<i>Myotis daubentonii</i>), 340 records

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Species - Mammals	Relevance to the Proposed Scheme
	- Noctule (<i>Nyctalus noctula</i>), 8 records - Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>), 1275 records
Hedgehog	One record of hedgehog (<i>Erinaceus europaeus</i>) within the study area were returned by the NBN Atlas search.
Otter	No records of otter (<i>Lutra lutra</i>) within the study area were returned by the NBN Atlas search. However, Dumfries and Galloway LBAP states that otter occur on all watercourses within Dumfries and Galloway. The River Nith is known for supporting otter populations.
Pine Marten	No records of pine marten (<i>Martes martes</i>) within the study area were returned by the NBN Atlas search. However, the LBAP states that pine marten are present within Dumfries and Galloway.
Red Squirrel	Grey squirrels (<i>Sciurus carolinensis</i>) have been predominantly recorded across the area, but historically (2010 onwards) red squirrels (<i>Sciurus vulgaris</i>) have been recorded within the study area at Crocketford, Springholm, Haugh of Urr, Old Bridge of Urr, in woodlands at Barfil and near the Urr Water shown on Saving Scotland's Red Squirrels. The NBN Atlas search returned 99 records of red squirrel and 166 records of grey squirrel within the study area.
Water Vole	No records of water vole (<i>Arvicola terrestris</i>) within the study area were returned by the NBN Atlas search. Water voles are now rare on lowland rivers in Dumfries and Galloway, likely due to predation by American Mink (<i>Neovison vison</i>).

Table 8-8: Protected and Notable Birds of Relevance to the Proposed Scheme

Species - Birds	Relevance to the Proposed Scheme
Birds	Twelve bird species that are found on the British Trust for Ornithology (BTO) Birds of Conservation Concern (BoCC) Red List have been recorded within the study area since 2010 as shown on Birds of Conservation Concern. Two birds of prey species have been recorded within the study area. Comprising: - Barn owl (<i>Tyto alba</i>), one record - Tawny owl (<i>Strix aluco</i>), one record

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Table 8-9: Protected and Notable Amphibians and Reptiles of Relevance to the Proposed Scheme

Species – Amphibians and Reptiles	Relevance to the Proposed Scheme
Newts	One record of an unidentified newt (<i>Lissotriton</i> sp.) within the study area were returned by the NBN Atlas search.
Frogs and toads	No records of frogs or toads within the study area were returned by the NBN Atlas search.
Reptiles	No records of reptiles within the study area were returned by the NBN Atlas search. However, the south-west of Scotland is considered a stronghold for the three reptile species native to Scotland; the European adder (<i>Vipera berus</i>), slowworm (<i>Anguis fragilis</i>) and common lizard (<i>Zootoca vivipara</i>).

Table 8-10: Protected and Notable Fish of Relevance to the Proposed Scheme

Species - Fish	Relevance to the Proposed Scheme
Atlantic salmon	Most of the watercourses within the study area are associated with the Urr Water catchment the main branch of which (the Urr Water) has 'good' Atlantic salmon (<i>Salmo salar</i>) populations.
Trout	The Spottes Burn, which is a tributary of the Urr water and runs through Springholm, has 'good' trout population.

Table 8-11: Protected and Notable Plants of Relevance to the Proposed Scheme

Species - Plants	Relevance to the Proposed Scheme
Non-Native Species (NNS)	Three records of Japanese knotweed (<i>Reynoutria japonica</i>), one record of signal crayfish (<i>Pacifastacus leniusculus</i>), one record of American mink and 166 records of grey squirrel were returned by the NBN Atlas search. The Galloway Fisheries Trust have been working on river catchments to manage NNS. Giant hogweed (<i>Heracleum mantegazzianum</i>) has been mapped and managed from just above the existing A75 crossing of the Urr Water; this location was considered to be the source of giant hogweed on the Urr as no plants were found above this point.

Species - Plants	Relevance to the Proposed Scheme
	It is likely that some NNS are present within all improvement strategies.

8.6 Potential Impacts

8.6.1 Designated Sites

No direct impacts on European or Ramsar sites are expected from any of the improvement strategies. However, all improvement strategies are hydrologically connected to the Solway Firth and therefore to the Solway Firth SAC and SPA, and the Upper Solway Flats and Marshes Ramsar site.

Improvement Strategy 5 lies partially within Milton Loch SSSI (900m² of overlap). Therefore, impacts to this site may occur during both construction and operation of the proposed scheme. The SSSI will be taken into consideration during development of the DMRB Stage 2 route option design and direct impacts will be avoided where possible. However, indirect impacts as a result of construction and operational run-off may still impact the SSSI.

Improvement Strategies 1, 2 and 3 have the potential to result in loss of AWI land parcels (Table 8-12). Total areas (hectares) of AWI with potential to be impacted are given for comparison purposes only. The areas of AWI will be taken into consideration during development of the DMRB Stage 2 route option design and direct impacts will be avoided where possible.

Improvement Strategy 1 results in the potential loss of more areas of AWI habitat than others (four AWI parcels, 3.99ha) although this is all classified as long-established woodland of plantation origin (LEPO) (type 2b). The AWI parcel potentially impacted by Improvement Strategy 3 is classified as ancient woodland of semi-natural origin (type 2a).

Changes to air quality during construction and operation of the proposed scheme, through dust and vehicle pollution, may potentially impact the Milton Loch SSSI and areas of AWI. Air quality impacts are considered in more detail in the Air Quality Chapter of this EAR.

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Table 8-12: Potential Impacts of Improvement Strategies on Designated Sites

Feature	Improvement Strategy 1	Improvement Strategy 2	Improvement Strategy 3	Improvement Strategy 4	Improvement Strategy 5	Improvement Strategy 6
European and Ramsar Sites	Potential for impacts	Potential for impacts	Potential for impacts	Potential for impacts	Potential for impacts	Potential for impacts
Milton Loch SSSI	No direct impacts	No direct impacts	No direct impacts	No direct impacts	Potential for direct impacts on Milton Loch SSSI given improvement strategy overlaps with designated area	No direct impacts
AWI * Total area of AWI that lies within the improvement strategy	Potential for four areas to be impacted, with a total area of 3.99ha	Potential for two areas to be impacted, with a total area of 1.07ha	Potential for one area to be impacted, with a total area of 0.10ha	No direct impacts on AWI	No direct impacts on AWI	No direct impacts on AWI

8.6.2 Habitats

All improvement strategies result in the loss of woodland identified in the NWSS, listed on the SFMW. Improvement Strategy 5 results in the greatest number of parcels and area impacted (10 areas, 6.38ha) whilst Improvement Strategy 4 results in the least number of parcels and area impacted (two areas, 0.62ha) (Table 8-13). These potential losses also include at least some areas listed on the AWI.

Total areas (hectares) of NWSS with potential to be impacted are given for comparison purposes only. The areas of NWSS will be taken into consideration during the development of the DMRB Stage 2 route option design and direct impacts will be avoided where possible.

Changes to air quality during construction and operation of the proposed scheme, through dust and vehicle pollution, may also potentially impact woodland identified in the NWSS (see the Air Quality Chapter of this EAR for more detail).

Changes to groundwater flow paths during the construction and operation of the proposed scheme, through construction activities or road alignment, may potentially impact GWDTE (see the Geology, Soils and Groundwater Chapter for more detail). Areas of GWDTE have yet to be identified along each of the improvement strategies, therefore potential impacts may result from all improvement strategies.

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Table 8-13: Potential Impacts of the Improvement Strategies on Habitats

Feature	Improvement Strategy 1	Improvement Strategy 2	Improvement Strategy 3	Improvement Strategy 4	Improvement Strategy 5	Improvement Strategy 6
NWSS No. of parcels	6	4	3	2	10	6
Total area (ha)* Total area of NWSS that lies within the improvement strategy.	3.32	1.48	1.26	0.62	6.38	3.28

8.6.3 Protected and Notable Species

Impacts to protected and notable species are anticipated from all six of the improvement strategies. Potential impacts to species are likely to include:

- Injury or mortality from construction related activities (vehicle movement, vegetation clearance) and/or from increased/new road footprint including new carriageway, junctions and access tracks leading to a likely increase in road traffic accidents.
- Habitat loss due to temporary construction activities or permanent road footprint.
- Loss of resting/refuge sites (for example roosts, setts, holts/couches, dreys).
- Habitat fragmentation and fragmentation of commuting and foraging routes due to road.
- Disturbance from noise, vibration or lighting associated with construction activities and/or from ongoing road operation.
- Sediment release and run-off (sediment, chemical and hydrocarbons) from construction related activities and/or run-off from ongoing road operation.
- Dust and vehicle pollution from construction related activities and/or from ongoing road operation may reduce air quality.

8.7 Design, Mitigation and Enhancement Measures

The objective of this section is to identify potential mitigation taking into account good practice, legislation and guidance. Potential mitigation would be developed and refined as part of DMRB Stage 2 (and eventually as part of DMRB Stage 3).

It is expected that some impacts could be mitigated through the application of good working practice (for example mitigation of potential pollution impacts through adherence to standard good practice and guidelines). Other significant ecological impacts are expected to be mitigated through a combination of good practice and mitigation techniques (as described below) which would be targeted to specific locations.

The design of the route options should aim to avoid impacts on statutory and non-statutory sites of significance and minimise habitat fragmentation and impacts on protected and notable species. Likely mitigation measures include:

- Reduction of the temporary and permanent works footprint and associated habitat loss.
- Seasonal constraints on construction works to avoid sensitive periods (species-specific).
- No night working or use of artificial lighting to mitigate potential species disturbance.
- Safe storage of materials, waste, machinery and equipment to avoid harm to animals.
- Pre-start checks of machinery for resting animals.

- Implementation of good practice pollution and biosecurity controls.
- Remediation of temporary works areas following demobilisation.
- Permanent lighting for the scheme should be designed to minimise impacts to bats and other sensitive species.
- Consideration for safe wildlife crossings and mammal-proof fencing in the design to minimise road traffic accidents.

Enhancement can be delivered by adopting a habitat-based approach which can provide benefits for a wide range of species. Enhancement opportunities may include woodland creation and management, NNS management, creating species-rich roadside verges, and providing additional artificial habitats for protected species (such as bat boxes) beyond that required for mitigation to provide added resilience for impacted species.

8.8 Assessment of Likely Significant Effects

Table 8-14 presents a summary of the predicted potential effects on ecological features from the construction and operation of the proposed scheme. Impacts and effects have not been assessed for each improvement strategy separately as the protected and notable species information is currently considered for the study area as a whole. The Designated Sites and Habitats sections of this chapter provide a breakdown of key habitats (AWI and NWSS) within each improvement strategy.

An assessment of the level of effect (minor, moderate, major) has not been provided at this stage due to the early stage of improvement strategy optioneering and the lack of improvement strategy-specific species information. However, due to their international importance any impacts on the Solway Firth SAC, Solway Firth SPA and the Upper Solway Flats and Marshes Ramsar site without mitigation are likely to result in effects of major significance. Furthermore, due to their national importance any impacts on Milton Loch SSSI and areas listed on the AWI are also likely to result in effects of major significance (prior to mitigation).

It is likely that effects on protected and notable species, such as habitat loss and fragmentation, will be greater for longer improvement strategies, particularly Improvement Strategies 1 and 6. Additionally, improvement strategies that require major watercourse crossings, such as crossing Urr Water (Improvement Strategies 1, 5 and 6), will likely have greater impacts on aquatic habitats and species.

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Table 8-14: Potential Impacts/Effects on Ecological Features During Construction and Operation of the Proposed Scheme

Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
European Sites	Solway Firth SAC and SPA Upper Solway Flats and Marshes Ramsar	Sediment release and run-off from construction related activities (sediment, chemical and hydrocarbons).	Run-off from ongoing operation of the road (sediment, chemical and hydrocarbons).	Potential impacts from all improvement strategies.
National Sites	Milton Loch SSSI	- Sediment release and run-off from construction related activities (sediment, chemical and hydrocarbons). - Dust during construction may adversely impact air quality and the SSSI (see the Air Quality Chapter of this EAR).	- Run-off from ongoing operation of the road (sediment, chemical and hydrocarbons). - Reduction in air quality due to ongoing operation of the road (see the Air Quality Chapter of this EAR).	Potential impacts from Improvement Strategy 5 which is partially within with Milton Loch SSSI.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
Habitats	Ancient woodland	- Transfer of NNS. - Dust during construction may adversely impact air quality and woodland habitats (see the Air Quality Chapter of this EAR).	- Loss of habitat within earthworks footprint. - Reduction in air quality due to ongoing operation of the road (see the Air Quality Chapter of this EAR).	Potential impacts from Improvement Strategies 1, 2, and 3. Greatest AWI loss under Improvement Strategies 1 and 2.
Habitats	Woodland and forest (broad leaved and coniferous; non- ancient woodland)	- Transfer of NNS. - Dust during construction may adversely impact air quality and woodland habitats (see the Air Quality Chapter of this EAR).	- Loss of habitat within earthworks footprint. - Reduction in air quality due to ongoing operation of the road (see the Air Quality Chapter of this EAR).	Potential impacts from all improvement strategies. Greatest NWSS loss under Improvement Strategies 1, 5, and 6.
Habitats	GWDTE	Construction activities may alter groundwater flow patterns.	- Loss of GWDTE habitat within earthworks footprint. - Run-off from ongoing operation of the road	Potential impacts from Improvement Strategy 5 which partially within with Milton Loch SSSI. Potential impact

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		Sediment release and run-off from construction related activities. (sediment, chemical and hydrocarbons).	(sediment, chemical and hydrocarbons).	unknown for all other improvement strategies at this stage.
Habitats	Rivers and lochs (non-priority)	Sediment release and run-off from construction related activities (sediment, chemical and hydrocarbons).	Run-off from ongoing operation of the road (sediment, chemical and hydrocarbons).	Potential impacts from all improvement strategies. Impacts anticipated to be greater for improvement strategies that involve crossing Urr Water (Improvement Strategies 1, 5 and 6) or adjacent to lochs (Improvement Strategies 3 and 4).
Protected and Notable Species	Badger	Injury or mortality from construction related activities	Injury or mortality from increased/new road footprint	Potential impacts from all improvement strategies.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		(vehicle movement, vegetation clearance). - Temporary habitat loss and fragmentation due to temporary construction activities restricting badger foraging and commuting. - Disturbance from noise, vibration or lighting associated with construction activities.	including new carriageway, junctions and access tracks. Likely increase in road traffic accidents. - Loss of habitat and/or setts. - Fragmentation of commuting and foraging routes due to road. - Disturbance from ongoing road operation.	
Protected and Notable Species	Bats	Injury or mortality from construction related activities (vegetation clearance).	- Loss of habitat and/or bat roosts. - Fragmentation of commuting and	Potential impacts from all improvement strategies.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		- Temporary obstruction/loss of commuting routes. - Disturbance from noise, vibration or lighting associated with construction activities.	- foraging routes due to road. - Disturbance from ongoing road operation.	
Protected and Notable Species	Otter	- Injury or mortality from construction related activities (vehicle movement, vegetation clearance, creation of excavations, in-stream activities). - Temporary habitat loss and fragmentation due to temporary construction activities	- Injury or mortality from increased/new road footprint including new carriageway, junctions and access tracks. - Loss of habitat, holts and/or couches. - Fragmentation of commuting and foraging routes due to road.	Potential impacts from all improvement strategies. Impacts anticipated to be greater for improvement strategies that involve crossing Urr Water (Improvement Strategies 1, 5 and 6).

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		restricting otter foraging and commuting. - Disturbance from noise, vibration or lighting associated with construction activities. - Sediment release and run-off from construction related activities (sediment, chemical and hydrocarbons).	- Disturbance from ongoing road operation. - Run-off from ongoing road operation (sediment, chemical and hydrocarbons).	
Protected and Notable Species	Pine marten	Injury or mortality from construction related activities (vehicle movement, vegetation clearance). Temporary habitat	Injury or mortality from increased/new road footprint including new carriageway, junctions and access tracks.	Potential impacts from all improvement strategies.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		loss and fragmentation due to temporary construction activities restricting foraging and commuting. Disturbance from noise, vibration or lighting associated with construction activities.	- Loss of habitat and/or dens. - Fragmentation of commuting and foraging routes due to road. - Disturbance from ongoing road operation.	
Protected and Notable Species	Red squirrel	Injury or mortality from construction related activities (vehicle movement, vegetation clearance). Temporary habitat loss and fragmentation due to temporary	- Injury or mortality from increased/new road footprint including new carriageway, junctions and access tracks. - Loss of habitat and/or dreys.	Potential impacts from all improvement strategies.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		construction activities restricting foraging and commuting. Disturbance from noise, vibration or lighting associated with construction activities.	- Fragmentation of commuting and foraging routes due to road. - Disturbance from ongoing road operation.	
Protected and Notable Species	Breeding birds (including Schedule 1 species)	- Temporary bird breeding habitat loss due to temporary construction activities. - Disturbance from noise, vibration or lighting associated with construction activities.	Loss of bird breeding habitat.	Potential impacts from all improvement strategies.
Protected and Notable Species	Amphibians	Injury or mortality from construction related activities	Fragmentation of commuting and	Potential impacts from all improvement strategies.

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		(vehicle movement, vegetation clearance, drainage). - Temporary habitat loss and fragmentation due to temporary construction activities restricting amphibian foraging and commuting. - Disturbance from noise, vibration or lighting associated with construction activities. - Sediment release and run-off from construction related activities (sediment,	foraging routes due to road. Run-off from ongoing road operation (sediment, chemical and hydrocarbons).	

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		chemical and hydrocarbons).		
Protected and Notable Species	Reptiles	▪ Injury or mortality from construction related activities (vehicle movement, vegetation clearance, topsoil stripping). ▪ Temporary habitat loss due to temporary construction activities.	▪ Loss of habitat.	Potential impacts from all improvement strategies.
Protected and Notable Species	Freshwater fisheries	▪ Injury or mortality from in-stream construction related activities (removal or installation of culverts, bridges). ▪ Disturbance from noise, vibration or lighting associated	▪ Disturbance from ongoing road operation (lighting). ▪ Run-off from ongoing road operation (sediment, chemical and hydrocarbons).	Potential impacts from all improvement strategies. Impacts anticipated to be greater for improvement strategies that involve crossing Urr Water (Improvement Strategies 1, 5 and 6).

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Feature Type	Feature	Potential Impacts/Effects During Construction	Potential Impacts/Effects During Operation	Relevance to Improvement Strategies
		with construction activities. Sediment release and run-off from construction related activities (sediment, chemical and hydrocarbons).		
Protected and Notable Species	NNS	Increased spread of NNS due to construction related activities (vehicle movement, vegetation clearance and disposal, soil transfer).	Increased spread of NNS due to ongoing road operation/new dispersal pathway.	Potential impacts from all improvement strategies.

8.9 Proposed Scope of Future Assessment

The improvement strategies pass through a range of valuable ecological habitat. There is potential for protected and notable species to be present within the DMRB Stage 1 Assessment Corridor and surrounding areas. Further ecological assessments will be required to inform the DMRB Stage 2 Environmental Assessment.

A habitat survey (extended Phase 1 or UK Habitat Classification (UKHabs)) of the improvement strategies selected for further assessment will be required. This will determine the need for further detailed habitat surveys and protected and notable species surveys. Based on the baseline information provided in this chapter, detailed surveys are likely to be required for the following habitats and species.

- Ancient Woodland: ancient woodland is present within some of the improvement strategies. A survey of the condition of ancient woodland areas should be undertaken.
- Badgers: badgers are likely present in the areas surrounding the improvement strategies.
- Bats: it is highly likely that bats are present within the improvement strategies. A survey should be completed to determine the potential presence of roost sites, in trees, structures and buildings, within the selected improvement strategy.
- Otters: otters are known to be present in Dumfries and Galloway and are likely present within the improvement strategies.
- Red squirrel and pine marten: red squirrel and pine marten are likely present in the areas surrounding the improvement strategies.
- Birds: bird surveys may be required to determine species presence and abundance, particularly for birds of prey species.

Other species-specific surveys may be required following on from the findings of the initial habitat survey. Depending on the outcome of the surveys, NatureScot European Protected Species Licences may be required.

Once the selected improvement strategy and a preferred route option has been identified a Habitats Regulations Appraisal may be required to address potential impacts to European sites.

8.10 Summary

A high level assessment of the improvement strategies in relation to biodiversity was undertaken. The proposed scheme, regardless of the improvement strategies selected, is likely to result in some adverse effects to biodiversity at a local level in relation to habitat loss and fragmentation, and the associated effects on notable and protected species.

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Improvement Strategies 1 and 6 would likely have the greatest impact on biodiversity in general as they cover the greatest total area and both will involve construction of a river crossing over Urr Water, resulting in a greater potential impact on aquatic habitats and species. Improvement Strategy 1 is also likely to result in a greater loss of AWI, which is considered to be an irreplaceable habitat, compared to other improvement strategies.

Improvement Strategy 5 will also involve construction of a river crossing over Urr Water. In addition, Improvement Strategy 5 lies partially within Milton Loch SSSI, therefore, construction and operation of the proposed scheme may directly and indirectly impact the SSSI. Improvement Strategy 5 also covers the largest area of NWSS of all improvement strategies.

As all six improvement strategies are in relatively close proximity to each other, the protected and notable species present are likely to be similar across all improvement strategies, provided habitat across the improvement strategies is similar. The proposed scheme may provide minor beneficial effects to biodiversity if habitat enhancement is employed beyond the level required for mitigation. Field surveys will be required at DMRB Stage 2 to provide further information on the habitats and species likely to be impacted by the proposed scheme.

9. Geology, Soils and Groundwater

9.1 Introduction

This chapter presents the DMRB Stage 1 geology, soils and groundwater assessment for the six improvement strategies for the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). This chapter has been produced in line with the Design Manual for Roads and Bridges (DMRB) [Design Manual for Roads and Bridges \(DMRB\) LA 109 – Geology and soils \(revision 0\)](#) (hereafter referred to as “DMRB LA 109”), [DMRB LA 113 – Road drainage and the water environment \(revision 1\)](#) (hereafter referred to as “DMRB LA 113”) and other relevant guidance.

Sensitive receptors reported within this chapter are typically soils and soils supporting sites of ecological importance, human receptors and controlled waters. Further information on mineral resources is contained in the Material and Wastes Chapter of this EAR. Additional information on biodiversity, human health receptors and controlled waters are detailed in the Biodiversity Chapter, Population and Human Health Chapter and Road Drainage and the Water Environment Chapter of this EAR.

9.2 Legislative and Policy Framework

Table 9-1 provides a summary of the legislation and policy that are relevant to this geology, soils and groundwater assessment.

Table 9-1: Legislation and Policy Relevant to the Geology, Soils and Groundwater Assessment

Legislation and Policy	Relevance to the Proposed Scheme
The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017	Schedule 4 (4) requires factors likely to be significantly affected (such as human health, land and soils) to be described.
Nature Conservation (Scotland) Act 2004	Provides the system for conserving and enhancing specific areas of Scotland which are considered to be of particularly high quality in terms of their flora, fauna, or geological or geomorphological features through Sites of Special Scientific Interest.
Part 2A of the Environmental Protection Act 1990 Environment Act 1995	This framework adopts a risk-based ‘suitable for use’ approach. Guidance is published in Land Contamination Risk Assessment . This framework forms the basis of the

Legislation and Policy	Relevance to the Proposed Scheme
	contamination assessment undertaken for this scheme.
Groundwater Policy Protection for Scotland	These regulations cover the protection of groundwater in Scotland against pollution.
The Water Environment and Water Services (Scotland) Act 2003 (WEWS)	These regulations cover rivers, lochs, transitional waters (estuaries), coastal waters groundwater and groundwater dependent wetlands.
The Water Environment (Controlled Activities) Scotland 2011	These regulations apply regulatory controls over activities which may affects Scotland's water environment. The regulations cover rivers, lochs, transitional waters, coastal waters, groundwater, and groundwater dependant wetlands.
Water Environment and Water Services (Scotland) Act 2003	These regulations apply regulatory controls over activities which may affects Scotland's water environment. The regulations cover rivers, lochs, transitional waters, coastal waters, groundwater, and groundwater dependant wetlands.
Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (the 'EU Water Framework Directive')	These regulations apply regulatory controls over activities which may affects Scotland's water environment. The regulations cover rivers, lochs, transitional waters, coastal waters, groundwater, and groundwater dependant wetlands.

9.2.1 National Policy

The following national policy documents have been taken into account in this assessment:

- [National Planning Framework 4:](#)
 - Policy 4 Natural places – To protect, restore and enhance natural assets making best use of nature-based solutions.
 - Policy 5 Soils – To protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development.

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- Policy 9 Brownfield, vacant and derelict land and empty buildings – To encourage, promote and facilitate the reuse of brownfield, vacant and derelict land and empty buildings, and help reduce the need for greenfield development.
- [The Scottish Soil Framework:](#)
 - The framework aims to promote the sustainable management and protection of soils consistent with the economic, social and environmental needs of Scotland.

9.2.2 Local Policy and Plans

The following local policies and plans are considered in this assessment:

- [Dumfries and Galloway Local Development Plan 2:](#)
 - Policy NE6 – Sites of National Importance for Biodiversity and Geodiversity
 - Policy NE11 – Supporting the Water Environment
 - Policy NE13 – Agricultural Soil
 - Policy NE14 – Carbon Rich Soil
 - Policy NE15 – Protection and Restoration of Peat Deposits as Carbon Sinks
 - Policy IN10 – Contaminated and Unstable Land

9.3 Assessment Methodology

9.3.1 Data Sources

Baseline data were collated from a variety of sources, as outlined in Table 9-2.

Table 9-2: Data Sources Used in this Assessment

Data Type	Reference
Groundsure Enviro + Geo Insight Report from Enviro Insight - Groundsure	Report Ref: GS-OV2-NAV-I43-Y8I, 21 March 2025
Scottish Geology Trust – Sites of Special Scientific Interest, Geological Conservation Review sites, Local Geological Sites	Scottish Geology Trust
SEPA - Groundwater and surface water WFD classification	Water Classification Hub
National scale land capability for agriculture	Scotland's Soil Map
British Geological Survey – Bedrock and Superficial Geology	BGS GeoIndex Onshore

Data Type	Reference
British Geological Survey – Aquifer Classifications	Scotland's Environment Web Viewer
NERC Open Research Archive – Groundwater Vulnerability	Groundwater Vulnerability (Scotland) GIS Dataset
The Mining Remediation Authority – Coal Mining Reporting Area	Map Viewer
Grampian Speliological Group – Mine shaft and cave locations	Scottish Cave and Mine Database

9.3.2 Assessment Guidance

The methodology described in this chapter is in accordance with the requirements specified in [DMRB LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as “DMRB LA 104”), DMRB LA 113 and DMRB LA 109. The level of significance of a potential effect on the existing baseline condition is determined by the sensitivity of the receptor, combined with the magnitude of potential impact.

In compliance with DMRB LA 109, a desktop review has been undertaken to identify potential sources of contamination associated with current and historical land uses, and pathways to receptors in accordance with [land contamination risk management guidance](#) and British Standards (BS)10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice. A Preliminary Sources Study Report (PSSR) was prepared in parallel to this EAR therefore a complete PSSR was not available to provide input to this assessment. This is proportionate to the level of assessment required at DMRB Stage 1.

The identification of potentially significant effects on geology, soils and groundwater have been derived from a qualitative desk-based assessment. The assessment accounts for the potential impacts across the river catchments as well as groundwater and surface water receptors. The assessment also accounts for relevant aspects of other environmental factors such as biodiversity and landscape. For example, groundwater quality aspects relating to any groundwater dependent habitats of relevance, and/or listed buildings or monuments.

Environmental impacts for geology, soils and groundwater have been expressed in terms of the significance of their effect, both beneficial and adverse.

Table 3.11 of DMRB LA 109 has been used to determine the environmental sensitivity of a receptor, while the magnitude of change is reported in the assessment in accordance with the

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criteria provided in Table 3.12 of DMRB LA 109. Groundwater and surface water receptors and magnitudes of impact are defined as per the National Highways Departure from Standards (revision 0) which allows for professional judgement and consistency with DMRB LA 113. The sensitivity criteria for groundwater has been based on development of Table 3.70 of DMRB LA 113, while the magnitude of impact criteria has been developed from Table 3.71 of DMRB LA 113. The assessment criteria used in this report are detailed in Table 9-3 and Table 9-4 below.

The approach to deriving impact significance from receptor value and magnitude of effects was undertaken in accordance with Table 3.8.1 of DMRB LA 104 and is not repeated here. As per DMRB LA 109 and DMRB LA 113, significant effects typically comprise effects that remain within the moderate, large or very large categories once mitigation has been taken into account.

Table 9-3: Soils, Geology, and Groundwater Receptor Values and Descriptions

Receptor Value (Sensitivity)	Receptor	Description
Very High	Geology	Internationally designated sites of geological value (for example UNESCO World Heritage Sites).
Very High	Soils	Soils directly supporting an EU designated site (for example Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar). Land Capability for Agriculture (LCA) grade 1 and 2.
Very High	Land Contamination: Human health	Very sensitive land use such as residential or allotments.
Very High	Land Contamination: Groundwater	Groundwater that locally supports a Groundwater Dependent Terrestrial Ecosystem (GWDTE). Bedrock aquifer with high productivity and Water Framework Directive (WFD) 'good' quality status.
Very High	Land Contamination: Surface water	Watercourse classified by the WFD as having 'good' overall status. Site protected under European or UK legislation (for example SAC, SPA, Site of Special Scientific Interest (SSSI)).
Very High	Groundwater	Principal bedrock and superficial aquifers. Groundwater flow and yield associated with licensed groundwater

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Receptor Value (Sensitivity)	Receptor	Description
		abstractions. Groundwater quality associated with SPZ1 (Inner Protection Zone) associated with licensed abstractions. Buildings of regional or national importance, such as Grade I and II listed buildings, scheduled monuments, hospitals, power stations and large industrial sites. Water feeding GWDTes with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs.
High	Geology	Rare geology and of national importance with little potential for replacement (for example geological SSSI).
High	Soils	Soils directly supporting a UK designated site (for example SSSI). LCA grade 3.1.
High	Land Contamination: Human health	High sensitivity land use such as public open space.
High	Land Contamination: Groundwater	Bedrock aquifer with moderate productivity and Water Framework Directive (WFD) 'good' quality status. Superficial aquifer where intergranular flow is significant with 'good' overall WFD status.
High	Land Contamination: Surface water	Watercourse classified by the WFD as having 'good' overall status. Watercourse protected of regional/local ecological importance.
High	Groundwater	Secondary A aquifers. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (for example supplying ten or more properties or supplying large farming / animal estates). Groundwater quality associated with SPZ2 (Outer Protection Zone) associated with licensed abstractions.

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Receptor Value (Sensitivity)	Receptor	Description
		Residential and commercial properties and Grade II listed buildings. Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly or moderately GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.
Medium	Geology	Geology of regional importance (for example Regionally Important Geological Sites (RIGS)) with limited potential for replacement.
Medium	Soils	LCA grade 3.2.
Medium	Land Contamination: Human health	Medium sensitivity land use such as commercial or industrial.
Medium	Land Contamination: Groundwater	Bedrock aquifer with low productivity and Water Framework Directive (WFD) 'good' quality status. Superficial aquifer where intergranular flow is significant with 'poor' overall WFD status.
Medium	Land Contamination: Surface water	Watercourse classified by the WFD as having 'moderate' overall status.
Medium	Groundwater	Secondary B and Secondary Undifferentiated aquifers. Groundwater flow and yield and quality associated with small scale private water abstractions (for example feeding fewer than ten properties). Groundwater quality associated with SPZ3 (Source Catchment Protection Zone) associated with licensed abstractions and with licensed abstractions for which no SPZ is defined. Unoccupied residential and commercial properties and buildings.

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Receptor Value (Sensitivity)	Receptor	Description
		Water feeding GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water feeding highly or moderately groundwater-dependent GWDTE sites with no conservation designation.
Low	Geology	Geology of local importance / interest with potential for replacement (for example non designated geological exposures, former quarries/mining sites).
Low	Soils	LCA grade 4.1 to 7.
Low	Land Contamination: Human health	Low sensitivity land use such as roads and rail.
Low	Land Contamination: Groundwater	Bedrock aquifer with high to low productivity and Water Framework Directive (WFD) 'poor' quality status. Superficial concealed aquifer or aquifer of limited potential with 'poor' or 'good' overall WFD status.
Low	Land Contamination: Surface water	Watercourse classified by the WFD as having 'poor' or 'bad' overall status. Watercourse not classified by the WFD.
Low	Groundwater	Very poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling. Water feeding GWDTE of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.
Negligible	Geology	No geological exposures, little / no local interest.
Negligible	Soils	Previously developed land formerly in 'hard uses' with little potential to return to agriculture.

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Receptor Value (Sensitivity)	Receptor	Description
Negligible	Land Contamination: Human health	Undeveloped surplus land / no sensitive land use proposed.
Negligible	Land Contamination: Groundwater	Not applicable
Negligible	Land Contamination: Surface water	Not applicable
Negligible	Groundwater	Not applicable

Table 9-4: Soils, Geology, and Groundwater Magnitude of Change and Descriptions

Magnitude of Impact (Change)	Receptor	Description
Major	Geology	Loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.
Major	Soils	Physical removal or permanent sealing of greater than 20 ha agricultural land.
Major	Land Contamination: Human health	Significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (for example category 4 screening levels) with potential for significant harm to human health. Contamination heavily restricts future use of land.
Major	Land Contamination: Groundwater	Results in loss of attribute and/or quality and integrity of the attribute. Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification.

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Magnitude of Impact (Change)	Receptor	Description
Major	Land Contamination: Surface water	Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
Major	Groundwater	Major or irreversible change to groundwater aquifer(s) flow, water level, quality or available yield which endangers the resources currently available. Groundwater resource use/abstraction is irreparably impacted upon, with a major or total loss of an existing supply or supplies. Changes to water table level or quality would result in a major or total change in, or loss of, a groundwater dependent area, where the value of a site would be severely affected. Changes to groundwater aquifer(s) flow, water level and quality would result in major changes to groundwater baseflow contributions to surface water and/or alterations in surface water quality, resulting in a major shift away from baseline conditions such as change to WFD status. Dewatering effects create significant differential settlement effects on existing infrastructure and buildings leading to extensive repairs required.
Moderate	Geology	Partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Moderate	Soils	Physical removal or permanent sealing of 1 ha – 20 ha of agricultural land or permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (for example through degradation, compaction, erosion of soil resource).
Moderate	Land Contamination: Human health	Contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (for example category 4 screening levels). Significant contamination can be present. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use.

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Magnitude of Impact (Change)	Receptor	Description
Moderate	Land Contamination: Groundwater	Results in effect on integrity of attribute, or loss of part of attribute. Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification.
Moderate	Land Contamination: Surface water	Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification.
Moderate	Groundwater	Moderate long term or temporary significant changes to groundwater aquifer(s) flow, water level, quality or available yield which results in moderate long term or temporarily significant decrease in resource availability. Groundwater resource use / abstraction is impacted slightly, but existing supplies remain sustainable. Changes to water table level or groundwater quality would result in partial change in or loss of a groundwater dependent area, where the value of the site would be affected, but not to a major degree. Changes to groundwater aquifer(s) flow, water level and quality would result in moderate changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a moderate shift from baseline conditions upon which the WFD status rests. Dewatering effects create moderate differential settlement effects on existing infrastructure and buildings leading to consideration of undertaking minor repairs.
Minor	Geology	Minor measurable change in geological feature / designation attributes, quality or vulnerability. Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Minor	Soils	Temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (for

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Magnitude of Impact (Change)	Receptor	Description
		example through degradation, compaction, erosion of soil resource).
Minor	Land Contamination: Human health	Contaminant concentrations are below relevant screening criteria (for example category 4 screening levels). Significant contamination is unlikely with a low risk to human health. Good practice measures can be used to avoid or reduce risks to human health.
Minor	Land Contamination: Groundwater	Results in some measurable change in attributes, quality or vulnerability. Minor effects on an aquifer, GWDTEs, abstractions and structures.
Minor	Land Contamination: Surface water	Minor effects on water supplies.
Minor	Groundwater	Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the Proposed Programme area. Changes to water table level, groundwater quality and yield result in little discernible change to existing resource use. Changes to water table level or groundwater quality would result in minor change to groundwater dependent areas, but where the value of the site would not be affected. Changes to groundwater aquifer(s) flow, water level and quality would result in minor changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a minor shift from baseline conditions (equivalent to minor but measurable change within WFD status). Dewatering effects create minor differential settlement effects on existing infrastructure and buildings which may need to be monitored but where repairs may be avoidable.
Negligible	Geology	Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected.

Magnitude of Impact (Change)	Receptor	Description
Negligible	Soils	No discernible loss / reduction of soil function(s) that restrict current or approved future use.
Negligible	Land Contamination: Human Health	Contaminant concentrations substantially below levels outlined in relevant screening criteria (for example category 4 screening levels). No requirement for control measures to reduce risks to human health / make land suitable for intended use.
Negligible	Land Contamination: Groundwater	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity. No measurable impact upon an aquifer and/or groundwater receptor.
Negligible	Land Contamination: Surface Water	No measurable impact.
Negligible	Groundwater	Very slight change from groundwater baseline conditions approximating to a 'no change' situation. Dewatering effects create no or no noticeable differential settlement effects on existing infrastructure and buildings.

9.3.3 Assessment Adaptations

Full application of the sensitivity and magnitude criteria, particularly in relation to ground conditions and potential contamination, requires a level of detail that is not available at this stage of the proposed scheme. Such information would be obtained through methods such as detailed surveys and intrusive ground investigation.

For DMRB Stage 1 risks from land contamination have been assessed based on a desktop review approach, following guidance set out in [Land Contamination Risk Assessment](#), DMRB LA 109, DMRB LA 113 and DMRB LA 104.

A source risk ranking has been applied to each historical land use identified within the study area (refer to the Potentially Contaminative Land Uses section of this chapter), as defined in Table 9-5. Note that historical land uses were identified from a number of data sources within the Groundsure report (see Table 9-2, Data Sources section of this chapter), and these have been merged to provide a single entry for each potential source.

Table 9-5: Contamination Source Risk Rankings

Source Risk Ranking	Risk Description	Example Land Uses
3	High risk of potential contamination.	Landfills and waste disposal, tanks, airports, fuel stations.
2	Medium risk of potential contamination.	Brick works, industrial estates and factories, railway land, sewage works.
1	Low risk of potential contamination.	Quarries and pits, ground workings, cuttings, ponds.
0	Unlikely to be a contamination source – scoped out.	Police station, telephone exchange, water tanks.

9.4 Assumptions and Limitations

The following limitations apply to this assessment:

- This assessment is based on six improvement strategies, and as typical for DMRB Stage 1, no detail is available about specific design elements, extent of land take or compound locations for any of the improvement strategies.
- At this stage of proposed scheme, it is not considered appropriate to undertake a site walkover, and no surveys or site sampling has been undertaken to inform this assessment. A desktop review is considered proportionate and appropriate.
- A PSSR is currently being undertaken, which will inform the contamination assessment at DMRB Stage 2. Regulator liaison and ground investigation has not yet been undertaken.
- The purchased Groundsure report covers the majority of the study areas (as defined in the Study Area section of this chapter), although some small areas are not covered. Data gaps have been filled using the third-party data sources defined in the Data Sources section of this chapter.
- Analysis of consents for discharge to groundwater, which could potentially modify the baseline groundwater chemistry of receiving aquifers, was not considered to be necessary at this stage.
- Information determining the locations of unlicensed groundwater abstractions has not been obtained and therefore have not been considered at this early stage. These would be assessed once data has been obtained during DMRB Stage 2.
- GWDTEs are defined as wetlands which critically depend on groundwater flows or chemistry. A full assessment of GWDTE has not been undertaken at this stage. An initial,

desk-based screening assessment has been undertaken using publicly available desk-based data such as the [Scotland's Environment Map](#) and brief online descriptions of the site from local authority websites. This will be followed up by field surveys, if required, during later assessment stages.

- Cultural heritage assets, which may be impacted by subsidence effects, have been identified from a desktop review only. No site survey has taken place and details of foundations have not been obtained. More detailed assessments of cultural heritage assets likely to be impacted by the proposed scheme will be carried out at later assessment stages, if required.

The following assumptions are relevant to this assessment:

- The geographical extents of the third-party geology and soils baseline information are assumed to be correct.
- The assessment of potentially contaminative land uses has been undertaken using third-party data. A review of historical maps will be undertaken once a preferred improvement strategy has been selected.
- Until detailed design information is available, it is assumed that potential impacts on the geology and soils receptors identified in this assessment could occur anywhere within the study area (refer to the Study Area section of this chapter).
- At this stage of proposed scheme, potential mitigation measures (refer to the Design, Mitigation and Enhancement Measures section of this chapter) have been assumed.

9.5 Study Area

For this assessment, 'improvement strategy' is the area within which route options may be developed at DMRB Stage 2. The study area applied for the assessments of the different sub-topics throughout this chapter vary.

The study area used for the description of the baseline conditions in relation to human health and controlled waters receptors has been decided in accordance with the conditions presented in DMRB LA109. This has been defined as each improvement strategy plus a 250m buffer in all directions and is shown in Figures 9-1 (A and B) to 9-3. This is in accordance with [Guidance for the Safe Development of Housing on Land Affected by Contamination](#).

For groundwater, a study area of 500m buffer around the assessment corridor has been used and is shown in Figure 9-4 (A and B). For groundwater aspects related to GWDTE, a wider study area of 1km around the assessment corridor has been used due to the sensitivity of the receptor and is shown in Figure 9-4 (C).

This is considered appropriate and proportionate in the context of the proposed scheme, taking account of the distance over which contamination and/or ground gases can migrate.

9.6 Baseline Conditions

The following sections outline the baseline soils, geology, land contamination and human health, hydrogeology and hydrology conditions recorded within the study area. A summary of the receptors identified in the study area and the respective sensitivities that have been applied is shown in Table 9-21.

9.6.1 Geology

Superficial Geology

The superficial geology of the study area is summarised in Table 9-6 and shown on Figure 9-1(A).

Table 9-6: Superficial Geology Recorded Within the Study Area

Unit	Description	Relevant Improvement Strategy
Devensian Till	Diamicton	1, 2, 3, 4, 5, 6
Alluvium	Silt, sand and gravel	1, 2, 3, 4, 5, 6
Glaciofluvial Deposits	Gravel, sand and silt	1, 5, 6
Peat	Peat	1, 2, 5

Bedrock Geology

The bedrock geology of the study area is summarised in Table 9-7 and shown on Figure 9-2.

Table 9-7: Bedrock Geology Recorded within the Study Area

Unit	Description	Relevant Improvement Strategy
Cairnharrow Formation	Wacke	1, 2, 3
Carghidown Formation	Wacke	1, 2, 3, 4, 5, 6
Kirkmaiden Formation	Wacke	1, 2, 3, 4, 5
North Britain Palaeogene Dyke Suite	Mafite	5

Unit	Description	Relevant Improvement Strategy
North Britain Siluro-Devonian Calc-alkaline Dyke Suite	Dioritic Rock	1, 2, 6
North Britain Siluro-Devonian Calc-alkaline Dyke Suite	Felsite	1
North Britain Siluro-Devonian Calc-alkaline Dyke Suite	Felsite and Microdioritic Rock	5, 6
North Britain Siluro-Devonian Calc-alkaline Dyke Suite	Lamprophyres	5
North Britain Siluro-Devonian Calc-alkaline Dyke Suite	Microdiorite - Porphyritic	6

Designated Geological Sites

There are no geological Sites of Special Scientific Interest (SSSI), Geological Conservation Review sites or Local Geodiversity Sites in the study area.

9.6.2 Soils

The [National scale land capability for agriculture map](#) defines 14 grades of soils according to their suitability for agriculture. Those present in the study area are summarised in Table 9-8.

Table 9-8: Soils Recorded within the Study Area

Soil Grade	Description	Relevant Improvement Strategy
3.2	Land capable of average production though high yields of barley, oats and grass can be obtained. Grass leys are common.	1, 2, 3, 4, 5, 6

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Soil Grade	Description	Relevant Improvement Strategy
4.1	Land capable of producing a narrow range of crops, primarily grassland with short arable breaks of forage crops and cereal.	1, 2, 3, 4, 5
4.2	Land capable of producing a narrow range of crops, primarily on grassland with short arable breaks of forage crops.	1, 2, 3, 4, 5, 6
5.1	Land capable of use as improved grassland. Few problems with pasture establishment and maintenance and potential high yields.	6
5.2	Land capable of use as improved grassland. Few problems with pasture establishment but may be difficult to maintain.	3, 4, 5, 6
5.3	Land capable of use as improved grassland. Pasture deteriorates quickly.	1, 2, 3, 4, 5, 6

The lengths and estimated maximum footprints of the improvement strategies are listed in Table 9-9. Refer to the Study Area section of this chapter for the definition of the improvement strategy study areas. It should be noted that the improvement strategies are considered a conservative envelope for design, and as such the footprint of any future design is likely to be significantly smaller.

Table 9-9: Comparison of Lengths and Maximum Footprints for each Improvement Strategy

Improvement Strategy	Length (km)	Area (ha)
1	19	380
2	12.4	248
3	5.4	107

Improvement Strategy	Length (km)	Area (ha)
4	6	119
5	11	220
6	17.2	343

Soils Supporting Sites of Ecological Importance

There are no National Nature Reserves, Special Areas of Conservation (SAC) or Ramsar Sites recorded within the study area for soils. Areas of Ancient Woodland are recorded in Improvement Strategies 1, 2 and 3 and the Milton Loch SSSI is located within Improvement Strategy 5.

9.6.3 Potentially Contaminative Land Uses

Table 9-10 summarises the number of potentially contaminative land uses in each risk ranking band for each of the improvement strategies. These are illustrated on Figure 9-3. The risk ranking system is detailed in the Assessment Adaptations section of this chapter.

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Table 9-10: Number of Potentially Contaminative Land Uses Recorded within the Study Area

Improvement Strategy	Number of High Risk Potentially Contaminative Land Uses Within the Study Area for each Improvement Strategy (3)	Number of Medium Risk Potentially Contaminative Land Uses Within the Study Area for each Improvement Strategy (2)	Number of Low Risk Potentially Contaminative Land Uses Within the Study Area for each Improvement Strategy (1)	Number of Potentially Contaminative Land Uses Within the Study Area for each Improvement Strategy Scoped Out (0)	Total Number of Potentially Contaminative Land Uses Within the Study Area for each Improvement Strategy
1	0	0	16	2	18
2	1	0	7	1	9
3	0	4	23	1	28
4	0	1	15	0	16
5	0	0	17	0	17
6	0	1	18	0	19

The key potentially contaminative land uses considered to be medium and high risk within the study area for each improvement strategy is detailed in Table 9-11.

Table 9-11: Key Potentially Contaminative Land Uses Recorded within the Study Area

Improvement Strategy	Key Potentially Contaminative Land Uses
1	Not applicable
2	Unspecified tank
3	Garages, unspecified mills
4	Unspecified mill
5	Not applicable
6	Water works / filter station

9.6.4 Human Health Receptors

A range of human health receptors have been identified within the study area, as detailed in Table 9-12.

Table 9-12: Human Health Receptors Recorded within the Study Area

Receptor	Description	Relevant Improvement Strategy
Residential areas	Springholm, Crocketford	3, 4
Residential areas	Old Bridge of Urr	1
Residential areas	Farmhouses	1, 2, 3, 4, 5, 6
Educational facilities	Springholm Primary School and Springholm Nursery	3, 4
Recreation, public open space	Crocketford Park	1,2
Recreation, public open space	Brandedleys Caravan Park	3, 4
Recreation, public open space	Haugh of Urr Park	6
Commercial and industrial	Farms	1, 2, 3, 4, 5, 6

Receptor	Description	Relevant Improvement Strategy
Transport infrastructure	A75, minor local roads	1, 2, 3, 4, 5, 6
Transport infrastructure	A712	1, 2, 3
Transport infrastructure	B794	1, 5, 6
Transport infrastructure	B795	1
Agricultural / open land	Farmland	1, 2, 3, 4, 5, 6

9.6.5 Groundwater

Further information on hydromorphology and surface waters is presented in the Road Drainage and the Water Environment Chapter of this EAR. The groundwater receptors relevant to this assessment are summarised in this section and shown on Figure 9-4 (A to C).

Aquifer Classifications

Aquifers are water bearing permeable bedrock, or superficial deposits, from which groundwater can be extracted. As discussed in the [Groundwater Vulnerability \(Scotland\) GIS Dataset](#), the aquifer classification system in Scotland is according to flow type and the aquifers potential for sustaining various levels of borehole water supply. This has been calculated with long term BGS groundwater databases. The classifications are shown in Table 9-13.

Table 9-13: Aquifer Classifications in Scotland

Aquifer Classification	Aquifer Productivity
Very High	Greater than 20 L/s
High	10 to 20 L/s
Moderate	1 to 10 L/s
Low	0.1 to 1 L/s
Very Low	Less than 0.1 L/s

The superficial deposits present within the improvement strategies include Alluvium, Peat, Glaciofluvial Deposits, Till (Devensian) and a unit defined by BGS as “Superficial Deposits – Sediment”. The moderately productive alluvium present in the study area coincides with all watercourses identified in the study area. The low productivity Till (Devensian) present in the study area is found on the southern and eastern side of hills, in raised areas throughout the study area. The low productivity Peat present in the study area is found in localised depressions. The moderately productive glaciofluvial deposits present in the study area are flanking the alluvium deposits. The superficial deposits are located under large bodies of surface water like the Milton Loch.

The bedrock present within all improvement strategies is classified as a low productivity aquifer with limited groundwater in near-surface weathered zone and secondary fractures. It is entirely Gneiss from the Hawick group that formed during the Llandovery Epoch. Three formations within the Hawick group have been identified within all six improvement strategies; the Carghidown Formation sits on top of the Kirkmaiden formation that has been thrust over the Cairnharrow formation. There are numerous north-east to south-west trending reverse faults extending from the coast and through Springholm and Crocketford, as well as north-south trending inferred faults displacing various lithologies. There are numerous dyke intrusions within the Carghhidown Gneiss Formation.

The aquifer designations assigned to the bedrock and superficial deposits within the study area are detailed in Table 9-14 and 9-15.

Table 9-14: Aquifer Designations Within the Study Area – Bedrock Geology

Geology	Formation Description	Distribution	Aquifer Designation	Groundwater Flow Mechanism	Importance	Relevant Improvement Strategy
Cairnharrow Formation	Greywacke with interbedded silty mudstone	In west of study area	Low Productivity Aquifer	Flow is virtually all through fractures and other discontinuities	Medium	1, 2, 3
Carghidown Formation	Greywackes with interbedded mudstones	Predominant formation in south-east of study area	Low Productivity Aquifer	Flow is virtually all through fractures and other discontinuities	Medium	1, 2, 3, 4, 5, 6
Kirkmaiden Formation	Greywackes with mudstone interbeds	The A75 is underlain by the Kirkmaiden Formation between Springholm and Crocketford	Low Productivity Aquifer	Flow is virtually all through fractures and other discontinuities	Medium	1, 2, 3, 4, 5
North Britain Siluro-Devonian	Mafite, Dioritic Rock, Felsite, Microdioritic rock,	Found to the south of	Not Productive	Not applicable	Low	5

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Geology	Formation Description	Distribution	Aquifer Designation	Groundwater Flow Mechanism	Importance	Relevant Improvement Strategy
Calckaline Dyke Suite	Laprophyres and Porphyritic Microdiorite	Improvement Strategy 5				

Table 9-15: Aquifer Designations Within the Study Area – Superficial Geology

Geology	Formation Description	Distribution	Aquifer Designation	Groundwater Flow Mechanism	Importance	Relevant Improvement Strategy
Devensian Till	Diamicton	Found across the majority of the study area	Low Productivity Aquifer	Intergranular flow with low permeability	Low	1, 2, 3, 4, 5, 6
Alluvium	Silt sand and gravel	Found near watercourses	Moderate Productivity Aquifer	Intergranular flow, high to low permeability	High	1, 2, 3, 4, 5, 6
Glaciofluvial Deposits	Gravel, sand and silt	Found in the south of the study area surrounding the River Urr	Moderate Productivity Aquifer	Intergranular flow high to low permeability	High	1, 5, 6

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Geology	Formation Description	Distribution	Aquifer Designation	Groundwater Flow Mechanism	Importance	Relevant Improvement Strategy
Peat	Peat	Found in small areas in the north of the study area	Unproductive Productivity Aquifer	Typically intergranular flow with low permeability	Low	1, 2, 5
Superficial Deposits	Sediment	Found centrally in the study area	Not applicable	Not applicable	Not applicable	3

According to the [Mining Remediation Authority Map Viewer](#), there are no records of past coal mining within the study area. However, according to the [Scottish Cave and Mine Database](#), there is one record of a mineshaft in the area, called the Old Shaft and located on Ha Hill, south of Springholm.

Drinking Water Safeguard Zones and Licensed Abstractions

Several Drinking Water Safeguard Zones for groundwater are identified within the study area from [Scotland's Environment Web Viewer](#). These include the Galloway (ID: 150694), the Urr Valley (ID: 150769), Castle Douglas (ID: 150672), and Cargenbank (ID: 150542).

Information on private licensed abstractions has not been requested at this time.

Private Unlicensed Abstractions

Private unlicensed abstractions are abstractions of less than 10m³/d that do not require SEPA registration. Details of private unlicensed groundwater abstractions have not been requested from the local authorities at this stage. Because there is no obligation for the owner to register private water supplies, unregistered private groundwater supplies may also be present. It is anticipated that this information will be requested to inform later assessment stages.

Fifteen Ordnance Survey (OS) mapped wells have been identified within the improvement strategies, and a further fourteen OS mapped wells have been identified within the 500m study area. The existence of these wells has not been confirmed at the time of writing.

Groundwater-Surface Water Interactions

Groundwater may contribute to the watercourses identified in the Road Drainage and the Water Environment Chapter of this EAR. Groundwater dependence will be reviewed at a later stage.

There are a number of springs, issues, sinks and collects within the study area shown in Table 9-16. No springs are located within the improvement strategies; however they are present within the wider 500m buffer area.

Table 9-16: Spring Locations

Name of Spring	Nearest Improvement Strategy	Distance from Nearest Improvement Strategy (m)
East of Cauld Hill	2	368
Northwest of Deanston Loch	5	788
Barr of Spots Dairy House	5	400
West of Markfast	5	1010
East of Midtown of Urr	5	977
East of Gerranton	6	530
North of Rigfoot	6	20

Groundwater Dependent Terrestrial Ecosystems

As discussed in the Biodiversity Chapter of this EAR, there are no Special Protection Areas (SPA), SAC, or Ramsar sites within the improvement strategies associated with the proposed scheme.

There is one potential GWDTE within the 1km study area; [Milton Loch SSSI](#) which is partially located within Improvement Strategy 5. It is designated for Beetle Assemblage and Eutrophic Loch status, however the groundwater dependent aspect of this SSSI is likely in reference to the wetland habitats, including wet willow woodland document at the SSSI.

Within the study area, the Milton Loch SSSI has the potential to contain a GWDTE in its freshwater habitats. There is also the Biosphere Reserve, designated west of Crocketford, which may indicate the area contains a protected ecosystem. Additional GWDTEs may be present within the 1km study area and will be reviewed at a later stage.

Surveys and consultation will be undertaken to establish the status and groundwater dependency of non-statutory sites of local value at later stages.

WFD Groundwater Bodies

The WFD Groundwater bodies present within the improvement strategies include Cargenbank (ID: 150542), Castle Douglas (ID: 150672), Galloway (ID: 150694), Urr Water Sand and Gravel (ID: 150769). These groundwater bodies all have a "Good" Quantitative and Qualitative status and are detailed in Table 9-17.

Table 9-17: WFD Groundwater Bodies Recorded within the Study Area

WFD ID and Waterbody Name	Relevant Improvement Strategies	Overall Status (2023)
150542 Cargenbank	1, 2, 3, 4, 5, 6	Good
150694 Galloway	1, 2, 3, 4, 5, 6	Good
150672 Castle Douglas	5, 6	Good
150769 Urr Water Sand and Gravel	1, 5, 6	Good

Groundwater Vulnerability

No groundwater nitrate vulnerable zones (NVZs) have been designated for this area as shown on the [Water Classification Hub](#).

The [groundwater vulnerability class](#) (shown in Table 9-18) of the study area is mostly class 5 with areas of class 4a, likely due to the areas of exposed bedrock outcrop.

Table 9-18: Description of Groundwater Vulnerability Ratings

Groundwater Vulnerability Class	Description
5	Vulnerable to most pollutants, with rapid impact in most scenarios.
4b	4 Vulnerable to those pollutants not readily absorbed or transformed 4b More likely to have clay present in the superficial deposits
4a	4 Vulnerable to those pollutants not readily absorbed or transformed 4a May have low permeability soil; less likely to have clay present in superficial deposits
3	Vulnerable to some pollutants; many others significantly attenuated.
2	Vulnerable to some pollutants, but only when they are continuously discharged or leaked.
1	Only vulnerable to conservative pollutants in the long term when continuously and widely discharged/leached
0	Not sufficient data to classify vulnerability: for example below lochs; in urban areas where geological and/or soils data are missing; where

Groundwater Vulnerability Class	Description
	superficial deposits are mapped but not classified; or in mined (including opencast) and quarried areas.

Built Environment

Buildings and other structures have the potential to be affected by localised subsidence resulting from dewatering. The study area includes 'A' roads and several areas of housing, including Springholm and Crocketford on the existing A75. This assessment also covers potential impacts to listed buildings and other cultural heritage assets resulting from dewatering. The Cultural Heritage Chapter of this EAR covers listed buildings and non-designated historic buildings and scheduled monuments along with any architectural remains that could be affected by the proposed scheme. Sites relevant to this assessment are illustrated on Figure 9-4 (C).

One scheduled monument is present within the 500m study area, this is the Green Island, on the west banks of Loch Milton.

There are multiple identified listed buildings within the improvement strategies as detailed in Cultural Heritage Chapter of this EAR.

Groundwater Quality

Point sources of pollution may have modified the baseline groundwater chemistry of the bedrock and superficial aquifers. Potential sources of pollution are detailed in the Potentially Contaminative Land Uses section of this chapter.

There is no groundwater quality data openly available for this site.

There are no historic or operative landfills in the study area as discussed in the Groundsure report.

Analysis of consents for discharge to groundwater, which could potentially modify the baseline groundwater chemistry of receiving aquifers, has not been considered necessary at this stage therefore this information has not been collected, and no discharge consents are present in the study area.

Summary

The groundwater receptors relevant to this assessment are provided in Table 9-19.

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Table 9-19: Groundwater Receptors Within the Study Areas

Receptor Type	Receptor	Description
Bedrock aquifers	Cairnharrow Formation	Low productivity aquifers are characterised by having a typical yield range of 0.1 to 1 l/s where the aquifer is saturated.
Bedrock aquifers	Carghidown Formation	Low productivity aquifers are characterised by having a typical yield range of 0.1 to 1 l/s where the aquifer is saturated.
Bedrock aquifers	Kirkmaiden Formation	Low productivity aquifers are characterised by having a typical yield range of 0.1 to 1 l/s where the aquifer is saturated.
Superficial aquifers	Devensian Till	Low productivity aquifers are characterised by having a typical yield range of 0.1 to 1 l/s where the aquifer is saturated.
Superficial aquifers	Alluvium	Moderate productivity aquifers are capable of supplying sustainable borehole yields of at least 1 l/s, if it contains sufficient sand and/or gravel, is thick enough and is of large enough extent.
Superficial aquifers	Glaciofluvial Deposits	Moderate productivity aquifers are capable of supplying sustainable borehole yields of at least 1 l/s, if it contains sufficient sand and/or gravel, is thick enough and is of large enough extent.
Superficial aquifers	Peat	Unproductive aquifers are not capable of sustainable water supplies and it is unlikely that there is surface water or wetland ecosystem dependence.
Groundwater abstractions	Licensed Abstractions	Changes to groundwater quality, levels and/or flows could impact private licensed groundwater abstractions
Groundwater abstractions	Private Unlicensed Abstractions	Information on unlicensed groundwater abstractions has not been received at this stage. As abstractions of this type cannot be ruled out, they are included as a potential receptor.
Groundwater-surface water features	Springs	Natural emergences of groundwater at surface. Current and historical OS mapping indicates the presence of springs in the study areas.

Receptor Type	Receptor	Description
Groundwater-surface water features	Wells	A shaft sunk into the ground to collect groundwater. Current and historical OS mapping indicates the presence of wells in the study area
Built environment	Listed buildings	The study area contains several areas of housing around the A75 and 21 listed buildings.
Built environment	Scheduled Monument	Green Island, a scheduled monument located on the western edge of Milton Loch.
Ecological receptors	SSSI	The Milton Loch SSSI has the potential to contain a GWDTE, and there may be more unmapped GWDTEs within the Study Area.

9.6.6 Surface Water

Further information on hydrology is presented in the Road Drainage and the Water Environment Chapter of this EAR. The surface water receptors located within the improvement strategies and the overall status of each water body (where classified) as shown on the [Water Classification Hub](#) are summarised in Table 9-20 and shown on Figure 9-4 (A to C).

A small area of the Milton Loch SSSI lies within the footprint of Improvement Strategy 5. This is a shallow eutrophic freshwater loch noted for its beetle assemblages.

Table 9-20: Named Surface Watercourses Recorded within the Study Area

Watercourse Name	Relevant Improvement Strategy	WFD ID	Overall Status (2023)
Barncailzie Lane	3, 4, 5	Not classified under WFD	Not classified under WFD
Bettyknowes Burn	1, 2, 5	10600 Cargen Pow / Bogrie Lane	Moderate ecological potential
Bogrie Lane	1, 2, 6	10600 Cargen Pow / Bogrie Lane	Moderate ecological potential
Brooklands Burn	1, 2, 3	10588 Spottes Burn	Good ecological potential
Causeway Burn	6	Not classified under WFD	Not classified under WFD

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Watercourse Name	Relevant Improvement Strategy	WFD ID	Overall Status (2023)
Crocketford Burn	1, 2, 3, 4	10600 Cargen Pow / Bogrie Lane	Moderate ecological potential
Cronie Burn	1, 2	Not classified under WFD	Not classified under WFD
Culshan Burn	3, 4, 5	10588 Spottes Burn	Good ecological potential
Deanston Burn	6	10602 Under Brae Lane	Good ecological potential
Garmartin Burn	2, 5	Not classified under WFD	Not classified under WFD
Glenhead Burn	1, 2	Not classified under WFD	Not classified under WFD
Larglea Burn	1, 2, 4, 5	10600 Cargen Pow / Bogrie Lane	Moderate ecological potential
Lochfoot Burn	1, 6	10601 Lochfoot Burn	Moderate ecological potential
Milton Burn	6	10591 Culloch Burn (Milton Loch to Kirkgunzeon Lane)	Good ecological potential
Minnydow Burn	1, 2	Not classified under WFD	Not classified under WFD
Spottes Burn	3, 4, 5, 6	10588 Spottes Burn	Good ecological potential
Under Brae Lane	6	10602 Under Brae Lane	Good ecological potential
Urr Water	1, 5, 6	10583 Urr Water (d/s Drumhumphrey Burn)	Good

9.6.7 Summary of Receptors

A summary of the receptors identified within the relevant study area for each improvement strategy are shown in Table 9-21.

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Table 9-21: Summary of Receptors Identified within the Study Areas

Receptor	Sensitivity	Name	Relevant Improve- ment Strategy 1	Relevant Improve- ment Strategy 2	Relevant Improve- ment Strategy 3	Relevant Improve- ment Strategy 4	Relevant Improve- ment Strategy 5	Relevant Improve- ment Strategy 6
Agricultural soils	Medium	LCA Grade 3.2	Yes	Yes	Yes	Yes	Yes	Yes
Agricultural soils	Low	LCA Grade 4.1 to 7	Yes	Yes	Yes	Yes	Yes	Yes
Human health	Very High	Residential	Yes	Yes	Yes	Yes	Yes	Yes
Human health	High	Educational Facilities	No	No	Yes	Yes	No	No
Human health	High	Recreation, Public Open Space	Yes	Yes	Yes	Yes	No	Yes
Human health	Medium	Commercial and Industrial	Yes	Yes	Yes	Yes	Yes	Yes
Human health	Low	Transport Infrastructure	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	Medium	Cairnharrow Formation	Yes	Yes	Yes	No	No	No

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Receptor	Sensitivity	Name	Relevant Improve- ment Strategy 1	Relevant Improve- ment Strategy 2	Relevant Improve- ment Strategy 3	Relevant Improve- ment Strategy 4	Relevant Improve- ment Strategy 5	Relevant Improve- ment Strategy 6
		Bedrock Aquifer						
Groundwater	Medium	Carghidown Formation Bedrock Aquifer	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	Medium	Kirkmaiden Formation Bedrock Aquifer	Yes	Yes	Yes	Yes	Yes	No
Groundwater	Medium	Devensian Till Superficial Aquifer	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	High	Alluvium Superficial Aquifer	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	High	Glaciofluvial Deposits	Yes	No	No	No	Yes	Yes

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Receptor	Sensitivity	Name	Relevant Improve- ment Strategy 1	Relevant Improve- ment Strategy 2	Relevant Improve- ment Strategy 3	Relevant Improve- ment Strategy 4	Relevant Improve- ment Strategy 5	Relevant Improve- ment Strategy 6
		Superficial Aquifer						
Groundwater	Low	Peat Superficial Aquifer	Yes	Yes	No	No	Yes	No
Groundwater	Very High	Licensed Abstractions	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	High	Private Unlicensed Abstractions	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater	High	Springs	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area
Groundwater	Medium	Wells	Yes	No	Yes	Yes	No	No
Groundwater	High	Listed Buildings	None but in wider	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area

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Receptor	Sensitivity	Name	Relevant Improve- ment Strategy 1	Relevant Improve- ment Strategy 2	Relevant Improve- ment Strategy 3	Relevant Improve- ment Strategy 4	Relevant Improve- ment Strategy 5	Relevant Improve- ment Strategy 6
			500m study area					
Groundwater	Very High	Scheduled Monument	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area	None but in wider 500m study area
Groundwater	High	Potential GWDTE (Milton Loch SSSI)	No	No	No	No	Yes	No
Surface water	Very High	Milton Lock SSSI	No	No	No	No	Yes	No
Surface water	High	Brooklands Burn	Yes	Yes	Yes	No	No	No
Surface water	High	Culshan Burn	No	No	Yes	Yes	Yes	No
Surface water	High	Spottes Burn	No	No	Yes	Yes	Yes	Yes
Surface water	High	Deanston Burn, Milton	No	No	No	No	No	Yes

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Receptor	Sensitivity	Name	Relevant Improve- ment Strategy 1	Relevant Improve- ment Strategy 2	Relevant Improve- ment Strategy 3	Relevant Improve- ment Strategy 4	Relevant Improve- ment Strategy 5	Relevant Improve- ment Strategy 6
		Burn, Under Brae Lane						
Surface water	Medium	Bettyknowes Burn	Yes	Yes	No	No	Yes	No
Surface water	Medium	Bogrie Lane	Yes	Yes	No	No	No	Yes
Surface water	Medium	Crocketford Burn	Yes	Yes	Yes	Yes	No	No
Surface water	Medium	Larglea Burn	Yes	Yes	No	Yes	Yes	No
Surface water	Medium	Lochfoot Burn	Yes	No	No	No	No	Yes
Surface water	Low	Barncailzie Burn	No	No	Yes	Yes	Yes	No
Surface water	Low	Causeway Burn	No	No	No	No	No	Yes
Surface water	Low	Cronie Burn, Glenhead Burn,	Yes	Yes	No	No	No	No

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Receptor	Sensitivity	Name	Relevant Improve-ment Strategy 1	Relevant Improve-ment Strategy 2	Relevant Improve-ment Strategy 3	Relevant Improve-ment Strategy 4	Relevant Improve-ment Strategy 5	Relevant Improve-ment Strategy 6
		Minnydow Burn						
Surface water	Low	Garmartin Burn	No	Yes	No	No	Yes	No

9.7 Potential Impacts

9.7.1 Construction

Roads schemes and the associated infrastructure can cause potentially significant effects on geological and soil resources. Construction work for, and operation of, a scheme can also compound environmental effects caused by previous activity. For instance, excavations and groundworks can mobilise contamination that may be present in the ground from former industrial activities.

Following a review of the baseline conditions presented in the Baseline Conditions of this chapter, Table 9-22 provides an overview of the potential impacts that may occur on geology, soil, groundwater and land contamination receptors during construction.

Table 9-22: Potential Impacts on Receptors During Construction of the Proposed Scheme

Element	Receptor	Potential Impacts
Geology	Designated geological sites	No receptors identified
Soils	Land capable for agriculture	Physical removal or permanent sealing of agricultural land beneath the road footprint. Impact is permanent.
Soils	Land capable for agriculture	Reduction or loss of soil function(s) due to stripping, handling and storage, through mechanisms such as compaction and erosion. Impact may be permanent, or temporary if soils are returned to previous use.
Soils	Peat (superficial geology), and Peatland	Physical removal or sealing of peat deposits beneath the road footprint. Impact is permanent.
Soils	Peat (superficial geology), and Peatland	Potential medium-term disruption of peat deposits due to stripping, handling and storage, through mechanisms such as compaction and erosion. Impact may be permanent, or temporary if soils are returned to previous use.
Soils	Soils supporting sites of ecological importance	No receptors identified

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Element	Receptor	Potential Impacts
Potential contamination	Human health	Disturbance of contaminated ground could affect construction workers through direct contact with contaminated soils or waters, inhalation or ingestion of contaminated dust or soil particles, or through inhalation of gases or asbestos fibres. Both short and long-term risks could arise.
Potential contamination	Human health	Adjacent land users may be impacted if contamination is disturbed and becomes mobile. Impacts could be via inhalation of contaminated dusts or asbestos, or migration of contaminants or gases within ground or surface waters. Both short and long-term risks could arise.
Potential contamination	Water environment - groundwater	Potential impact to water quality and water resource through mobilisation of contamination and/or creation of pollutant pathways during construction. Potential to further impact surface waters if aquifers are supporting watercourses. Both short and long-term risks could arise.
Potential contamination	Water environment – surface waters	Mobilisation of contamination and/or surface water runoff during construction could lead to potential impact to water quality, ecological potential and/or water resource. Both short and long-term risks could arise.
Groundwater	▪ Bedrock Aquifers ▪ Superficial Aquifers ▪ Licensed abstractions ▪ Unlicensed abstractions ▪ Potential GWDTE	Potential impacts to groundwater quality due to accidental leaks/spills of fuel and chemicals during construction. Potential impacts to groundwater quality due to creation of vertical pathways during construction which may result in mobilisation of suspended solids, transport of contaminated groundwater, or mixing of different groundwater chemistries.

Element	Receptor	Potential Impacts
		Potential impacts to groundwater levels, flows, and/or quality due to excavation of cuttings which may result in dewatering if groundwater is intercepted or compaction due to embankments.
Groundwater	Built environment	Potential increase in risk of groundwater flooding to the built environment.

9.7.2 Operation

During operation, nearby land users could potentially be exposed to contamination if in-ground maintenance works occur in areas where contamination has been left in-situ or could be mobilised to controlled waters. There is also the potential for the proposed scheme to act as a preferential pathway between contamination and controlled waters.

Potential direct impacts on surface water during operation, for example from siltation or spills, are considered within the Road Drainage and the Water Environment Chapter of this EAR.

Potential impacts on groundwater during operation include:

- Potential impacts to groundwater quality due to contamination from routine runoff which discharges to ground.
- Potential impacts to groundwater quality due to contamination from accidental leaks/spills which bypass road drainage.
- Potential impacts to groundwater levels and flows due to permanent below ground structures, which may result in long-term disturbance of groundwater flows.
- Potential impacts to groundwater quality due to permanent below ground structures which may intercept contaminated groundwater or result in mixing of different groundwater chemistries.
- Potential impact to groundwater quality, levels and flows due to ongoing dewatering of cuttings via road drainage.
- Potential increase in risk of groundwater flooding to the built environment.

9.8 Design, Mitigation and Enhancement Measures

9.8.1 Mitigation Measures – Construction Phase

Mitigation measures should follow the mitigation hierarchy:

- Avoidance of effects through design.
- Minimising effects through limiting the size of the footprint.
- Reducing the severity of effects through specific mitigation.

Future design mitigation measures could include, but are not limited to, the following:

- Amendment of the improvement strategy alignment to avoid major constraints, such as a significantly contaminated site.
- Reduced development footprints to minimise the loss of agricultural land.
- Stripping of topsoil from the footprints of permanent development, followed by sustainable reuse.

For the purposes of this assessment, it has been assumed that the following would be embedded mitigation:

- Production of a PSSR to detail the expected ground conditions in the study area.
- Ground investigation for the preferred improvement strategy, including appropriate sampling for chemical analysis, followed by risk assessment and remediation (if required) in accordance with Land Contamination Risk Management.
- Ground investigation (including pumping tests if necessary) to assess effects of dewatering and groundwater level monitoring. Further assessment will be undertaken to identify the potential impacts of construction activities and additional mitigation identified, if appropriate, to reduce the significant of any effects.
- Use of low permeability cut-off walls to control groundwater flows and discharges.
- Undertake work in line with guidance for pollution prevention and relevant code of construction practices.
- Ensure that scheme complies with the requirements of SEPA's approach to [Groundwater Protection Policy for Scotland](#).
- Minimise the extent of works as far as practicable.
- Adoption of good soil management practices in accordance with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.
- Development of a Construction Environment Management Plan and Site Waste Management Plan, including robust pollution prevention measures, to reduce the

likelihood of the proposed scheme aerating new contamination through leaks and spills during construction.

- Development of a Materials Management Plan for reuse of materials under The Definition of Waste: Development Industry Code of Practice.
- Procedures to mitigate risks from encountering unexpected contamination during construction, including control and containment measures.

It should be noted that the potential effects on soils related to land take can only be mitigated through design.

Additional mitigation measures may need to be developed to address identified site-specific impacts. At this early stage in the proposed scheme, the requirement for specific mitigation measures cannot be meaningfully identified, particularly in relation to impacts related to ground contamination. Any potential remediation requirements are usually informed by ground investigation, detailed risk assessment and the development of a Conceptual Site Model. Potential mitigation solutions and remediation costs are likely to be more complex if the proposed scheme is aligned through higher risk areas, and as such the design should avoid these areas if possible.

9.8.2 Mitigation Measures – Operational Phase

At the time of writing, it is not expected that mitigation will be required during the operational phase, as any contamination present in areas where maintenance works may occur shall be dealt with during construction.

Mitigation that may be required during the operational phase to reduce impact to groundwater receptors includes the following:

- Foundations and other potential below ground structures should be designed to allow existing groundwater flow paths to function to prevent an increase in groundwater flood risk and to protect nearby sensitive receptors, such as issues/springs.
- If impacts occur from abstracting groundwater to keep cuttings dry, then use abstracted water to recharge groundwater.
- Avoid routes which pass through or close to the most sensitive areas for example Milton Loch SSSI, and areas where groundwater contributes to other ecological receptors.
- Install pollution prevention measures for drainage systems using industry-established treatment trains.
- Locate drainage discharge points to ground and groundwater outside of the most sensitive areas such as the Milton Loch SSSI and other areas where groundwater contributes to ecological receptors.

9.8.3 Enhancement Measures

At the time of writing, no enhancement measures have been identified for the construction or operational phases. There is the potential for enhancement opportunities to be identified during later stages of the proposed scheme. Examples of such opportunities may include improving existing or creating new geological exposures, remediation measures and/or the collection and analysis of geological data.

9.9 Assessment of Likely Significant Effects

The following sections outline the anticipated significant effects that are predicted to occur as a result of the development of the proposed scheme. Significant effects are defined as those assessed as moderate and above. Non-significant effects (slight and neutral) have not been included.

9.9.1 Construction Phase

Soils

The significance of potential effects on soils is summarised in Table 9-23. It should be noted that at this stage of the proposed scheme, no specific detail relating to required land take has been determined. As such, the extents of land take are expected to be significantly overestimated at this stage. However, Improvement Strategies 3 and 4 are likely to have lower impacts on soils through disturbance and sealing because they cover the least total area.

In addition, areas or extents of temporary land-take such as access tracks or compounds, are currently unknown.

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Table 9-23: Potentially Significant Construction Effects on Soils

Effect	Receptor	Sensitivity	Relevant Improvement Strategies	Magnitude of Impact	Significance
Physical removal or permanent sealing of agricultural land/peat beneath the road footprint	LCA Grade 3.2	Medium	1, 2, 5, 6	Major	Large
Physical removal or permanent sealing of agricultural land/peat beneath the road footprint	LCA Grade 4.1 to 7	Low	1, 2, 5, 6	Major	Moderate
Physical removal or permanent sealing of agricultural land/peat beneath the road footprint	LCA Grade 3.2	Medium	3, 4	Moderate	Moderate
Physical removal or permanent sealing of agricultural land/peat	Peat (superficial geology), and Peatland (class 3, 4 and 5)	High	All	Major	Large

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Effect	Receptor	Sensitivity	Relevant Improvement Strategies	Magnitude of Impact	Significance
beneath the road footprint					
Reduction or loss of soil function(s) due to stripping, handling and storage, through mechanisms such as compaction and erosion.	Peat (superficial geology), and Peatland (class 3, 4 and 5)	High	All	Major	Large

Human Health

The types of human health receptors potentially affected by the realisation of potential contaminant linkages during construction are broadly comparable between the improvement strategies, with the exception of educational facilities, recreational facilities and public open space. However, no significant effects for human health have been recorded.

Groundwater

The types and sensitivities of hydrogeological receptors potentially affected during construction are broadly comparable between the improvement strategies. However, with the improvement strategies that cover a greater land area there is a greater area of aquifer that has the potential to be affected.

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Table 9-24: Potentially Significant Construction Effects on Groundwater

Effect	Receptor	Sensitivity	Relevant Improvement Strategies	Magnitude of Impact	Significance
Pollution of groundwater quality due to mobilisation of contamination and/or creation of pollutant pathways	Licensed abstractions	Very High	All	Minor	Moderate
Pollution of groundwater quality due to accidental leaks/spills of fuel and chemicals	Licensed abstractions	Very High	All	Minor	Moderate
Quantitative impact to groundwater levels, flows, and/or quality due to excavation of cuttings which may result in dewatering if groundwater is intercepted or	Licensed abstractions	Very High	All	Minor	Moderate

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Effect	Receptor	Sensitivity	Relevant Improvement Strategies	Magnitude of Impact	Significance
compaction due to embankments.					

Surface Water

Generally, the improvement strategies that cover a larger area intersect with a greater number of surface watercourses, and as such the potential for effects to be realised is greater.

Table 9-25: Potentially Significant Construction Effects on Surface Water

Effect	Receptor	Sensitivity	Relevant Improvement Strategy	Magnitude of Impact	Significance
Mobilisation of contamination and/or surface water runoff during construction	Milton Loch SSSI	Very High	5	Minor	Moderate

9.9.2 Operation Phase

Following the construction mitigation measures outlined in the Design, Mitigation and Enhancement Measures section of this chapter, no significant operational effects are likely to arise.

9.10 Proposed Scope of Future Assessment

A PSSR is being produced for the study area, including a preliminary Conceptual Site Model (CSM). This will inform on the likely ground conditions for the improvement strategies, and feed into the designing of an appropriate ground investigation strategy, including environmental sampling and assessment. Results from the ground investigation should be assessed against appropriate criteria and will feed into the development of the land contamination risk assessment and CSM revision within the Ground Investigation Report.

At DMRB Stage 2, an Environmental Scoping Report and Environmental Assessment Report shall be produced. These reports will expand on the assessment of the potential impacts to the receptors outlined in this chapter.

9.11 Summary

A range of baseline data has been reviewed and used to identify relevant geology, soils and groundwater receptors in the study areas. The receptors identified for the improvement strategies are agricultural soils, human health, groundwater and surface waters.

In accordance with relevant industry guidance, an assessment was undertaken on the potential effects on these receptors from the implementation of the proposed scheme and their potential significance. The following significant effects were identified for all improvement strategies unless otherwise stated:

- Physical removal or permanent sealing of agricultural land and/or peat.
- Reduction or loss of soil function(s) due to stripping, handling and storage, through mechanisms such as compaction or erosion.
- Potential mobilisation of contamination and/or surface water runoff into Milton Loch SSSI (Improvement Strategy 5 only).
- Spills and leaks of construction runoff could impact groundwater quality.
- Routine road runoff discharge or spills and leaks increase the risk of pollution.

In conclusion, potential significant effects were similarly identified across all improvement strategies. With the exception of Improvement Strategy 5 where additional potential significant effects were identified for surface water due to its proximity to Milton Loch SSSI.

The risk of potential significant effects being realised is highest for Improvement Strategies 1 and 6 as they cover the greatest total area. Improvement Strategy 5 is the next most likely to have significant effects due to its length and proximity to Milton Loch SSSI, followed by Improvement Strategy 2, then Improvement Strategy 4 and 3 due to their smaller total areas.

The identified effects on soils are due to land take and would need to be mitigated through route optioneering or future design mitigation measures.

10. Material Assets and Waste

10.1 Introduction

This chapter describes the methodology and potential impacts for the material assets and waste assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). The assessment will be undertaken in accordance with the [Design Manual for Roads and Bridges \(DMRB\) LA 110- Material assets and waste, \(revision 0\)](#) (hereafter referred to as “DMRB LA 110”) and other relevant guidance as set out in this chapter.

The assessment for material assets and waste considers the following matters:

The consumption of ‘material assets’ [Article 3.1 (d) of the Directive 2011/92/EU], which includes materials and products from primary, secondary, recycled, sustainable, and renewable sources, and the use of excavated and other arisings that fall within the scope of waste exemption criteria.

Any impacts on mineral safeguarded areas (or other minerals supply aspects) within the relevant Mineral Planning Authority (MPA).

The production and disposal of ‘waste’ [Annex IV of the Directive 2011/92/EU], in the context of surplus materials which can become waste, as well as other substances which the holder discards or intends or is required to discard.

It does not include the direct energy use associated with operation of the network.

10.2 Legislative and Policy Framework

Table 10-1 and 10-2 provides a summary of the material assets and waste legislation and policies that are relevant to this assessment.

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Table 10-1: Applicable National Legislation relevant to the Proposed Scheme

Legislation	Relevance to the Proposed Scheme
Landfill Tax (Scotland) Act 2014 (as amended)	Defines taxable disposal of waste to landfill sites, to encourage waste reduction and recovery of value from waste.
The Environmental Protection (Duty of Care) (Scotland) Regulations 2014 (as amended)	Sets out requirements which apply to anyone who produces, carries, keeps, disposes of, or manages controlled waste in Scotland, to ensure waste is managed responsibly and does not harm the environment or human health.
Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 (as amended)	The Regulations set out the producer responsibility regime for waste electrical and electronic products in the UK. These regulations implement the requirements of the EU WEEE Directive (2012/19/EU). In particular, they ensure that producers of Electrical and Electronic Equipment (EEE) finance the cost of collection, treatment, recycling and recovery of that equipment when it becomes WEEE.

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Legislation	Relevance to the Proposed Scheme
The Waste (Scotland) Regulations 2012 (as amended)	Mandate that businesses, public sector and not-for-profit organisations present recyclable materials for separate collection (including glass, metal, plastic, paper and card). Food businesses must also separate food, unless in rural areas. Local authorities must provide a minimum recycling service to households and from 2021, biodegradable municipal waste is banned from going to landfill.
The Waste Management Licensing (Scotland) Regulations 2011 (as amended)	These regulations transpose relevant definitions contained in Directive 2008/98/EC and establish legal framework for waste management in Scotland, including licensing of waste management activities.
The Waste Batteries and Accumulators Regulations 2009 (as amended)	These regulations prevent incineration and landfilling of waste batteries, promote collection, treatment and recycling of waste batteries, and set out responsibilities for battery producers.
The Landfill (Scotland) Regulations 2003 (as amended)	The Landfill (Scotland) Regulations 2003 set standards for the design and operation of landfills.
The Special Waste Regulations 1996 (as amended)	Implements the hazardous waste Directive 91/689/EEC. Sets out procedures for disposing of, carrying and receiving special waste.

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Legislation	Relevance to the Proposed Scheme
The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991 (as amended)	These regulations supplement the Control of Pollution (Amendment) Act 1989, which makes waste carrier registration a legal requirement to transport controlled waste to or from any place in the UK. The regulations establish a system for the registration of carriers of controlled waste.
The Environmental Protection Act 1990 (as amended)	This Act outlines the basic provisions for the management of all waste, which includes details on the definition of waste, and outlines the Duty of Care placed on those involved in managing wastes.
The Control of Pollution (Amendment) Act 1989 (as amended)	This Act addresses regulation of waste transport, particularly of 'controlled waste'. It requires waste carrier registration for carrying controlled waste and outlines the powers to deal with vehicles used for illegal waste disposal.

Table 10-2: Applicable National Policy relevant to the Proposed Scheme

National Policy	Relevance to the Proposed Scheme
Scotland's Circular Economy and Waste Route Map to 2030	Sets 11 priority actions to maximise progress towards a circular economy for Scotland. The Waste Route Map focuses on reducing waste, enhancing recycling and minimising the environmental impact of unavoidable waste.

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National Planning Framework 4	The National Planning Framework 4 (NPF4) sets out national planning policy and guides spatial development for Scotland. This framework shapes how land is used and developed across the country. NPF4 is a statutory development plan, and its policies are used to make decisions on planning applications.
Making Things Last A Circular Economy Strategy for Scotland	Sets out priorities for moving towards a circular economy, to keep products and materials in high value use for as long as possible.
Guidance Regulations: timber and FLEGT licences	Guidance for businesses trading timber and timber-related products, Prevents the illegal harvest of timber in the UK market.
Safeguarding Scotland's Resources - Blueprint for a More Resource Efficient and Circular Economy	A programme to reduce waste; focusing on reuse and repair and maximising the value of materials.
Scotland's Zero Waste Plan	A framework for delivering a 'zero waste' Scotland. Sets out specific actions and priorities.

10.2.1 Local Policy and Plans

Local level policy and plans set out the following statements with regards to management of material assets and waste:

- [Dumfries and Galloway Local Development Plan 2](#) (LDP2):
 - Waste must be treated as a resource through keeping materials separate, to maximise their value. Prevention is encouraged, followed by recycling and energy recovery, with disposal (landfill) as the least preferred option of waste management, in accordance with the waste hierarchy.
 - A Site Waste Management Plan (SWMP) may be required by the Council depending on the type and quantity of waste expected.
 - Policy IN6: Waste Management Requirements for New Development lists waste management requirements for all non-waste related new development proposals.

This policy states that 'any planning application which in the view of the Council requires to address the issue of waste should be supported by a SWMP'.

- The Council is working towards [Scotland's Zero Waste Plan](#) objectives.
- Policy ED13: Minerals states that 'permanent development that would result in the sterilisation of mineral resources which are viable or may become viable and could be extracted in accordance with the LDP policy (or which are the subject of extraction interest) will not be permitted'.
- Peat is generally to be protected as a carbon store.
- [Dumfries and Galloway Local Development Plan 2: Mineral Resources Supplementary Guidance](#):
 - Provides mineral resource maps and quarry locations.
- [Collation of the results of the 2019 Aggregate Minerals Survey for Scotland](#) (AMSS):
 - Includes an assessment of mineral reserves and estimates regional landbank.

10.3 Assessment Methodology

The methodology applied is based on DMRB LA 110, using two geographically different study areas to examine the use of primary, secondary and recycled material assets and the generation and management of waste. Mineral Safeguarding Sites (MSSs) and peat resources which may be encroached on/intersected by the improvement strategies have also been examined. See the Study Area section of this chapter in respect to the study areas.

The material requirements and waste generated by the six improvement strategies is not currently known due to the limited design information available, which is typical at this early stage in the design process. Furthermore, material sources are currently unknown. Calculations of waste arisings (for instance for the earth works balance) will be estimated at DMRB Stage 3. This chapter therefore provides a high-level assessment of the impacts associated with likely materials use and waste generated by the improvement strategies.

The sources of information available at DMRB Stage 1 are the lengths of improvement strategies and the maximum number of new major structures required to be built within the improvement strategies. Therefore, a preliminary level evaluation was carried out, as set out in DMRB LA 110. As is proportionate at this stage of the DMRB assessment, materials and waste quantity estimates and cut/fill balance have not been taken into consideration.

This assessment considers MSSs and peat resources, material consumption, generation and management of waste with respect to the proposed scheme for the following:

- The likely (though yet to be specified) materials required.

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- The likely (though yet to be specified) anticipated waste arisings (such as inert, non-hazardous, hazardous).
- MSSs and peat resources in proximity of the improvement strategies.
- The effects that would arise from potential issues identified and whether these are likely to be significant.
- A conclusion about whether this level of assessment is sufficient to understand the effects of the proposed scheme or whether detailed assessment is necessary, and the identification of any mitigation measures.

Resources and receptors considered in the assessment include:

- Policy and targets relevant to material assets and waste.
- Resource depletion from quarries, other sources of minerals and other finite raw material resources.
- Capacity of regional waste management infrastructure such as landfills, materials recovery facilities, composting sites and energy from waste plants.

Where quantitative data is not available, professional judgement has been used to inform the criteria set out in DMRB LA 110 when assessing the likely significance of effects during the construction period. This provides a qualitative measure of the relative environmental impacts associated with the use of materials and production of waste from the improvement strategies.

10.3.1 Data Sources – Use and Interpretation of DMRB LA 110

[DMRB LA 101 - Introduction to environmental assessment \(revision 0\)](#) (hereafter referred to as “DMRB LA 101”) advises to undertake a ‘simple assessment’ approach where there is a sufficient level of uncertainty on likely significant environmental effects, and where further evidence is required to support the assessment.

The assessment of effects on material assets and waste adopted for the significance categories is outlined in Table 10-3. The significance of effects on material assets and waste are reported in accordance with Table 3.14 Significance criteria of DMRB LA 110.

Table 10-3, reproduced from DMRB LA 110, uses very precise and deliberate language, specifically “OR”, “AND” and “AND/OR” after each descriptor of effect to denote which significance category should be applied. All descriptors need to be met in full in order to assign a relevant significance category (for example with the notable exception of a large effect which can be assigned when a project sterilises greater than or equal to one mineral safeguarding site and/or peat resource). The descriptors of effect for the waste matter are

either standalone (very large and neutral effects) or summative (large, moderate and slight effects).

In the absence of further guidance in the DMRB LA 110 standard, the descriptor for material assets with respect to achieved recovery/recycling rates has been interpreted to mean 'project achieves XX% overall material reuse/recycling/recovery (by weight) to substitute use of primary materials on or off-site' (for example within the first or second study area). Limiting this to solely 'construction and demolition waste' in the context of the 'material assets' descriptors (where there are already separate descriptors for 'waste') would be impractical and inappropriate given that 'waste' is a legally defined term, and that the proposed scheme would not look to use 'waste' to substitute primary materials given the potential costs, delays and risks associated with securing Waste Management Licenses.

In the absence of a Scottish specific target in the Scotland National Application Annex to DMRB LA 110 Material assets and waste, the England Average target of 25% (provided in England National Application Annex) has been adopted for the purposes of this assessment for the 'relevant regional percentage target'.

The published version of DMRB LA 110 includes "AND" instead of "AND/OR". This has been changed to correct an editorial error in the original guidance that was confirmed in an email from Wilson. S (2020) at Highways England.

Sterilisation is defined by DMRB LA 110 to mean "substantially constrain/prevent existing and potential future use and extraction of materials". In the absence of further guidance, this has been interpreted to mean that the proposed scheme will need to substantially sterilise (in their entirety) one or more allocated mineral extraction sites and/or or existing or potential peat extraction site or intersects with a significant part of a safeguarded minerals site/existing or potential peat extraction site (greater than 50% by area). A peat resources is defined in DMRB LA 110 as "Existing or potential peat extraction sites".

Consequently, this simplified assessment framework precludes the application of a methodology to derive a measure of the significance of effect based on the value of a resource (or receptor) and the magnitude of impact as with other DMRB topics.

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Table 10-3: DMRB LA 110 Significance Category Descriptions for Adverse Effects (adopted from Table 3.13 of DMRB LA 110)

Significance Category	Description
Very large	Material assets: - No criteria: use criteria for large categories. Waste: - Greater than 1 percentage reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or - Construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material assets: - Project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous Construction and Demolition Waste (CDW) to substitute use of primary materials; and - Aggregates required to be imported to site comprise less than 1% reused / recycled content; and/or - Project sterilises greater than or equal to 1 mineral safeguarding site and/or peat resource. Waste: - Greater than 1 reduction in the regional capacity of landfill as a result of accommodating waste from a project; and - Greater than 50% of project waste for disposal outside of the region.
Moderate	Material assets: - Project achieves less than 70% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials ; and - Aggregates required to be imported to site comprise reused/recycled content below the relevant regional percentage target. Waste: - Greater than 1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and 1-50% of project waste for disposal outside of the region.

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Significance Category	Description
Slight	Material assets: - Project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and - Aggregates required to be imported to site comprise reused/recycled content in line with the relevant regional percentage target. Waste: - Less than or equal to 1% reduction or alteration in the regional capacity of landfill; and - Waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising the integrity of the receiving infrastructure (design life or capacity) within the region.
Neutral	Material assets: - Project achieves greater than 99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials; and - Aggregates required to be imported to site comprise greater than 99% reused/recycled content. Waste: - No reduction or alteration in the capacity of waste infrastructure within the region.

Table 10-4: Significance Criteria for Material Assets and Waste (adopted from Table 3.14 of DMRB LA 110)

Significance Category	Aspect	Description
Significant (one or more criteria met)	Material assets	Category descriptions met for moderate or large effect.
Significant (one or more criteria met)	Waste	Category description met for moderate, large or very large effect.
Not significant	Material assets	Category description met for neutral or slight effect.
Not significant	Waste	Category description met for neutral or slight effect.

To note, there is no criteria for very large effects on materials, as discussed in Table 10-3.

10.4 Assumptions and Limitations

10.4.1 Assumptions

The assessment on material assets and waste receptors is predominantly based on a review of the publicly available baseline information, improvement strategy lengths, the indicative maximum number of major structures likely required to be built within each improvement strategy, and other design information available at the time of the assessment.

At this stage, due to the high-level design development and options appraisal, there are limited details available on construction materials and waste quantities. Therefore, a preliminary level evaluation has been carried out based on DMRB LA 110 methodology, while reporting the assumptions and limitations on data gaps. There has not been an assessment of the potential for using site-won arisings as this information is not available at this stage.

Professional judgement has been used, as appropriate, based on the scale of the improvement strategies and current waste management practices to identify the likely magnitude of the impact. It should be recognised that these will change in subsequent stages as the design progresses and more information becomes available. The assessment of significance assumes that there are no primary materials mandated to be used within any of the improvement strategies.

Operational impacts have been scoped out of this assessment, on the basis that these are not expected to be significant (by quantity). It is also assumed that the assessment of any environmental impacts and effects associated with material assets and waste during any future maintenance, renewal, or improvement works, would be undertaken by the Overseeing Organisation, in line with their requirements and therefore falls outside the scope of this assessment.

10.4.2 Limitations

Whilst the baseline data sources used in this assessment represent the most recently available information, there is a general lag (in years) for materials, waste processing and landfill capacity data in the UK/Scotland and conditions may have changed since the publication of this data. For example, as mineral planning permissions are granted for new reserves and as existing material reserves are worked and consumed. Waste management facilities may be subject to reduced capacities due to utilisation of their finite capacity or permit modification and surrenders changing the availability of capacities.

Although checks are made by stakeholders for anomalies or errors in their data prior to publication, it cannot be guaranteed that these data sets are error-free, or whether any

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commercial decisions have been taken by site operators that may have affected these data. The availability of material assets and waste management capacity may also be impacted by other buildings and infrastructure projects taking place at the time of construction of the proposed scheme.

Some environmental impacts associated with the extraction and transport of primary raw materials and manufactured products would likely occur offsite. The source, processing and manufacture of materials cannot be determined at this stage. Therefore, it is outside the scope of this assessment to consider the environmental impacts associated with the extraction of raw materials and the manufacture of products.

There is little information available at this early stage regarding the material requirements and waste quantities generated associated with constructing the proposed scheme. These limitations are typical of a scheme at this stage, and the information presented in this chapter includes professional judgement for assessing the requirements. This is considered to represent an appropriate level of detail in line with the assessment methodology outlined in Section 3 of DMRB LA 110.

There is limited information currently available for the following:

Material Assets:

- Provenance of imported materials and products.
- Materials that contain secondary/recycled content.
- Any known sustainability credentials of materials to be consumed.
- The type and volume of materials that will be recovered from on-site and off-site sources.
- Details of on-site storage and stockpiling arrangements, and any supporting logistical details.

Waste Management:

- The types and quantities of waste that may be produced associated with the proposed scheme.
- The amount of waste (by weight) that will be recovered and diverted from landfill either on-site or off-site (that is, for use on other projects).
- Types and quantities of waste arising from the proposed scheme (demolition, excavation arisings and remediation) requiring disposal to landfill.
- Details of on-site storage and segregation arrangement for waste and any supporting logistical arrangements.

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- The chosen waste management methods (recycling, recovery, disposal) and precise geographical locations for managing each waste stream that cannot be re-used on-site.
- The types and quantities of any hazardous waste.

10.5 Study Area

Study areas are defined with reference to DMRB LA 110. The assessment defines two geographically different study areas, used to examine the use of primary, secondary, recycled and manufactured materials, and the generation and management of waste.

The first study area comprises all land contained within the improvement strategies. Within this area materials would be contained, mineral safeguarding sites and/or peat resources could be sterilised, and waste generated and managed, including any areas identified for temporary uses. Such temporary land could include temporary storage areas, construction compounds, haul roads and land for temporary construction site drainage. This will be applied to the improvement strategies as appropriate for assessment, as exact details of construction boundaries are not yet defined. The improvement strategies are located within Dumfries and Galloway.

To allow determination of likely significance of effects in line with the latest DMRB requirements, a second study area has been defined, using professional judgement, as being sufficient to identify:

- Feasible sources and availability of construction materials.
- Suitable waste management facilities that could accept excavated arisings and waste generated by the proposed scheme.

Using professional judgement, the second study area is considered on a regional basis for Dumfries and Galloway, in line with DMRB LA 110. In the context of this chapter, the Dumfries and Galloway region comprises of Dumfriesshire, Kirkcudbrightshire, and Wigtownshire.

In reality, and in accordance with DMRB LA 110, professional judgement may need to be applied, with consideration for a balance of the proximity principle and value for money in establishing the second study area. A study area with greater than regional consideration may need to be applied during later DMRB stages to take a realistic account of the interregional movement of material assets and waste within the UK, to recognise that cross-boundary movements are likely to occur.

The study areas described above are shown on Figure 10-1 (A and B).

10.6 Baseline Conditions

A desktop review assessment has been undertaken using the information available at this time, in order to establish for the two study areas, the current and likely future baseline conditions for material assets and waste over the next 10-years in the absence of a specified anticipated construction period.

Baseline data has been collected at the regional level for Dumfries and Galloway, including the availability of primary, secondary and recycled aggregate materials; as well as information on waste management capacity, including remaining landfill void space and annual capacities of waste transfer, waste treatment, metal recycling and waste incineration facilities. The presence of mineral safeguarded and allocated sites, and active quarries has been collected on a county level for Dumfries and Galloway.

For the landfill capacity and waste infrastructure baseline, surrounding regions of the second study area have been included in the assessment. This broader area is referred to as 'Dumfries and Galloway and the surrounding area' and includes Dumfries and Galloway, the Scottish Borders, Ayrshire, Lanarkshire and Glasgow City.

The baseline has been prepared with reference to the latest minerals, waste and waste planning information, and other information, comprising:

- [British Geological Survey Directory of Mines and Quarries 2020](#)
- [British Geological Survey GeoIndex Onshore](#)
- [Collation of the results of the 2019 Aggregate Minerals Survey for Scotland](#)
- [Dumfries and Galloway Local Development Plan 2](#)
- [Mining Remediation Authority Map Viewer](#)
- [SEPA Scottish waste sites and capacity tool](#)
- [SEPA Waste from all sources Discover Data tool](#)

10.6.1 Material Assets

For the purposes of this assessment, material assets are considered to be the physical resources that may be required for the construction of the proposed scheme, which may be of man-made or natural origin.

Primary, secondary and recycled aggregates have been chosen to act as a proxy indicator of regional material assets given that large quantities of aggregates are typically required for motorway and all-purpose trunk road schemes. This is also considered appropriate due to the prominence given to aggregates in DMRB LA 110.

10.6.2 Material Assets – Aggregates Consumption Associated with the Existing Roads Network

The operational maintenance of the existing road network is likely to consume both unbound aggregates (used as sub-base and drainage applications) and bound aggregates (used in ready-mixed concrete, asphalt and pre-cast concrete products). At this stage, no figures are available regarding the baseline quantities of operational and maintenance aggregates consumption generated across the first study area. This information will be sought where it is available as the design develops through the subsequent stages.

10.6.3 Material Assets – Regional Primary, Secondary and Recycled Aggregates

[Scotland's National Planning Framework 4](#) (hereafter referred to as "NPF4") continues the UK landbank approach to planning for the supply of construction aggregates. Adopted in February 2023, NPF4 details the long-term planning strategy for Scotland to 2045. In terms of minerals, NPF4 sets out planning policies which ensure that a steady supply of construction aggregates is maintained to meet the needs of society and the economy in an acceptable and sustainable manner.

NPF4 requires those preparing local development plans to adopt a landbank approach to planning for the supply of construction aggregates. This approach is intended to ensure that a stock of reserves, with planning permission, is maintained to ensure adequate supplies of aggregates. Those preparing local development plans are required through NPF4 to maintain a landbank of permitted reserves equivalent to a minimum of ten years' supply at all times. The 10-year period recognises the likely time that it takes to bring a new site into full production.

NPF4 confirms that Dumfries and Galloway had a total landbank for crushed rock and sand and gravel of 109 years and 14 years respectively at the end of 2019 (the most recent year available), as presented in Table 10-5 below.

Table 10-5: 2019 Dumfries and Galloway Landbank and Reserves, [Aggregate Minerals Survey for Scotland](#)

Dumfries and Galloway, Aggregate Minerals Survey for Scotland: Reporting Year 2019	Sand and Gravel	Crushed Rock
Landbank (years)	14	109
Sales (tonnes)	407,000	165,000
Reserves (tonnes)	5,852,000	17,878,000

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Review of the [British Geological Survey Directory of Mines and Quarries](#) suggests that the mines and quarries in the study area are able to supply a wide range of materials, including but not limited to, primary aggregate, concrete and asphalt products. It can reasonably be inferred that there is likely to be an adequate supply of construction aggregates available within the study area to construct the proposed scheme; and policy, strategic and legislative drivers are likely to facilitate that sufficient capacity is provided.

A metric for estimating recycled and secondary aggregates within the regions is via the assessment of Construction and Demolition Waste (CDW) management data contained within [SEPA's Waste Discover Data tool](#). The latest datasets show that 4,616,588 tonnes of CDW was generated in Scotland in 2022. The composition of this waste is indicated in Table 10-6.

The tool also confirmed that 90.4% of inert and non-hazardous CDW was recorded as having been recycled in 2022 (88.8% average between 2011 and 2022), against the EU Waste Framework Directive 2008/98/EC target of 70% by 2020. Construction and demolition recycling rates are from data provided to Europe for reporting under the Waste Framework Directive. Construction and demolition recycling excludes hazardous waste and naturally occurring soil and stones coded under 17 05 04 of the European Catalogue List of Wastes.

Table 10-6: Generated Construction and Demolition Waste from all Sources in 2022

Waste Type	Generated in 2022 (tonnes)	Composition in 2022 (percentage)
Dredging spoils	5,129	0.11
Glass wastes	20,277	0.44
Household and similar wastes	2,610	0.06
Metallic wastes, ferrous	85,316	1.85
Metallic wastes, mixed ferrous and non-ferrous	20,415	0.44
Metallic wastes, non-ferrous	10,329	0.22
Mineral waste from construction and demolition	1,359,714	29.45
Other mineral wastes	2,215	0.05
Plastic wastes	7,825	0.17
Soils	2,981,523	64.58
Vegetal wastes	792	0.02

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Waste Type	Generated in 2022 (tonnes)	Composition in 2022 (percentage)
Wood wastes	120,443	2.61
Total	4,616,588	100

10.6.4 Mineral Safeguarding Sites and Peat Resources

DMRB LA 110 defines mineral sites as 'operational sites or sites identified within strategic planning documents for the extraction of minerals'. Scotland's NPF4 requires that:

- Local development plans should safeguard important workable mineral resources, which are of economic or conservation value, and take steps to ensure these are not sterilised by other types of development.

A review of the [Dumfries and Galloway Local Development Plan 2: Mineral Resources Supplementary Guidance](#) has identified, from Map 2, underlying greywacke (a form of sandstone) north-west of the first study area. From the current maps available, it appears that the mineral is present within a 2km buffer of the first study area. However, the intersection is slight, and none of the improvement strategies themselves appear to intersect the mineral safeguarding site (MSS). It is therefore unlikely that any improvement strategies would intersect the greywacke MSS. From Map 2, there are no quarries identified within the improvement strategies. Therefore, there is no likely impact on MSSs in Dumfries and Galloway.

A review of the [Mining Remediation Authority Map Viewer](#) shows that none of the improvement strategies lie within a Coal Mining Reporting Area.

Peat (superficial geology), and peatland, have been identified within the DMRB Stage 1 Assessment Corridor. Please refer to Figure 9.1 (A and B) – Superficial Geology and Peatland.

Peat (superficial geology) is contained within the DMRB Stage 1 Assessment Corridor and is impacted by Improvement Strategy 1,2 and 5; it is also in close proximity to Improvement Strategy 4.

A review of the [Carbon and Peatland 2016 map](#) also indicates that Class 3, 4 and 5 peatland is contained within the DMRB Stage 1 Assessment Corridor. Improvement Strategies 1, 2, 5 and 6 impact class 3, 4 and 5 peatland and Improvement Strategies 3 and 4 impact class 4 and 5 peatland.

As some improvement strategies have the potential to intersect with peat (superficial geology) and peatland, impacts on MSSs and peat resources will be considered further in this assessment.

10.6.5 Materials – Future Baseline

For the purpose of this assessment, it has been assumed that the size of the primary aggregate landbanks and the supply market for secondary and recycled aggregate will be largely the same during the construction period as for the baseline year.

While it is expected that existing landbanks will continue to be depleted, other sites and extensions to existing sites are likely to be granted to offset any potential shortfall in capacity, so that sufficient availability is provided in line with future policy requirements and market demands. MSSs and peat resources in proximity of the proposed scheme are also assumed likely to remain as per the current baseline.

10.6.6 Waste

The proposed scheme would potentially produce a range of waste types including inert, non-hazardous and hazardous wastes. The majority of wastes assumed to be produced would be construction and demolition type wastes (CDW). There would also be a small amount of municipal-type waste associated with construction workers such as food waste and packaging. A large proportion of this waste is likely to be suitable for reuse, recycling or other recovery, although a proportion may also require disposal.

10.6.7 Waste – Waste Generation Associated with the Existing Roads Network

The operational maintenance of the existing road network is likely to generate a range of CDW wastes including, but not limited to asphalt planings, soft-estate vegetative arisings, road sweepings, gully arisings, oil separator waste, animal by-products and litter. At the time of writing, there were no precise figures available regarding the baseline quantities of operational/maintenance waste generated across the first study area.

10.6.8 Waste – Waste Transfer, Treatment Recycling and Recovery Baseline

The availability of waste transfer, treatment, recycling, recovery and disposal infrastructure within Dumfries and Galloway and the surrounding area, able to accept inert, non-hazardous and hazardous waste likely to be generated during construction, has been considered through a review of the [SEPA Scottish waste sites and capacity tool](#).

A number of the waste facilities identified in Table 10-7 operate more than one waste management activity on-site and include both merchant and restricted facilities. The reported tonnages therefore represent the total wastes inputted to each facility type and not the tonnages per activity. Similarly, the reported capacities are for the facility type as a whole, not per activity as these data are not currently published by SEPA.

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Table 10-7: Annual Capacity and Utilised Capacity of Operational Waste Sites in Dumfries and Galloway and the Surrounding Area, 2023

Waste Management Facility Type	Annual Waste Capacity (tonnes)	Waste Inputs (2023) (tonnes)	Utilised Capacity (2023) (percentage)
Anaerobic digestion	275,750	114,872	42
Anaerobic digestion / Other treatment	121,135	104,597	86
Civic amenity	437,374	182,262	42
Civic amenity / Composting	38,926	15,179	39
Civic amenity / Landfill (not operational)	2,499	796	32
Civic amenity / Transfer station	667,982	191,444	29
Co-incineration	750,000	71,845	10
Composting	105,800	29,282	28
Incineration / Anaerobic Digestion / Other treatment	246,000	164,136	67
Incineration / Other treatment	10,000	3,266	33
Landfill	1,130,000	142,399	13
Landfill / Civic Amenity / Composting	277,500	7,005	3
Landfill / Composting	254,950	75,482	30
Landfill / Other treatment	1,800,000	464,071	26
Landfill / Transfer station	125,000	42,621	34
Metal recycler	337,921	537,303	159
Metal recycler / Transfer station	21,000	9,641	46
Other treatment	3,943,229	4,105,246	104
Transfer station	8,199,025	1,292,799	16
Transfer station / Landfill (not operational)	140,000	1,585	1
Transfer station / Other treatment	883,905	442,376	50

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Waste Management Facility Type	Annual Waste Capacity (tonnes)	Waste Inputs (2023) (tonnes)	Utilised Capacity (2023) (percentage)
Total capacity / inputs, and average utilised capacity (2023)	19,767,996	7,998,207	42

It can therefore be assumed on the basis of the above facility types, throughputs and capacities, that there would be significant opportunity for appropriate wastes arising during the construction of the proposed scheme to be reused, recycled or otherwise recovered via appropriate means, subject to the waste hierarchy.

Notwithstanding, the available waste transfer, treatment, recycling and recovery infrastructure is considered to be a beneficiary of incoming feedstock through driving the management of waste up the waste hierarchy. These facilities are therefore not considered to be receptors, for the purposes of the assessment in the same way as landfills, given that they have the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal.

10.6.9 Waste – Inert, Non-Hazardous and Hazardous Landfill Capacity Baseline

For wastes which cannot be reused, recycled or otherwise recovered, disposal to landfill would be required. [SEPA Scottish waste sites and capacity tool](#) details the total remaining landfill capacity in Dumfries and Galloway and the surrounding area in 2023 as presented in Table 10-8.

Table 10-8: Landfill Capacity Available in Dumfries and Galloway and the Surrounding Area, 2023

Landfill Type	Dumfries and Galloway and the Surrounding Area (tonnes)
Hazardous	0
Non-hazardous landfill	7,253,902
Inert landfill	5,315,500
Total	12,569,402

There is no hazardous landfill capacity remaining in Dumfries and Galloway and the surrounding area, therefore national hazardous landfill capacity has been considered for the proposed scheme (see Table 10-9).

Table 10-9: Hazardous Landfill Capacity Available in Scotland, 2023

Landfill Type	Scotland (tonnes)
Hazardous	31,000
Total	31,000

10.6.10 Waste – Future Waste Treatment, Recycling and Recovery Capacity Baseline

Waste treatment, recycling and recovery facilities are typically characterised by large annual throughputs; consequently, large step changes in capacity (as single facilities are commissioned) have an exaggerated impact on trends. Waste treatment, recycling and recovery infrastructure capacity cannot, therefore, be realistically projected forward to the construction period.

Waste treatment, recycling and recovery infrastructure respond to market demands, and historical trends show that infrastructure is added or removed, not least to cope with changes in waste generation. The future waste treatment and recovery infrastructure capacity for use in the assessment will, therefore, be based on the most recent available SEPA annual capacity/input data. This suggests that there is likely to be adequate opportunity for wastes arising during the construction to be recycled or otherwise recovered via appropriate means.

10.6.11 Waste – Future Inert, Non-Hazardous and Restricted User Landfill Capacity Baseline

Projected future inert, non-inert and hazardous landfill capacity has been estimated in Table 10-10. This is based on the average annual percentage change in remaining landfill capacity for the years for which consistent data are available from the [SEPA Scottish waste sites and capacity tool](#) (2015 to 2023).

The predicted changes in landfill capacity are derived from the existing SEPA waste sites and capacity tool time-based data (such as remaining landfill capacity at the end of each calendar year). These data have been projected forward to 2035, using the calculated average annual capacity change in inert and non-hazardous landfill (5.09% increasing capacity), and hazardous landfill (13.37% decreasing capacity) from 2015 to 2023, in order to provide an estimate of the remaining landfill capacity that may be available during the construction period (which has yet to be specified, but has been assumed likely to fall within the next 5-8 years). These estimates assume the continuation of a similar trend as that reported by SEPA for 2015 to 2023.

Due to there being no hazardous landfill capacity remaining in Dumfries and Galloway and the surrounding area, this assessment has considered hazardous landfill capacity on a national basis. There is limited non-hazardous landfill capacity and no remaining inert landfill capacity in Dumfries and Galloway, which is why the further decision has been made to assess

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the inert and non-hazardous landfill capacity in the region on the basis of Dumfries and Galloway and the surrounding area (Dumfries and Galloway, the Scottish Borders, Ayrshire, Lanarkshire and Glasgow City).

Table 10-10: Forecast Future Inert and Non-Hazardous Landfill Capacity in Dumfries and Galloway and the Surrounding Area and National Hazardous Landfill Capacity

Timeline	Forecast Future Landfill Capacity in the Second Study Area - Dumfries and Galloway and the Surrounding Area Inert and Non-Hazardous Landfill Capacity (tonnes)	Forecast Future Landfill Capacity in the Second Study Area - National Hazardous Capacity (tonnes)
2015	22,149,429	164,264
2016	20,561,385	133,601
2017	19,684,593	100,000
2018	17,416,457	80,000
2019	16,198,240	59,180
2020	15,858,253	43,557
2021	26,155,689	34,732
2022	13,325,178	17,225
2023	12,569,402	31,000
2024	13,209,370	26,856
2025	13,881,921	23,266
2026	14,588,715	20,156
2027	15,331,496	17,462
2028	16,112,095	15,128
2029	16,932,438	13,106
2030	17,794,548	11,354
2031	18,700,553	9,836
2032	19,652,687	8,521
2033	20,653,298	7,382
2034	21,704,855	6,395

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Timeline	Forecast Future Landfill Capacity in the Second Study Area - Dumfries and Galloway and the Surrounding Area Inert and Non-Hazardous Landfill Capacity (tonnes)	Forecast Future Landfill Capacity in the Second Study Area - National Hazardous Capacity (tonnes)
2035	22,809,952	5,541
Average between (2025 to 2035)	18,014,778	12,559

There is generally a reducing trend for landfill capacity in Scotland, however, it is envisaged that the vast majority of waste arising from the proposed scheme would be reused, recycled or otherwise recovered in accordance with legislative and policy requirements. This assumption is validated by the available Scottish statistics with 90.4% of inert and non-hazardous CDW having been recycled and diverted from landfill in 2022 (the most recent year available).

This will be required in order to demonstrate the proposed scheme's contribution to achieving [Scotland's Zero Waste Plan](#) target of recycling 70% of all waste, and landfilling a maximum of 5% by 2025; and to comply with the provisions of The Waste (Scotland) Regulations 2011 (for example taking all such reasonable measures available to apply the waste hierarchy) and The Waste (Scotland) Regulations 2012 (for example banning the landfilling of segregated waste).

It is also of note that even where wastes are accepted at landfill some may, subject to their properties, be used within landfill cover or other engineering uses, rather than be subject to and accounted as disposal. Any landfills that have ceased infilling at the time of construction and are no longer accepting waste may also still require inert and non-hazardous materials for capping and restoration purposes and therefore may be amenable to accepting any suitable surplus materials arising from the proposed scheme. However, the potential for this to occur has not been explored at this stage.

10.6.12 Sensitivity

The baseline environment is comprised of receptors which have been defined geographically based on the likely environmental effects, associated with the use and consumption of material assets and the production and disposal of waste, as set out in DMRB LA 110. Whilst these receptors and an indication of their sensitivity have been summarised in Table 10-11, it should be noted that the DMRB LA 110 simplified significance framework precludes the need to assign a sensitivity rating to the identified receptors for the purposes of assessment.

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Table 10-11: Baseline Receptor Sensitivity

Receptor	Sensitivity of the Receptor
Primary, secondary and recycled aggregate resources	There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the proposed scheme. Although, there is currently limited information on the availability of secondary aggregates.
Mineral safeguarding sites and peat resources	There is one mineral site within the 2km buffer zone of the first study area. There are Class 3, 4 and 5 peatlands identified within the first study area, and there is potential intersection of all improvement strategies (except Improvement Strategy 4) with peat soil. Given that all improvement strategies appear to intersect or be in close proximity to peat resources, as a receptor, peat and peatland has been scoped in to further assessment of potential impact and effects in this chapter.
Waste management infrastructure	There is likely to be sufficient inert and non-hazardous landfill capacity (18,014,778 tonnes) within the second study area to support the construction of the proposed scheme. However, there is anticipated to very limited hazardous landfill capacity (12,559 tonnes).

10.7 Potential Impacts

10.7.1 Material Assets

The types of materials likely to be required for construction would be common to all improvement strategies including aggregates, concrete and asphalt. At this stage of the proposed scheme, there is no information on the quantities of materials to be used during construction for all improvement strategies. However, information on the indicative maximum number of new major structures required for each improvement strategy and the approximate

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lengths of improvement strategies have been estimated. A summary of this data can be seen in Table 10-12.

The indicative maximum number of new major structures presented in Table 10-12 is based on the estimated number of major structures only, excluding minor structures that may require to be built for the improvement strategies. Retaining walls have not been considered at this stage. For the purposes of this assessment, a minor structure has an expected length of 2m or greater, up to 20m, and a major structure has an expected length of 20m or greater. In addition, structure numbers are approximate depending on the route option developed at DMRB Stage 2.

Table 10-12: Improvement Strategy Approximate Lengths and the Indicative Maximum Number of New Major Structures required for each Improvement Strategy

Improvement Strategy	Approximate Length (km)	Indicative Maximum Number of New Major Structures
Improvement Strategy 1	19.0	4
Improvement Strategy 2	12.4	2
Improvement Strategy 3	5.4	1
Improvement Strategy 4	6.0	2
Improvement Strategy 5	11.0	1
Improvement Strategy 6	17.2	3

Imported aggregates can be either primary (sand, natural gravels or rock) or secondary (recycled concrete, recycled road planings or materials from building demolition). The choice of whether to use primary or secondary aggregates (or both) would be made considering a combination of factors such as materials source, specification, production and transport. Secondary aggregates may not always have the lowest impact on the environment, and materials would be selected based on a consideration of all relevant impacts – like the effects from transportation.

10.7.2 Waste

The main waste streams generated by construction of the proposed scheme is expected to be CDW, in a form of unavoidable construction wastes (off-cuts, off-specification products), avoidable construction wastes (damaged and excess materials), demolition waste from the existing structures and excavated arisings (cut).

Other waste types generated by the improvement strategies would include soils, WEEE, packaging wastes, wood or timber waste, waste metal and Municipal Solid Waste (MSW) from site offices and construction workers. Quantities of those are not available at this stage, however, available information on waste management facilities in Dumfries and Galloway and the surrounding area (see Table 10-7) and professional judgement suggest there is adequate capacity to transfer, recycle and recover waste from the construction of the proposed scheme.

For all improvement strategies, small amounts of hazardous wastes such as used paint, oils, adhesives, sealants, bituminous mixtures and tars generated during construction could be managed via the regional hazardous waste transfer station facilities for recycling, recovery and disposal as appropriate. Although it is possible that some specific items of hazardous wastes may end up being disposed of outside of the region, this is unlikely to be large volumes (for example, small numbers of portable batteries to very specialist national facilities).

As per the Waste – Future Inert, Non-Hazardous and Restricted User Landfill Capacity Baseline section of this chapter, it is expected that at least 70% of non-hazardous CDW from the proposed scheme would be reused, recycled or otherwise recovered. Realistically, it is expected that it would be at least 90%. Nonetheless, to present the worst-case scenario, the assessment assumed that all excavated arisings would require disposal to a landfill.

10.7.3 Impact of Improvement Strategies – Material Assets

From Table 10-12, general assumptions can be made for the material quantity requirements for each improvement strategy. The longer the improvement strategy, the more material is likely to be required for improvement strategy construction. The higher the maximum number of major structures required to be built to enable construction of the improvement strategy, the more material is likely to be required for the construction of these major structures.

The limitation to this assumption is that it is unknown at this stage whether the route options that are to be developed within improvement strategies would be single carriageway or dual carriageway, and the size of the different major structures required for each improvement strategy. This information is not typically available DMRB Stage 1.

Improvement Strategy 1 is the longest (approximately 19km) and would require the highest maximum number of new major structures (four structures). On this basis, it is likely that Improvement Strategy 1 would require the most materials for construction.

Improvement Strategy 3 is the shortest (approximately 5.4km) and would require the lowest maximum number of new major structures (one structure). On this basis, it is likely that Improvement Strategy 3 would require the least materials for construction.

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Based on this logic, a shorter improvement strategy length and a lower maximum number of new major structures required to be built to enable construction, the less construction material would be required for the proposed scheme. Table 10-13 summarises a ranking of the likely impacts of materials from the improvement strategies.

Improvement Strategy 5 is approximately 11.0km in length and would require a maximum of one new major structure. Improvement Strategy 4 is approximately 6.0km in length and would require a maximum number of two new major structures. In this instance, it is more difficult to determine which option may have the greater effect. As the size of the major structures is considered a more variable parameter, this has been selected as the less reliable indicator of the quantity of material that may be required for construction. For this reason, the longer improvement strategy (Improvement Strategy 5) has been assumed to have a greater effect from materials than Improvement Strategy 4.

Table 10-13: Likely Significant Effects of Material Assets from Improvement Strategies

Improvement Strategy	Likely Significance of Effect of Material Assets (Ranked in Order From Most to Least)	Reasoning
Improvement Strategy 1	1st(Most significant)	This is the longest improvement strategy (approximately 19.0km) and has the highest maximum number of new major structures to be built (4).
Improvement Strategy 6	2nd	This is the second longest improvement strategy (approximately 17.2km) and has the second highest number of new major structures to be built (3).
Improvement Strategy 2	3rd	This is the third longest improvement strategy (approximately 12.4km) and has the joint second lowest maximum number of new major structures to be built (2).

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Improvement Strategy	Likely Significance of Effect of Material Assets (Ranked in Order From Most to Least)	Reasoning
Improvement Strategy 5	4th	This is the third shortest improvement strategy (approximately 11.0km) and has the joint lowest maximum number of new major structures to be built (1).
Improvement Strategy 4	5th	This is the second shortest improvement strategy (approximately 6.0km) and has the joint second lowest maximum number of new major structures to be built (2).
Improvement Strategy 3	6th (Least significant)	This is the shortest improvement strategy (approximately 5.4km) and has the joint lowest maximum number of new major structures to be built (1).

10.7.4 Impact of Improvement Strategies – Waste

From Table 10-12, general assumptions can be made for the waste quantities associated with each improvement strategy. It is likely that the longer improvement strategies, would require more excavation activities and therefore more excavation waste is likely to be generated. The higher the maximum number of new major structures required to be built within the improvement strategy, the more waste from construction (offcuts, damaged and excess materials) is likely to be generated to enable the major structure to be built. Demolition waste is also more likely for longer improvement strategies, as these routes span greater distances, covering more land surface and increasing the chances of intersecting with existing structures.

The limitation to this assumption is that it is unknown at this stage whether the route options that are to be developed within improvement strategies would be single carriageway or dual carriageway, and the size of the different major structures required. This information is not typically available DMRB Stage 1.

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As is typical at this early stage of the design process, the design of the improvement strategies is currently not at a stage to determine potential demolition waste, so this is also a limiting factor in this assessment.

Improvement Strategy 1 is the longest (approximately 19.0km) and has the highest maximum number of new major structures to be built (four structures). On this basis, it is likely that Improvement Strategy 1 would generate the most waste from construction, excavation and demolition.

Improvement Strategy 3 is the shortest (approximately 5.4km) and has the lowest maximum number of new major structures to be built (one structure). On this basis, it is likely that Improvement Strategy 3 would generate the least waste from construction, excavation and demolition.

Based on this logic, a shorter improvement strategy length requires less structures to be built to enable construction and as such, less construction, excavation and demolition waste would be generated by the proposed scheme. Table 10-14 summarises a ranking of the likely impacts of waste from the improvement strategies.

Improvement Strategy 5 is approximately 11.0km long and would require a maximum of one new major structure. Improvement Strategy 4 is approximately 6.0km long and would require a maximum of two new major structures. In this instance, it is more difficult to determine which route may have the greater effect. As the size of the major structures is considered a more variable parameter, this has been selected as the less reliable indicator of the quantity of waste that may be generated. For this reason, the longer improvement strategy (Improvement Strategy 5) has been assumed to have a greater effect from waste than Improvement Strategy 4.

Table 10-14: Likely Significant Effects of Waste from Improvement Strategies

Improvement Strategy	Likely Significance of Effect of Waste (Ranked in Order From Most to Least)	Reasoning
Improvement Strategy 1	1st (Most significant)	This is the longest improvement strategy (approximately 19.0km) and has the highest maximum number of new major structures to be built (4).
Improvement Strategy 6	2nd	This is the second longest improvement strategy (approximately 17.2km) and

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Improvement Strategy	Likely Significance of Effect of Waste (Ranked in Order From Most to Least)	Reasoning
		has the second highest maximum number of new major structures to be built (3).
Improvement Strategy 2	3rd	This is the third longest improvement strategy (approximately 12.4km) and has the joint second lowest maximum number of new major structures to be built (2).
Improvement Strategy 5	4th	This is the third shortest improvement strategy (approximately 11.0km) and has the joint lowest maximum number of major new structures to be built (1).
Improvement Strategy 4	5th	This is the second shortest improvement strategy (approximately 6.0km) and has the joint second lowest maximum number of new major structures to be built (2).
Improvement Strategy 3	6th (Least significant)	This is the shortest improvement strategy (approximately 5.4km) and has the joint lowest maximum number of new major structures to be built (1).

It should be noted that although Table 10-14 uses reasonable assumptions for the likely impacts of waste to be generated from the proposed scheme, the amount of demolition waste generated could notably affect the waste estimates for the improvement strategies and must be considered further.

10.8 Design, Mitigation and Enhancement Measures

Measures are proposed, where appropriate, to reduce the potential impacts associated with both the consumption of material as well as the generation and management of waste during the construction of the proposed scheme. There is considerable synergy between material use and waste generation, thus, there is overlap between the mitigation measures.

10.8.1 Design Measures

The design of the proposed scheme has not been sufficiently developed to allow mitigation measures to be defined in detail. This section then identifies established and reliable design, mitigation and enhancement measures considering relevant legislation, policy and good practice. These measures would be implemented during subsequent stages as more information becomes available.

The design for the proposed scheme would aim to minimise the use of materials where practicable and follow the waste hierarchy by reducing waste generation, increasing the recycling or recovery of waste where feasible, and reducing where possible the need for waste disposal. The earthworks design associated with the proposed scheme would aim to achieve a cut/fill balance to avoid the need to import or export material during the construction of the proposed scheme. Where practicable, construction materials would be sourced from locations close to the proposed scheme, for example, aggregate, tarmac and drainage products such as pipework.

Additional measures to design out waste and improve resource efficiency include:

- Importing materials with high recycled content.
- Designing the layout to use the existing topography.
- Designing for off-site construction of elements if practical (for example manholes, retaining walls).
- Designing for deconstruction and flexibility to make sure structures can be maintained, refurbished or extended if required.

10.8.2 Mitigation Measures

The production of a SWMP is regarded as good practice and an effective tool to achieve the most sustainable outcome in terms of waste and materials management. Furthermore, the Dumfries and Galloway LDP2 Policy IN6 states that any non-waste related planning application which in the view of the Council requires to address the issue of waste should be supported by a SWMP.

Potential additional measures that can be taken to reduce waste arisings during construction include:

- Segregating all arisings on-site.
- Reuse and recovery of materials on-site.
- Screening arisings for use as recycled aggregates.
- Identifying reusable materials on site for use on-site, storage or resale.
- Recycling and reusing suitable materials from any excess incoming construction materials.
- Removing recyclable and recoverable materials from site to be processed by licensed facilities.

10.8.3 Enhancement Measures

Enhancement measures will be explored throughout the design and construction. Design choices and the choice of materials for the construction of the proposed scheme may make a significant contribution to minimising the material operational effects by influencing the required frequency of maintenance and their lifecycle.

Enhancement opportunities exist for reuse of soils and materials within the proposed scheme, that align with the requirements of the waste hierarchy and can be implemented where applicable post-consent during the detailed design phase and subsequent construction work.

Example enhancement opportunities could include, but are not limited to:

- Using surplus recycled or recovered materials in community projects, for example using recycled mulch from tree felling on adjacent community facilities.
- Recycling suitable material for construction of noise and landscape bunding outside of the road boundary where need has previously been identified (where land availability allows).

10.9 Assessment of Likely Significant Effects

The likely significance of the potential effects is assessed within the summary provided in Table 10-15 and 10-16, which takes into consideration the application of the mitigation measures detailed in the Design, Mitigation and Enhancement Measures section of this chapter.

At this stage of assessment, based on the information available, all improvement strategies have been assessed as having the same significance outcome for material assets and waste. However, the varying potential significance of effects based on the approximate improvement

strategy lengths and indicative maximum number of major structures required can be seen and considered in Table 10-13 and Table 10-14.

Overall, the potential impacts from all improvement strategies would result from the use of material resources in construction, resulting in the depletion of natural resources at a regional and national level. This could prevent the consumption of similar material assets by future generations. The generation of surplus materials and wastes as a result of construction may impact upon the available waste management infrastructure, through both the permanent use of local and regional landfill capacity, or the short-term use of waste and recycling infrastructure capacity.

The baseline information indicates that there is likely to be sufficient material available to meet the volume required to be brought onsite for construction of all improvement strategies. It is reasonable to assume that, in line with standard practice, all improvement strategies would be able to achieve greater than or equal to 70% (by weight) of non-hazardous CDW to substitute the use of primary materials. It is also reasonable to assume that the aggregates required to be imported to site could be selected and sourced to ensure they comprise reused or recycled content in line with the percentage target of 25% for the England average target, in the absence of a Scotland specific target.

There is an increasing trend in inert and non-hazardous landfill capacity, and there is currently a reasonable overall landfill capacity available within Dumfries and Galloway and the surrounding area, as shown in Table 10-8. These data indicate that there is sufficient capacity to enable landfill disposal, if this is required by the proposed scheme. However, due to limited and declining hazardous landfill capacity in Scotland, it is possible that hazardous waste generated by the proposed scheme may require to be disposed of outside of the country boundary. In reality, small amounts of hazardous waste generated by the proposed scheme are likely able to be managed at treatment facilities within the region, and hazardous waste disposal to landfill should be avoided where feasible.

Given the current information available, the outcome of this assessment is that all improvement strategies are likely to have a moderate and 'significant' effect on waste receptors, due to the very limited hazardous waste capacity remaining and forecast in Scotland. All improvement strategies are likely to have large and 'significant' effects on material asset receptors, due to potential sterilisation of peat resources, for the purposes of environmental impact assessment or for selecting the improvement strategy.

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Table 10-15: Summary of Significance Assessment for Improvement Strategies 1 – 6: Material Asset

DMRB Significance Criteria	Assessment Against Significance Criteria
Project achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute use of primary materials.	Slight and Not Significant
Aggregates required to be imported to site comprise reused/recycled content which meets the relevant regional percentage target, which the England average of 25%.	Slight and Not Significant
Project sterilises greater than or equal to 1 mineral safeguarding site and/or peat resource.	Large

Description of Impacts – Material Asset

For material assets for Improvement Strategies 1 – 6, it is estimated that the proposed scheme could achieve 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW to substitute virgin material, and the England average target of 25% for reused/recycled content for material brought to site.

This assumption is based on the proposed scheme's contribution to achieving Scotland's Zero Waste Plan target of recycling 70% of all waste and landfilling a maximum of 5% by 2025. With good practice and mitigation this is likely to be higher.

This assumption is further supported by Scottish waste statistics which confirm that 90.4% of inert and non-hazardous CDW was recycled in 2022 (88.8% average between 2011 and 2022).

Reference to the Mineral Products Association [‘Profile of the UK Mineral Products Industry 2023 Edition’](#) also confirms that ~30% of the total supply of construction aggregates in 2022 was from recycled and secondary sources.

However, Improvement Strategies 1 – 6 appear to intersect or be in close proximity to peat soils and peatland. This means there is potential to sterilise peat greater than or equal to 1 peat resource, and therefore the overall impact significance of material assets must be categorised as large.

Table 10-16: Summary of Significance Assessment for Improvement Strategies 1 – 6: Waste

DMRB Significance Criteria	Assessment Against Significance Criteria
Greater than 1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project.	Moderate and Significant
1-50% of project waste for disposal outside of the region.	Moderate and Significant

Description of Impacts – Waste

There is capacity within the regional waste infrastructure to accommodate the likely types and quantities of non-hazardous and inert waste material from Improvement Strategies 1- 6. Table 10-7 demonstrates the range of facilities that are available to manage wastes, in particular inert and non-hazardous waste materials.

The regional waste infrastructure is likely to have sufficient landfill capacity to be able to accommodate non-hazardous and inert waste types generated from the proposed scheme, without compromising the integrity of the receiving waste infrastructure. With recycling and mitigation, the volume of waste generated is even more likely to have a less than 1% impact on regional landfill capacity.

Hazardous waste transfer stations and physical treatment or physico-chemical treatment facilities within the region are likely to be able to manage small quantities of hazardous waste expected to be generated by the proposed scheme. However, landfill sites in Scotland have limited capacity to manage quantities of hazardous waste that require landfill disposal depending on their type and properties and may require disposal outside of the region.

10.10 Proposed Scope of Future Assessment

Further information, namely estimates for material and waste quantities, would be required in subsequent DMRB Stages. From preliminary assessment, it seems likely that waste will be scoped in to further assessment, and materials and mineral safeguarding areas will also be scoped in to further iterations. Anticipated construction period, estimated construction, excavation, and demolition waste, and cut/fill balances would be required for more detailed waste significance criteria assessment. Estimated construction material quantities for the improvement strategies (influenced by the carriageway dimensions for example single carriageway/dual carriage way) and indicative maximum number of major structures required to enable development of the improvement strategies would also be required, as would

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construction material quantities for any supporting or temporary structures of the proposed scheme.

10.11 Summary

At this stage of assessment, all improvement strategies have been assessed to have similar significance for adverse effects. All improvement strategies are likely to have moderate and significant effects on regional and Scotland-wide waste receptors and are likely to have large and significant effects on regional material asset and mineral safeguarding area receptors.

As is proportionate at DMRB Stage 1, estimated quantities for materials required and waste generated from the proposed scheme have not been taken into consideration. Assumptions have been made based on the approximate improvement strategy lengths and indicative maximum number of new major structures required. Table 10-17 summarises the outcome of this assessment, using a ranking from 1st (likely to have the most significant effect) to 6th (likely to have the least significant effect).

Table 10-17: Likely Significance of Effect of Material Assets and Waste from Improvement Strategies

Improvement Strategy	Likely Significance of Effect of Material Assets and Waste (Ranked in Order From Most to Least)
Improvement Strategy 1	1st
Improvement Strategy 6	2nd
Improvement Strategy 2	3rd
Improvement Strategy 5	4th
Improvement Strategy 4	5th
Improvement Strategy 3	6th

However, due to the high level nature of information available at this stage, Table 10-17 does not account for the potential effects of demolition waste as a result of the proposed scheme. This will need to be assessed in further stages of assessment in order to gain clarity on the effects of construction, excavation and demolition waste generated by the proposed scheme.

11. Noise and Vibration

11.1 Introduction

This chapter describes the methodology followed and potential impacts identified for the noise and vibration assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). This assessment has been undertaken with reference to [Design Manual for Roads and Bridges \(DMRB\) LA 111 - Noise and vibration \(revision 2\)](#) (hereafter referred to as “DMRB LA 111”) and other relevant standards and guidance set out within this chapter.

11.2 Legislative and Policy Framework

Table 11-1 provides a summary of the legislation relevant to this noise and vibration assessment.

Table 11-1: Legislation Relevant to the Noise and Vibration Assessment

Legislation	Relevance to the Proposed Scheme
Noise Insulation (Scotland) Regulations 1975 and Land Compensation (Scotland) Act 1973	In the case of noise from new or altered roads the ‘Noise Insulation (Scotland) Regulations 1975’ (NISR) provides certain mandatory and discretionary powers in relation to the provision of noise insulation to affected dwellings. The methodology provided in ‘The Memorandum on the Noise Insulation (Scotland) Regulations 1975’ Regulations 3 and 6 should be used to establish eligibility of receptors. Under Regulation 3 of the NISR, noise from a new highway that conditionally exceeds 68 dB $L_{A10,18h}$ requires a roads authority to make offers of insulation to eligible dwellings. The conditions are that the noise level must also increase by at least 1 dB, with a 1 dB contribution to the increase in noise level to be from the new or altered roads.

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Legislation	Relevance to the Proposed Scheme
	Note: The index adopted by the UK Government to quantify road traffic noise is the $L_{A10,18h}$, which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the 18 one-hour periods between 6am and midnight.
Control of Pollution Act 1974	The Control of Pollution Act 1974 controls waste disposal, water pollution and noise atmospheric pollution. Under the Act, the local authority may serve notice imposing requirements as to how and when works to roads are carried out, in order to limit construction noise arising from such works and having regard to the need to ensure the best practicable means are employed to minimise noise. The Act sets out the procedure for applying to the local authority for consent prior to carrying out works with the intention of agreeing noise and vibration limits in advance of works and avoiding the need for service of a notice for control of noise under the Act.
Environmental Protection Act 1990	The Environmental Protection Act 1990 provides for the control of air pollution, land wastes, nuisance and radioactive substances in order to protect the environment. Part III of the Act defines what may constitute a statutory nuisance (including noise prejudicial to health), what activities are specifically exempt, the procedures the local authority must follow for service of notices to deal with abatement of statutory nuisances and the penalties payable for conviction of causing a statutory nuisance. Local authorities have a duty under the Act

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Legislation	Relevance to the Proposed Scheme
	to inspect their area from time to time to detect statutory nuisances.
The Noise and Statutory Nuisance Act 1993	This Act amended Part III of the Environmental Protection Act 1990 by placing additional definitions in the list of statutory nuisances in Section 79 of that Act. The definitions relate to nuisance caused by vehicles, machinery and equipment in the road.
Environmental Noise (Scotland) Regulations 2006 amended by the Environmental Noise (Scotland) Amendment Regulations 2018	The Environmental Noise (Scotland) Regulations 2006 implements the obligations of the Scottish Government established within the Environmental Noise Directive (END). The regulations relate to the assessment and management of environmental noise. They require the production of strategic noise maps showing peoples exposure to environmental noise from major roads, railways and airports and in urban areas. Action plans must also be developed based on the noise maps to reduce noise levels where necessary and to preserve environmental noise quality in areas where it is good.

11.2.1 National Policy

Planning Advice Note 1/2011: planning and noise

The Scottish Government's [Planning Advice Note 1/2011: planning and noise](#) (PAN) provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. Information and advice on noise impact assessment (NIA) methods is provided in the associated Technical Advice Note.

The PAN promotes the principles of good acoustic design and a sensitive approach to the location of new development, to ensure that quality of life is not unreasonably affected, and that new development continues to support sustainable economic growth.

The PAN provides advice on the assessment of some source of noise. In relation to road traffic noise impact assessments for the development or improvement of major roads predictions of the effects of road traffic noise can be useful.

Assessment of Noise: Technical Advice Note (March 2011)

The Scottish Government's [Assessment of Noise: Technical Advice Note](#) (TAN) provides guidance to assist in the technical evaluation of noise assessment. It does not provide prescriptive guidance on noise assessment. The TAN defines noise impact assessment as a process which identifies and evaluates the key noise impacts of a development for the purposes of informing the design and planning decision process. The noise assessment should assess the change in the acoustic environment that will be brought about by the proposed scheme.

For a quantitative assessment of noise impacts, the significance of the noise impact at receptors can be determined from the sensitivity of a receptor and the magnitude of change relative to an absolute threshold or relative to the pre-existing ambient noise level. Guidance on the appropriate sensitivity of a receptor is given, and a scale of magnitude is provided in relation to change in road traffic noise in a residential area in terms of $L_{A10,18hr}$ decibels (dB).

11.2.2 Local Policy and Plans

[Dumfries and Galloway Local Development Plan 2](#) provides the local planning framework and includes the following policy in relation to noise and vibration:

- Policy OP1 Development Considerations: Development proposals should be compatible with the character and amenity of the area and should not conflict with nearby land uses. There are a range of issues which may result from the development, including noise and vibration, which will be a material consideration in the assessment of proposals.

11.3 Assessment Methodology

The methodology that has been used for this high-level assessment is described in this section. The improvement strategies have been assessed qualitatively with reference to the assessment methodology described in DMRB LA 111.

There are six improvement strategies under consideration, which run between Castle Douglas and Dumfries alongside or in parallel to the existing A75. There are various start and end points of the improvement strategies with the southernmost being Allanton Roundabout, and the northernmost being Drummore roundabout at the start of the existing dualled section, east of Lochfoot Burn.

DMRB LA 111 paragraph 2.1 states:

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- 'During options identification, the level of detail of a noise and vibration assessment shall be proportionate to the quality of data available and the risk of likely significant effects occurring'.

As is proportionate for DMRB Stage 1, the assessment of improvement strategies is qualitative with discussion of the possible impacts within each improvement strategy.

11.3.1 Data Sources

- [Scotland's Noise maps](#)

11.4 Assumptions and Limitations

11.4.1 Assumptions

It is assumed that the Scotland Noise maps can provide an indication of the existing noise level to inform a high-level summary of the baseline.

It is assumed that operational vibration from road traffic would be scoped out of assessment at DMRB Stage 2, in line with the recommendations of DMRB LA 111.

11.4.2 Limitations

There is no information available regarding likely construction phase activities, and at this stage the specific location of likely construction activities is also not known. An assessment of likely noise from construction activities has therefore not been carried out. This is not considered to be a risk to the selection of an improvement strategy as construction methods are likely to be similar for all improvement strategies and are temporary.

There was no traffic data for the improvement strategies available to inform the assessment. The study area is therefore based on a distance of 600m from the improvement strategies at this stage. This is not considered to be a risk to the selection of an improvement strategy as the same assumption is made for all improvement strategies.

11.5 Study Area

Instructions on how to set the study area for an assessment of noise and vibration are provided within DMRB LA 111. The distances used for the study areas have been informed by professional judgement and correspond to the distance where it is considered that receptors could potentially be affected by noise or vibration.

For construction noise, a study area of 300m from construction activities is considered appropriate. For construction vibration, any receptors within 100m of an activity likely to generate a noticeable level of vibration would be considered. The construction traffic (such as

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traffic generated due to the construction of the proposed scheme but excluding non-construction related traffic using a diversion route) study area is an area 50m from the kerb line of public roads with the potential for an increase in noise level of 1dB(A) or more as a result of the addition of construction traffic to existing traffic levels. A study area for diversion routes is defined to include a 25m width from the kerb line of any diversion route.

The study area for operational road traffic should include the area within 600m of new road links or road links physically changed or bypassed by the proposed scheme. In addition, any roads outside of this area where there is a change in the short term of more than 1dB(A) as a result of the proposed scheme would also be considered when traffic data is available to inform this, and on these links the receptors within 50m should be included within the assessment. This is not known at this stage as traffic data is not available.

The study areas relevant to this DMRB Stage 1 assessment are shown on Figure 11-1.

11.6 Baseline Conditions

The baseline conditions are from a desktop review of available information. For an assessment of noise and vibration, sensitive receptors would typically be where people are, so such locations as dwellings, schools, hospitals and community facilities. A building alone can be sensitive to structural damage from vibration, although the building would need to be very close to certain construction works for this to occur.

The existing noise climate in the vicinity of the proposed scheme is dominated by road traffic noise from the A75. An indication of the noise level can be found in the strategic [Noise map](#) produced by the Scottish Government. These maps indicate a daytime noise level of 65-70dB L_{DAY} (L_{DAY} is a noise indicator based upon annual average A-weighted long-term sound over the day-time period (07:00-19:00)) adjacent to the A75 between Springholm and Crocketford, with the night-time noise being around 60-65dB L_{NIGHT} (L_{NIGHT} is a noise indicator for sleep disturbance based upon annual average A-weighted long term sound over the night-time period (23:00 – 07:00)). Further from the A75 road traffic levels will be lower, and no other major noise sources have been identified.

Transport Scotland has identified areas where the 1% of the population that are affected by the highest noise levels from roads are located, according to the results of the strategic noise mapping, and these are Candidate Noise Management Areas (CNMAs). There are no CNMAs located within 600m of the improvement strategies.

There are residential dwellings in the settlements of Brae, Crocketford and Springholm along the A75 within the DMRB Stage 1 Assessment Corridor, as well as smaller groups and individual residential dwellings. There is also Springholm Primary School, in Springholm,

approximately within 45m of the A75 that currently experience road traffic noise from the A75.

Within 600m of the improvement strategies there are the settlements of Milton, Kirkpatrick Durham, Hardgate, Haugh of Urr, Old Bridge of Urr, Clarebrand and the northern side of Castle Douglas. There are also further smaller groups and individual residential dwellings as well as Hardgate Primary School and Castle Douglas Medical Group GP surgery.

11.7 Potential Impacts

11.7.1 Construction Phase

The assessment of impacts from construction noise and vibration considers that there is the potential for adverse impacts within distances of 300m and 100m respectively from construction works. The locations of any construction works are not known at DMRB Stage 1, with broad improvement strategies under consideration. Furthermore, likely construction phase activities are not currently known, and these are likely to differ depending on the improvement strategy selected.

Potential impacts during construction, including those from construction traffic and possible haul routes, will therefore be reviewed at the next stage of assessment when more information regarding route options and potentially construction phase activities are known.

11.7.2 Operation Phase

A description of the likely impacts from road traffic noise for each improvement strategy is provided in this section.

Improvement Strategy 1

Improvement Strategy 1 is offline and leaves the existing A75 at Allanton Roundabout. It then runs north-west of Springholm, Auchenreoch Loch and Crocketford, before rejoining the existing A75 at Drummole Roundabout. It would involve the construction of a new carriageway between the Allanton and Drummole roundabouts. The total length of the improvement strategy is approximately 19km.

There is the potential for there to be reductions in road traffic noise for noise sensitive receptors that are within 600m of the current section of the A75 that would be bypassed by Improvement Strategy 1. This includes residential dwellings in the settlements of Brae, Crocketford and Springholm along the A75 as well as smaller groups and individual residential dwellings and a primary school in Springholm.

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Improvement Strategy 1 would introduce road traffic noise into areas where there are no existing major sources of road traffic noise. In particular, noise sensitive receptors within 600m of the route would be likely to experience increases in road traffic noise. This includes moving the main source of road traffic noise from the eastern side of Crocketford to the western side and increasing road traffic noise to the settlements of Old Bridge of Urr, Kirkpatrick Durham and Clarebrand as well as smaller groups and individual residential dwellings.

Improvement Strategy 2

Improvement Strategy 2 is offline and leaves the existing A75 at a location approximately 2.7km south of Springholm. It then runs north-west of Springholm, Auchenreoch Loch and Crocketford before rejoining the existing A75 at a location approximately 0.8km north-east of the settlement of Brae. It would involve the construction of a new carriageway between the existing A75 / B794 junction and the existing A75 to north-east of Brae. The total length of the improvement strategy is approximately 12.4km.

There is potential for reductions in road traffic noise for noise sensitive receptors that are within 600m of the current section of the A75 that would be bypassed by Improvement Strategy 2. This includes residential dwellings in the settlements of Brae, Crocketford and Springholm along the A75 as well as smaller groups and individual residential dwellings and a primary school in Springholm.

Improvement Strategy 2 would introduce road traffic noise into areas where there are no existing major sources of road traffic noise. In particular, noise sensitive receptors within 600m of the route would likely experience increases in road traffic noise. This includes moving the main source of road traffic noise from the eastern side of Crocketford to the western side and increasing road traffic noise to the eastern side of the settlement of Kirkpatrick Durham as well as small groups and individual residential dwellings.

Improvement Strategy 3

Improvement Strategy 3 is online and follows the route of the existing A75 from the south of Springholm to the north of the Crocketford. This includes the sections of existing A75 subject to the 30mph speed restriction. The total length of the improvement strategy is approximately 5.4km.

There are noise sensitive receptors in the vicinity of the A75 in this section within Crocketford and Springholm, including Springholm Primary School, as well as smaller groups and individual residential dwellings that may experience increases in road traffic noise.

Improvement Strategy 4

Improvement Strategy 4 is offline and leaves the existing A75 at a location approximately 0.8km south-west of Springholm. It then runs to the south-east of Springholm, parallel to the existing A75 for approximately 1.2km, before continuing south-east of Crocketford and re-joining the existing A75 approximately 0.6km north-east of Crocketford. It would involve the construction of a new carriageway between the south-west of Springholm and the north-east of Crocketford. The total length of the improvement strategy is approximately 6.0km.

There is potential for a reduction in road traffic noise for noise sensitive receptors that are within 600m of the current section of the A75 that would be bypassed by Improvement Strategy 4. This includes residential dwellings in the settlements of Crocketford and Springholm along the A75 as well as smaller groups and individual residential dwellings and a primary school in Springholm.

Improvement Strategy 4 would increase road traffic noise for a smaller number of individual and groups of dwellings within 600m of its alignment to the east where the A75 would be brought closer to sensitive receptors.

Improvement Strategy 5

Improvement Strategy 5 is offline and leaves the existing A75 approximately 0.4km south of the Ramhill Bridge over Urr Water. It then runs south-east of Springholm and passes south-east of Auchenreoch Loch and Crocketford and north-west of Milton Loch before rejoining the existing A75 near the settlement of Brae. It would involve the construction of a new carriageway between the south of Ramhill Bridge and the south of Brae. The total length of the improvement strategy is approximately 11km.

There is potential for reductions in road traffic noise for noise sensitive receptors that are within 600m of the current section of the A75 that would be bypassed by Improvement Strategy 5. This includes residential dwellings in the settlements of Crocketford and Springholm, including the primary school, as well as smaller groups and individual residential dwellings.

Improvement Strategy 5 would increase road traffic noise for a smaller number of individual and groups of dwellings within 600m of its alignment to the east where the A75 would be brought closer to noise sensitive receptors.

Improvement Strategy 6

Improvement Strategy 6 is offline and leaves the existing A75 at Allanton Roundabout. It then follows a route south-east of Springholm, Crocketford and Milton Loch. It also passes to the east of Haugh of Urr, Hardgate and Milton, running parallel to the Old Military Road for the

majority of the route, rejoining the existing A75 at the Drummole Roundabout. It would involve the construction of a new carriageway between the Allanton to Drummole roundabouts. The total length of the improvement strategy is approximately 17.2 km.

There is potential for a reduction in road traffic noise for noise sensitive receptors that are within 600m of the current section of the A75 that would be bypassed by Improvement Strategy 6. This includes residential dwellings in the settlements of Brae, Crocketford and Springholm along the A75 as well as smaller groups and individual residential dwellings and a primary school in Springholm.

Improvement Strategy 6 would introduce road traffic noise into areas where there are no existing major sources of road traffic noise, where noise sensitive receptors within 600m of the route would be likely to experience increases in road traffic noise. This includes the settlements of Haugh of Urr, Hardgate, Milton and Lochfoot as well as smaller groups and individual residential dwellings. Improvement Strategy 6 is also within 600m of Hardgate Primary School and Lochrutton Primary School where increases in road traffic noise would be likely.

11.8 Design, Mitigation and Enhancement Measures

11.8.1 Construction Phase

Construction noise and vibration mitigation would occur as a matter of course due to legislative requirements or standard sector practices. Prior to construction, an Environmental Management Plan (EMP) would be prepared and implemented. This would include the relevant construction noise criteria and any proposed monitoring during construction. This would also contain details of good practice measures associated with mitigating potential noise and vibration impacts. Appropriate mechanisms to communicate with local residents would be developed to highlight potential periods of disruption. These mechanisms could include web-based updates or articles, newsletters and radio announcements.

11.8.2 Operation Phase

When considering any required operational noise mitigation, the principle of source-path-receptor is applied. This is a principle where noise mitigation is first considered at source as this is more often the most practical and cost-effective solution, and it would also provide a reduction in noise to all the surrounding receptors. Examples of mitigation at source are:

- Changes to the vertical or horizontal alignment of the road.
- Low noise road surfacing.
- Speed limits.
- Restrictions on noisy vehicle types.

DMRB LA 111 notes that, for operational mitigation, speed limits or restrictions on noisy vehicle types are not normally practical for use on motorways and all-purpose trunk roads, as they can encourage drivers to take alternative routes which can be less safe and result in higher noise levels for populations along the alternative routes.

The reduction of noise between the source and receptor is considered next as, after controlling noise at source, a reduction in the path would benefit the greatest number of receptors. A reduction in noise in the path is most likely to be achieved by placing a solid structure between the source and receptor, such as a purpose-built noise barrier. However, the use of a solid barrier would only protect receptors within around 200m of the barrier.

Examples of mitigation in the path are:

- Purpose build noise barriers.
- Bunds or earth embankments.

The mitigation of noise at the receptor in the form of noise insulation of buildings is the last resort in terms of noise mitigation and is included here only to demonstrate the hierarchy of noise mitigation. Noise insulation is the last form of mitigation because it would only be of benefit to the individual receptor. In addition, providing insulation in terms of improved glazing would be ineffective if the windows of a property are open or if the individuals are outside.

11.9 Assessment of Likely Significant Effects

11.9.1 Construction Phase

The construction phase of the proposed scheme is likely to cause some significant adverse noise effects for some receptors and is likely to be the case for any improvement strategy. The main construction activities are likely to include the following:

- De-vegetation/site clearance.
- Earthworks/retaining walls.
- Drainage works.
- Road construction and surfacing.
- Lighting and traffic signs.
- Landscaping.

Significant adverse effects can usually be mitigated through the implementation of a Construction Environmental Mitigation Plan (CEMP). Construction phase impacts and effects will be considered in more detail at DMRB Stage 2 and 3. It is considered unlikely there would be any significant adverse effects from vibration.

11.9.2 Operation Phase

It has not been possible to confirm the magnitude of change in noise through calculations at this stage of assessment, and therefore the likelihood of significant effects. However, it is considered likely that with Improvement Strategies 1, 2, 4, 5 and 6, there would be significant beneficial effects from road traffic noise for receptors along the existing A75 alignment, and significant adverse effects from road traffic noise for receptors within these improvement strategies. It is considered likely that mitigation can be provided that can reduce or remove any potential significant adverse effects.

Improvement Strategy 3 involves mostly online improvements. There is the potential for significant adverse effects from road traffic noise if the improvements result in increased traffic flows or speeds. It is considered likely that mitigation can be provided that can reduce or remove any potential significant adverse effects.

The magnitude of change for route options developed within the improvement strategies will be confirmed at DMRB Stage 2 through calculation. The risk of likely significant effects is considered to be the same for all improvement strategies.

11.10 Proposed Scope of Future Assessment

Assessment should be undertaken at DMRB Stage 2 and 3 to assess potential construction noise and operational noise and vibration at a suitable level of detail proportionate to the information available at each stage.

11.11 Summary

It is likely that the construction phase would result in some temporary significant adverse effects for some noise sensitive receptors close to the construction works for any of the improvement strategies. Significant adverse effects can usually be mitigated through the implementation of a CEMP. Construction phase impacts and effects will be considered in more detail at DMRB Stage 2 and 3.

The operation phase would result in changes in road traffic noise for noise sensitive receptors, depending on their location relative to the proposed scheme. The overall effects are likely to be similar whichever improvement strategy is selected, although Improvement Strategy 3 is less likely to result in any significant beneficial effects. Operational phase impacts and effects will be considered in more detail at DMRB Stage 2 and 3.

12. Population and Human Health

12.1 Introduction

This chapter describes the methodology followed and the potential impacts identified for the population and human health assessment of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). This assessment has been undertaken with reference to the [Design Manual for Roads and Bridges \(DMRB\) LA 112 - Population and human health \(revision 1\)](#) (hereafter referred to as “DMRB LA 112”) and other relevant standards and guidance set out within this chapter.

12.2 Legislative and Policy Framework

Table 12-1, Table 12-2 and Table 12-3 provide a summary of the legislation and policies that are relevant to this population and human health assessment.

12.2.1 Legislation

Table 12-1: Legislation Relevant to the Population and Human Health Assessment

Legislation	Relevance to the Proposed Scheme
EIA Directive 2014/52/EU	The EIA Directive 2014/52/EU mandates that environmental impact assessments (EIAs) for major projects in the EU must evaluate their significant effects on population and human health. The assessment must be thorough, transparent, and involve public consultation. After Brexit, Directive 2014/52/EU no longer directly applies in Scotland. However, its provisions have been retained in UK law through the European Union (Withdrawal) Act 2018. This means that the requirements of Directive 2014/52/EU continue to be implemented in Scotland through domestic legislation.
Environmental Protection Act 1990	This Act ensures that environmental pollutants, which can arise from increased traffic and construction activities, are identified and mitigated. By regulating emissions and waste, the Act helps protect public health from adverse effects such as air and water pollution. Additionally, it addresses statutory nuisances, which include noise and vibration, further safeguarding community health.

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Legislation	Relevance to the Proposed Scheme
The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017	The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 require that any new road construction project undergoes an environmental impact assessment (EIA) if it significantly affects the environment. This includes evaluating impacts on population and human health, such as air quality, noise, and socio-economic conditions.

12.2.2 National Policy

Table 12-2: National Policy Relevant to the Population and Human Health Assessment

National Policy	Relevance to the Proposed Scheme
National Planning Framework 4	The National Planning Framework 4 (NPF4) sets out a national spatial strategy for Scotland, emphasising sustainable development and the creation of healthier, more inclusive communities. It promotes sustainable mobility by encouraging the development of infrastructure that supports walking, cycling, and public transport. Additionally, it focuses on health risks associated with traffic, noise, and air pollution, while enhancing access to public services and recreational spaces.
Scottish Planning Policy	The current Scottish Planning Policy (SPP) was published in June 2014, it directs the form and content of development plans and is a material consideration in the assessment of planning applications. SPP sets out the core values and vision of planning set against the same four planning outcomes as NPF4 (above). The outcomes are consistent across the NPF4 and SPP and focus on creating a place which is sustainable, low carbon, natural, resilient and more connected. SPP sets out two principal policies; 'sustainability' and 'placemaking' and then outlines various subject policies.
National Transport Strategy 2	The National Transport Strategy 2 (NTS2) focuses on reducing inequalities, taking climate action, delivering inclusive economic growth, and improving health and wellbeing through active travel and reduced pollution.

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National Policy	Relevance to the Proposed Scheme
Scotland's Cities: Delivering for Scotland	The agenda identified connecting cities with strong, reliable and resilient transport infrastructure as a key characteristic to support growth. Published alongside this was the Scottish Government's Infrastructure Investment Plan, providing an overview of plans for infrastructure investment over the coming decades. To complement the Agenda for Cities, the investment plan contains a commitment to complete the dual carriageway network between all Scotland's cities by 2030.
Promoting Health in All Policies and intersectoral action capacities	Health in All Policies (HiAP) is an approach by the WHO that integrates health considerations into policymaking across all sectors. It aims to improve population health and equity by systematically considering health impacts and fostering intersectoral collaboration such as with the transport sector.
Scotland's public health priorities	In 2018, Scottish Government and Convention of Scottish Local Authorities (COSLA) developed six priorities for public health that aim to improve the health of the population. The priorities are intended to be a foundation for the whole system, for public services, third sector, community organisations and others, to work better together to improve Scotland's health, and to empower people and communities. A Population Health Framework (PHF) is currently being developed by the Scottish Government and COSLA, in collaboration with key system wide partners, including Public Health Scotland and Scotland's Directors of Public Health. The PHF is due to be released imminently and could replace the existing public health priorities. The release of the framework will be monitored and once it becomes available will be considered in the population and human health assessment moving forwards.
Scotland's National Performance Framework	Alongside the public health priorities, the National Performance Framework underpins the policy approach to health and wellbeing. The Scottish Government has committed to a period of reform of National Performance Framework to support the development and implementation of a more strategic and impactful framework for Scotland highlighted in the National Performance Framework - Open Government action plan 2021 to 2025: commitment 5 – participation

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National Policy	Relevance to the Proposed Scheme
	milestone progress . In the meantime, the current 11 National Outcomes are still in operation as is the duty (Community Empowerment Act) on public bodies 'to have regard' to them.
A Long-Term Vision for Active Travel in Scotland 2030	Transport Scotland's Vision for Active Travel sets out an approach to Scotland's communities which are shaped around people with walking or cycling as the most popular choice for shorter everyday journeys. Regarding infrastructure, The Transport Scotland vision seeks to ensure: 'Comprehensive active travel networks are available for walking and cycling... Nationally, walking and cycling networks (comprising the National Cycle Network, Long Distance Routes (LDRs), regional routes, core paths and local cycle networks) link settlements, places of interest and public transport hubs'.

12.2.3 Local Policy and Plans

Table 12-3: Local Policy and Plans Relevant to the Population and Human Health Assessment

Local Policy and Plans	Relevance to the Proposed Scheme
SWestrans Regional Transport Strategy 2023 to 2042	The SWestrans Regional Transport Strategy 2023-2042 focuses on improving connectivity and infrastructure to enhance accessibility and mobility across the region, with an emphasis on active travel, public transport, sustainable mobility, and health and wellbeing.
Dumfries and Galloway Active Travel Strategy 2022 to 2032	This document aims to promote walking, cycling, and other forms of sustainable transport. It recognises the link between transport and health, aiming to create environments that support physical activity and reduce health risks.
South of Scotland Indicative Regional Spatial Strategy	The Indicative Regional Spatial Strategy (IRSS) outlines development priorities and includes considerations for transport infrastructure and its effects on community wellbeing.
Dumfries and Galloway Local Development Plan 2	The Local Development Plan 2 (LDP2) outlines how land and property would be used and where development would take place. It includes policies to ensure that new

Local Policy and Plans	Relevance to the Proposed Scheme
	developments are accessible and meet the needs of all residents.
Dumfries and Galloway Council Plan 2023-28	This plan outlines the vision and strategic outcomes for the region, including creating connected, healthy, and sustainable communities. It emphasizes the importance of quality public services and aims to ensure all citizens prosper.

12.3 Assessment Methodology

12.3.1 Introduction

This chapter examines potential population and human health issues related to each of the six improvement strategies, recognising that road transport schemes have the potential to significantly impact the local environment and communities in their vicinity. This Environmental Appraisal Report (EAR) will be conducted in accordance with the DMRB LA 112.

DMRB LA 112 is the standard approach used for road infrastructure schemes across the UK and Ireland for the assessment of environmental impacts. The guidance provides a framework for assessing the impact on land use and accessibility and has been used to determine the sensitivity and magnitude of impact for residential, community, commercial, WCH (Walking, Cycling, and Horse-riding), and agricultural receptors, as well as health impacts from construction and operation phases of the proposed scheme.

As is typical at DMRB Stage 1, there is limited design and baseline information available, it is not possible to undertake a full assessment in alignment with DMRB LA 112 (for example using sensitivity and magnitude criteria). Therefore, a qualitative assessment using professional judgement has been undertaken with cognisance of DMRB LA 112. As further information becomes available at DMRB Stage 2 and 3, DMRB LA 112 guidance will be fully utilised.

12.3.2 Data Sources

A desktop review has been undertaken to establish the baseline and inform the assessment of significant effects. This has been informed drawing on the following key information sources:

- [Scotland's Census](#).
- [AddressBase Plus](#) for residential, community and commercial receptors.
- [Google Maps](#).

- Project design drawings.
- [NatureScot local path networks](#) for Dumfries and Galloway.
- Local, national, and regional walking/cycling trails.
- [Scotland's Public Health Observatory](#).
- [Scottish Index of Multiple Deprivation](#).

12.3.3 Receptor Sensitivity – Land Use and Accessibility

When considering the sensitivity of land use receptors, cognisance has been given to the DMRB LA 112 criteria outlined in Table 12-4. However, at this early stage in development of corridors for improvement strategies, sensitivity has not yet been assigned to individual receptors. This will be undertaken at DMRB Stage 2 once route options are defined and a more comprehensive baseline is developed.

When considering the sensitivity criteria for private property and housing, a higher sensitivity value can be allocated where private property or housing provision is integral to the character and function of the community with little/no provision for substitution (for example private property in small rural villages). Additionally, for development land and businesses, a higher sensitivity score can be allocated where a business is the main source of employment for a community with little/no provision for substitution.

It should be noted that while the Disability Discrimination Act 1995 laid the groundwork for disability rights in the UK, the Equality Act 2010 is the most recent and relevant legislation that provides comprehensive protections against disability discrimination.

Table 12-4: Receptor Sensitivity Criteria (reproduced from Table 3.11 of DMRB LA 112)

Category	Indicative Criteria
Very High	Private property and housing: Existing housing and land allocated for housing (for example strategic housing sites) covering greater than 5ha and/or greater than 150 houses. Community land and assets where there is a combination of the following: Complete severance between communities and their land/assets, with little/no accessibility provision; Alternatives are only available outside the local planning authority area; The level of use is very frequent (daily); and The land and assets are used by the majority (greater than or equal to 50%) of the community. Development land and businesses:

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Category	Indicative Criteria
	Existing employment sites (excluding agriculture) and land allocated for employment (for example strategic employment sites) covering greater than 5 hectares. Agricultural land holdings: Areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a frequent basis (daily). WCH: National trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little/no potential for substitution. Routes regularly used by vulnerable travelers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. Rights of way for WCH crossing roads at grade with greater than 16,000 vehicles per day.
High	Private property and housing: Existing housing and land allocated for housing (for example strategic housing sites) covering greater than 1-5 hectares and/or greater than 30-150 houses. Community land and assets where there is a combination of the following: There is substantial severance between community and assets, with limited accessibility provision; Alternative facilities are only available in the wider local planning authority area; The level of use is frequent (weekly); and The land and assets are used by the majority (greater than or equal to 50%) of the community. Development land and businesses: Existing employment sites (excluding agriculture) and land allocated for employment (for example strategic employment sites) covering greater than 1 - 5 hectares. Agricultural land holdings:

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Category	Indicative Criteria
	Areas of land in which the enterprise is dependent on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a frequent basis (weekly). WCH: Regional trails and routes (for example promoted circular walks) likely to be used for recreation and to a lesser extent commuting, which record frequent (daily) use. Limited potential for substitution; and/or Rights of way for WCH crossing roads at grade with greater than 8,000 - 16,000 vehicles per day.
Medium	Private property and housing: Existing housing and land allocated for housing (for example strategic housing sites) covering less than 1 hectares and/or less than 30 houses. Community land and assets where there is a combination of the following: There is severance between communities and their land/assets but with existing accessibility provision; Limited alternative facilities are available at a local level within adjacent communities; The level of use is reasonably frequent (monthly); and The land and assets are used by the majority (greater than or equal to 50%) of the community. Development land and businesses: Existing employment sites (excluding agriculture) and land allocated for employment (for example strategic employment sites) covering less than 1 hectares. Agricultural land holdings: Areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly). WCH: Public rights of way and other routes close to communities which are used for recreational purposes (for example dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys, and/or

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Category	Indicative Criteria
	Rights of way for WCH crossing roads at grade with greater than 4000 – 8000 vehicles per day.
Low	Community land and assets where there is a combination of the following: Limited existing severance between community and assets, with existing full Disability Discrimination Act (DDA) DDA 1995 compliant accessibility provision; Alternative facilities are available at a local level within the wider community; The level of use is infrequent (monthly or less frequent); and The land and assets are used by the minority (greater than or equal to 50%) of the community. Development land and businesses: Proposed development on unallocated sites providing employment with planning permission/in the planning process. Agricultural land holdings: Areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and Access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent). WCH: Routes which have fallen into disuse through past severance, or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes, and/or Rights of way for WCH crossing roads at grade with less than 4000 vehicles per day
Negligible	Community land and assets where there is a combination of the following: No or limited severance or accessibility issues; Alternative facilities are available within the same community; The level of use is very infrequent (a few occasions yearly); and The land and assets are used by the minority (greater than or equal to 50%) of the community. Agricultural land holdings: Areas of land which are infrequently used on a non-commercial basis.

12.3.4 Magnitude of Impact – Land Use and Accessibility

When considering the magnitude of impact, cognisance has been given to the DMRB LA 112 criteria outlined in Table 12-5. However, at this early stage in the development of improvement strategies and design, the magnitude of impact is not yet known.

Table 12-5 Magnitude of Impact Criteria (reproduced from Table 3.12 of DMRB LA 112)

Category	Indicative Criteria
Major	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. For example direct acquisition and demolition of buildings and direct development of land to accommodate highway assets; and/or Introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision. WCH: Greater than 500m increase (adverse)/decrease (beneficial) in WCH journey length.
Moderate	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: Partial loss of/damage to key characteristics, features or elements, for example partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings; and/or Introduction (adverse) or removal (beneficial) of severe severance with limited/moderate accessibility provision. WCH: Greater than 250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.
Minor	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: A discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, for example amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings; and/or

Category	Indicative Criteria
	Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision. WCH: Greater than 50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.
Negligible	Private property and housing, community land and assets, development land and businesses and agricultural land holdings: Very minor loss or detrimental alteration to one or more characteristics, features or elements. For example acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings; and/or Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision. WCH Less than 50m increase (adverse) or decrease (beneficial) in WCH journey length.
No Change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

In general, direct acquisition of a property would be categorised with a major magnitude. A moderate magnitude would be assigned where there would be changes to access or the acquisition of land, but the overall changes would not compromise the overall ability to use a property. A minor magnitude would be assigned where there would be a minor loss of land.

12.3.5 Significance of Effect – Land Use and Accessibility

DMRB LA 112 outlines significance as an effect that should be derived by combining the assigned value (sensitivity) of receptors with the magnitude of change arising from a project, in accordance with [DMRB LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as “DMRB LA 104”).

Table 12-6 outlines a matrix that will be used to determine the significance of effects. As sensitivity has not yet been assigned to receptors, and it is not yet possible to determine the magnitude of impact, an assessment of significance in accordance with the significance matrix has not been undertaken at DMRB Stage 1. This will be undertaken at DMRB Stage 2 during route option development.

Table 12-6: Significance Matrix

Sensitivity	Negligible Magnitude	Minor Magnitude	Moderate Magnitude	Major Magnitude
Low	Negligible	Negligible / slight	Slight / Moderate	Moderate
Medium	Negligible/Slight	Slight	Moderate	Moderate/Major
High	Slight	Slight / Moderate	Moderate / Major	Major

At DMRB Stage 2, the significance of effect would be determined for each element of the land and accessibility subtopic (for example private property and housing, development land and businesses) affected by the proposed scheme. Alongside the significance of the effect, the assessment would report on the nature and scale of the effect on the land use and accessibility elements as either; beneficial, neutral or adverse.

12.3.6 Human Health

Health effects are influenced by a wide range of environmental, social and economic factors that can impact both positively and negatively on health and wellbeing (known as health determinants). This broader understanding of health is defined by the [World Health Organization](#) (WHO) which states that 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. When considering the health effects of major infrastructure projects, this broader definition of health is applied, which encompasses both physical and mental wellbeing.

Direct effects on health can occur from sources of environmental pollution such as noise (for example, sleep disturbance and associated health effects), and traffic (for example, driver stress caused by disruption from construction vehicle movements). Indirect effects could relate to disruption to communities arising from increased traffic, that may result in reduced community interaction (direct effect), which may have an adverse effect on well-being (indirect effect). Similarly, a change in levels of happiness or change in levels of stress (indirect effect) could result from singular or multiple direct and prolonged environmental effects, perceived or real.

In accordance with DMRB LA 112, the human health assessment reports on:

- Environmental conditions relevant to human health:
 - Air quality
 - Noise

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- Sources of pollution (for example light, odour, contamination)
- Landscape amenity
- Severance/accessibility and the ability of communities to access community land, assets and employment:
 - Reduced or increased access to open green space/recreational facilities.
 - Reduced or increased opportunities for WCH.
 - Reduced or increased opportunities for accessing healthcare facilities.

A health profile of communities in the study area is established to determine the sensitivity of the local community/population to changes in health determinants. The sensitivity of a community/population is reported as: low, medium or high; though it is noted that this rating may be subject to change at subsequent stages as more granular baseline data is gathered.

The human health assessment is informed by the outputs of the assessments undertaken for the environmental factors that have potential to cause a change to health and wellbeing determinants: namely air quality, noise, landscape and visual, geology, water, and population. At DMRB Stage 1, limited information is available from these related assessments, therefore a necessarily high level assessment is provided. Further detail will be provided in subsequent DMRB stages, once the impacts and mitigation measures from other assessments is available. A high level, qualitative assessment has been undertaken for the purposes of DMRB Stage 1 with the limited information available.

At DMRB Stage 2, once community/population sensitivity and changes to health determinants likely to occur as a result of a project are established, a qualitative assessment of human health will be undertaken, with evidence provided to support conclusions. The likely health outcome(s) will be identified in line with the categories in Table 12-7 below.

Table 12-7: Human Health Outcome Categories (reproduced from Table 3.32 of DMRB LA 112)

Health Outcome Category	Health Outcome Description
Positive	A beneficial health impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse health impact is identified
Uncertain	Where uncertainty exists as to the overall health impact

12.4 Assumptions and Limitations

The population and human health assessment will consider health effects and data at a population level, rather than health data and effects relating to individuals. The aggregated data and statistics that will be used to support the assessment cannot be used to make inferences about the health of individuals within the communities assessed. Gathering demographic data in the study area can be limited by the administrative boundaries by which population statistics are gathered, therefore in some instances presents a broader overview for context rather than a baseline for the population that could feasibly be impacted. At this stage in the assessment, a high level baseline context has been provided, with more granular population health data to be collected at DMRB Stage 2 (where available).

Health data does not capture other factors that contribute to disease and ill-health: social and economic conditions, cultural and historical trauma and behavioural risk factors (for example smoking, alcohol use, nutrition). These are known determinants of increased risk of illness and injury and pose another limitation on the ability to compare health outcomes measured before and after environmental changes.

Data for this EAR (for example list of receptors) has been compiled using desktop review and so its accuracy has not yet been verified. Site walkovers may be required at subsequent stages to verify the presence and nature of community receptors.

A comprehensive list of assumptions and limitations can be developed once detailed baseline data has been collected at DMRB Stage 2.

12.5 Study Area

12.5.1 Population

The study area for the population element of the assessment comprises the six improvement strategies plus a 500m buffer. This size of study area captures all six of the improvement strategies and the main communities within a distance most likely to be affected by the proposed scheme. The study area will be revised as the improvement strategies, design and construction methods are developed in more detail.

12.5.2 Human Health

For the human health element of the assessment, DMRB LA 112 states that the study area 'shall be defined based on the following: 1) the extent and characteristics of a project, and 2) the communities/wards directly and indirectly affected by the project'. The study area is unique to each project and is based on the sensitivity of affected communities and the nature/extent of the project resulting in changes to health determinants'.

The study area for human health therefore encompasses the study areas of the other environmental assessments that influence the health determinants; for air quality, noise, landscape and visual, geology, water, and population. For the initial assessment of impacts at DMRB Stage 1, a 2km study area has been applied for human health. The study area for health will be amended accordingly at subsequent stages of DMRB assessment as anticipated environmental impacts emerge.

The study areas for population and human health are shown on Figure 12-1.

12.6 Baseline Conditions

12.6.1 Land Use and Accessibility

The desktop review for land use and accessibility uses data from Ordnance Survey Maps, AddressBase Plus and the Dumfries and Galloway Council website.

The study area encompasses several towns, villages, properties and clusters of properties located near the existing A75, shown in Table 12-8. The key receptors are residential, community, commercial, and Walking Cycling Horse riding (WCH) assets such as Public Rights of Way, Regional and National Trails, as presented in Table 12-9, Table 12-10 and Table 12-11.

Table 12-8: Residential Receptors

Towns and Villages within the 500m Buffer	Improvement Strategy Adjacent to Settlement
Castle Douglas	1, 6
Haugh of Urr	6
Calrebrand	1
Old Bridge of Urr	1
Kirkpatrick Durham	1, 2
Springholm	1, 2, 3, 4, 5
Crocketford	1, 2, 3, 4
Brae	1, 2
Shawhead	1
Lochfoot	6

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Table 12-9: Community Receptors

Community Receptors within the 500m Buffer	
Educational facilities	Hardgate Primary School Springholm Primary School Longrutton Primary School
Places of worship	Urr Parish Church
Green/ bluespaces	Springholm Park George V Recreation Ground Auchenreoch Loch Milton Loch
Village hall	Crocketford Village Hall Springholm Memorial Hall
Post office	Haugh of Urr Post Office

Table 12-10: Commercial Receptors

Commercial Receptors within the 500m Buffer	
Hotels	Field Cottage Laurie Arms Chipperkyle Bed and Breakfast The Inn on the Loch Galloway Arms Hotel East Brae Cottage B and B Barnbackle Cottage Nunland Country Holidays
Caravan and camping sites	Mollance Farm Caravan Park Brandedleys Touring Caravan, Camping Site and Holiday Lodges
Restaurants and licensed establishments	Ernespie Farm
Shops	Springholm Shop Crocketford Shop Brass Tacks W Johnstone and Sons Ltd

Commercial Receptors within the 500m Buffer

Fireplaces Direct

Table 12-11: Walking Cycling Horse Riding Assets within the 500m Buffer

Route Name	Description
Core path URR/603/1	Located at the east of Springholm Primary School, Core Path URR/603/1 is approximately 3600m long and connects Springholm to Milton Loch. This path branches off from the existing A75, providing a route to reach Milton Loch, while also providing farm access.
Core path IRON/72/1, 3	Core Path IRON/72/1 is located to the west of Brae and runs from Shawhead towards Bettyknowes Burn. There is an option to take a north-west turn approximately 130m before the path reaches the Glenhead Burn, which leads to IRON/72/3.
Core path LOCK/160/3	Core path LOCK/160/3 branches off the old military road. It then splits into two separate paths after approximately 886m, with each route providing access to different farms. At this junction, the path commencing west serves as access to farms, with the alternative eastern path leading towards Lochrutton for approximately 1637m.
Core path URR/601/2	Runs for approximately 2730m and bypasses several farms before linking up with the old military road (NCN7), which provides access to Milton.
Core path URR/150/7,1,2,6	Riverside walk heading east from Haugh of Urr alongside Spottes Burn and adjacent to B794 for approximately 350m. Path crosses B794 and continues along Spottes Burn for a further 450m before branching off on either side of the burn.
Undesignated local path 1	Situated between the existing A75 and the Larglea Burn, undesignated local path 1 is used by cyclists and pedestrians runs parallel to the adjacent carriageway for approximately 1460m.
Undesignated local path 2	Undesignated local path 2, which runs from the Lochfoot junction, is approximately 270 meters in length and is located on the eastbound side of the carriageway.
Undesignated local path 3	Undesignated local path 3, which runs from the Terregles junction, is approximately 150 meters in length and is located on the westbound side of the carriageway.

Route Name	Description
National Cycle Network, Route 7	National Cycle Network cycle path that runs from Castle Douglas to Dumfries.

Development land for housing and commercial premises has been investigated. One plot of proposed housing development SPR.H1 Land off Ewart Place (40 units allocated up to 2029) intersects with Improvement Strategy 3 and is in close proximity to Improvement Strategies 4 and 5.

Agricultural Land Holdings and Soil Land Capability of Agriculture (LCA) baseline data is presented in the Geology, Soils and Groundwater chapter of this EAR.

12.6.2 Human Health

The age profile of the population in the Dumfries and Galloway Council area is presented in comparison to Scotland in Table 12-12. As shown, Dumfries and Galloway has a more elderly population than Scotland overall, with a higher percentage of people aged over 65 years, and a lower percentage of the population under five years old.

Table 22-12: Age Group Composition in Scotland and Dumfries and Galloway (Mid-Year Population Estimate) ([Scotland's Public Health Observatory](#))

Age Group	Scotland (%)	Dumfries and Galloway (%)
Under 1 year	0.8	0.7
0-15 years	16.3	15.0
16-39 years	30.0	23.0
40-64 years	33.4	34.4
65-74 years	11.0	14.4
75+ years	9.3	13.2

Health profile data for the Dumfries and Galloway Council area is presented in comparison to Scotland in Table 12-13, Table 12-14 and Table 12-15.

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Table 12-13: General Health for Dumfries and Galloway and Scotland (Table UV302, [Scotland's Census](#))

General Health (Self-reported)	Scotland (%)	Dumfries and Galloway (%)
Very Good	48.0	43.9
Good	30.9	32.3
Fair	14.2	16.4
Bad	5.3	5.8
Very Bad	1.6	1.8

Table 12-14: Health Conditions for Dumfries and Galloway and Scotland (Table UV304, [Scotland's Census](#))

Health Condition	Scotland (%)	Dumfries and Galloway (%)
Deaf or partially hearing impaired	7.1	9.2
Blind or partially vision impaired	2.5	3.0
Full/partial loss of voice or difficulty speaking	0.3	0.3
Has one or more of learning disability, learning difficulty or developmental disorder	5.2	4.6
Physical disability	9.7	11.6
Mental health condition	11.3	10.2
Long-term illness, disease or condition	21.4	23.7

Table 12-15: Key Health Indicators for Dumfries and Galloway and Scotland ([Scotland's Public Health Observatory](#))

Data	Measure	Year	Scotland	Dumfries and Galloway
Life expectancy (male)	Years	2021 to 2023 (3 year aggregate)	76.8	77.8

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Data	Measure	Year	Scotland	Dumfries and Galloway
Life expectancy (female)	Years	2021 to 2023 (3 year aggregate)	80.8	81.6
Children in low-income families	Percentage	2016 August snapshot	16.7	15.8
Chronic obstructive pulmonary disease (COPD) patient hospitalisations	Age-sex standardised rate per 100,000	2021/22 to 2023/24 financial years; 3-year aggregates	210.1	198.2
Population prescribed drugs for anxiety or depression	Percentage	2023/24 financial year	22.4	20.9
Asthma patient hospitalisations	Age-sex standardised rate per 100,000	2021/22 to 2023/24 financial years; 3-year aggregates	76.2	71.1
Lung cancer deaths	Age-sex standardised rate per 100,000	2020 to 2022 calendar years; 3-year aggregates	86.0	78.5

Key insights from the health profile data are as follows:

- A lower percentage of people in Dumfries and Galloway report having 'Very Good' health than Scotland overall, and a greater percentage report 'Good' or 'Fair' health.
- A higher percentage of people in Dumfries and Galloway report having a physical disability, long-term illness or medical condition than Scotland overall.
- The population of Dumfries and Galloway generally reports better health outcomes across the range of key health indicators presented in Table 12-15 than Scotland overall.

Within the study area, there are no Statistical Data Zones in the bottom 20% (most deprived) on the Scottish Index of Multiple Deprivation (SIMD).

With consideration of the demographic profile, health data and SIMD score, the sensitivity of the community in the study area is assigned as High. Despite the low levels of deprivation and better health outcomes across some indicators, this rating accounts for the high proportion of elderly people in the area, as well as the higher-than-average proportion of people with physical disabilities, long-term illnesses and medical conditions. This is a preliminary sensitivity rating and will be reviewed and updated at subsequent stages, if required, as additional, more granular baseline data is gathered.

Medical facilities within the human health study area for which communities require access are as follows:

- Castle Douglas Hospital.
- Garden Hill Primary Care Centre (GP).
- Boots Pharmacy.
- Castle Chemist.
- While outside of the initial 2km study area for health, it is noted that Dumfries and Galloway Royal infirmary is within 5km of the improvement strategies, located in Dumfries to the north-east of study area.

12.7 Potential Impacts

12.7.1 Construction

Table 12-16 presents potential construction impacts across the different improvement strategies for land use and accessibility.

Table 12-16: Construction Phase Potential Impacts

Improvement Strategy	Description of Potential Impacts
Improvement Strategy 1	The construction of a new section of carriageway within this improvement strategy may disrupt access to agricultural land, residential receptors and community greenspaces such as George V playing field. Some receptors, such as agricultural farmland, may experience temporary impacts from the land-take required to construct the proposed scheme.
Improvement Strategy 2	Crocketford and Brae are the closest towns to Improvement Strategy 2, and these areas may experience disruptions due to access issues or temporary land acquisition. These settlements include commercial, community, and residential properties. Merton is one of the residential

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Improvement Strategy	Description of Potential Impacts
	properties that may be impacted. Merton provides access to Brae's private road, and if construction affects this property, it would likely disrupt access to community land.
Improvement Strategy 3	Construction may affect residential, community, and commercial properties in Springholm and Crocketford, including Springholm Primary School and Crocketford Village Hall. Construction may overlap with these properties, leading to access issues and potential temporary land acquisition. This improvement strategy is the shortest of the six and utilises the existing A75 infrastructure, which means it is likely to require the less land for construction purposes than the other improvement strategies.
Improvement Strategy 4	There is minimal overlap between Improvement Strategy 4 and existing properties in comparison to other improvement strategies. However, construction works and traffic could disrupt access to green and bluespace, such as the Inn on the Loch and the Inn itself (Loch Motel).
Improvement Strategy 5	The construction phase may affect receptors, for example, access to agricultural land and assets may be disrupted by construction activities and traffic. However, construction works and traffic could disrupt access to green and bluespace, such as the Inn on the Loch and the Inn itself (Loch Motel).
Improvement Strategy 6	The construction of a new carriageway may affect residential properties along the B794 in Haugh of Urr. Some properties may experience temporary loss of land or property due to the land required for construction. Additionally, the route closely follows the Old Military Road, which has several residential properties along it. Consequently, this improvement strategy would have varying significant impacts on numerous residential receptors. National Cycle Route 7 may be affected but this could be managed through appropriate diversions and therefore depends on management plans/mitigation in place.

In relation to health impacts, it is possible that construction activities associated with each of the improvement strategies could result in:

- Increased dust and/or noise levels and a reduction in landscape amenity, and potential associated increase in stress/anxiety levels for community members.

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- Disturbance of potentially contaminated land, which could impact on adjacent land users if it becomes mobile, via inhalation of contaminated dusts or asbestos, or migration of contaminants or gases within ground or surface waters.
- Disruption to local journeys impacting on accessibility to community facilities, WCH routes and greenspace, which could have an impact on health outcomes.

However, construction good practice and mitigation measures are expected to greatly reduce these potential impacts. It is noted that until more detailed designs and construction methods are developed, and the outputs of the other relevant assessments are available, it is not possible to provide an in-depth assessment of health impacts for each improvement strategy.

12.7.2 Operation

Table 12-17 presents potential operation impacts across the different improvement strategies for land use and accessibility.

Table 12-17: Operation Phase Potential Impacts

Improvement Strategy	Description of Operational Impacts
Improvement Strategy 1	Throughout the entire improvement strategy, several properties could be directly affected potentially leading to permanent disruptions in access and land use. This may result in long-term impacts on the properties, as land acquisition in and around it might be necessary for construction and operation. Large areas of agricultural land could potentially be affected.
Improvement Strategy 2	The majority of Improvement Strategy 2 would be situated to the north of the existing A75 and may result in the permanent loss of community receptors, agricultural land and residential land such as Woodpark Farm.
Improvement Strategy 3	Operation of the improvement strategy may affect residential, community, and commercial properties in Springholm and Crocketford, including Springholm Primary School and Crocketford Village Hall. This improvement strategy is the shortest of the six improvement strategies and utilises existing A75 infrastructure, which would reduce the amount of land take compared to other improvement strategies. However, there is potential for impacts on receptors that are located in proximity to the A75 (for example Springholm Primary School).
Improvement Strategy 4	Improvement Strategy 4 closely follows the existing A75 infrastructure and may directly impact residential receptors through potential

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Improvement Strategy	Description of Operational Impacts
	requirement for permanent land take. Large areas of agricultural land may also be affected.
Improvement Strategy 5	Improvement Strategy 5 would likely require minimal acquisition of residential properties, however there may be impacts on agricultural land arising from land-take and changes to accessibility/severance.
Improvement Strategy 6	During the operational phase, Improvement Strategy 6 is likely to impact residential, commercial, and community receptors along its path through changes to accessibility and potential land take. Depending on detailed design and mitigation in place, access to certain areas, receptors, and agricultural land may be improved or reduced. An example of this is the National Cycle Network 7 that follows the Old Military Road, which could be improved by being incorporated into the design. However, if not considered as part of the design, access/quality of journey could become worse.

In relation to health impacts, it is possible that the operation of the proposed scheme could result in the following:

- There may be a change in air quality due to an increased or reduced presence of traffic. However, as noted in the Air Quality Chapter of this EAR, road traffic emissions are expected to reduce over time due to improvements in the vehicle fleet, it is therefore unlikely, given the low concentrations within Dumfries and Galloway, that there will be any exceedances of Air Quality Objectives at human receptors with the proposed scheme in place.
- For landscape amenity, as reported in Landscape and Visual chapter of this EAR, each improvement strategy presents differing levels of potential impact to landscape and visual receptors. All improvement strategies would result in changes to the rural landscape character and views from residential properties, active travel routes, local roads and other locations within the surrounding landscape. The extent to which this could result in an effect on human health would be explored at future assessment stages.
- As reported in the Geology, Soils and Groundwater chapter of this EAR, during operation, nearby land users could potentially be exposed to contamination if in-ground maintenance works occur in areas where contamination has been left in-situ or could be mobilised to controlled waters. There is also the potential for the proposed scheme to act as a preferential pathway between contamination and controlled waters. With mitigation measures in place, no significant effects on human health are expected.

- In relation to potential noise impacts, it is reported in the Noise and Vibration Chapter of this EAR that with Improvement Strategies 1, 2, 4, 5 and 6, it is likely there would be significant beneficial effects from road traffic noise for receptors along the existing A75 alignment, and significant adverse effects from road traffic noise for receptors within proximity of these improvement strategies. Improvement Strategy 3 involves mostly online improvements. There is the potential for significant adverse effects from road traffic noise if the improvements result in increased traffic flows or speeds. However, it is noted that the risk of likely significant effects is considered to be the same for all improvement strategies, and that mitigation measures are likely to reduce or remove these.
- Changes to land use and accessibility reported in Table 12-17 could result in changes to human health outcomes, by changing access or introducing severance to community assets and open space. Improvement Strategy 3 would pass close to Springholm Primary School, which – in the absence of mitigation measures - could result in a negative health outcome for children at this school. Improvement Strategy 6 runs adjacent to the National Cycle Network 7 and there are opportunities to enhance this route, which could increase active travel uptake, and result in positive health outcomes.

Mitigation measures, which are yet to be developed, are expected to greatly reduce these potential impacts. It is noted that until more detailed designs are developed, and the outputs of the other relevant assessments are available, it is not possible to provide an in-depth assessment of health impacts for each improvement strategy.

12.8 Design, Mitigation and Enhancement Measures

Mitigation and enhancement measures developed in population and human health assessment are influenced by design measures (for example route selection to avoid land take from community assets), environmental mitigation measures (for example landscape and ecological planting) and good practice construction measures (for example construction traffic management plan). As such, any bespoke mitigation and enhancement measures for the population and human health assessment must be cognisant of these.

Due to the high level nature of the improvement strategies, no mitigation or enhancement measures are proposed at this stage.

12.9 Assessment of Likely Significant Effects

12.9.1 Construction Phase

Construction of the proposed scheme has the potential to significantly affect residential, commercial and community receptors within the study area and adjacent to all improvement strategies. Land requirements are not defined at DMRB Stage 1 due to the early stage of the

scheme design and assessment process, and the construction footprint and methods are yet to be developed. The location and extent of land take is unknown at this time and therefore the likely significant effect on receptors is uncertain. Improvement strategies which make use of existing road infrastructure, in particular Improvement Strategy 3, may require the least land take. However, improvement strategies that expand upon an existing road have the potential to create significant accessibility and disruption effects due to likely construction and traffic management/diversions in place. Indirect impacts during the construction phase could also include disruption to commercial receptors and changes in accessibility/severance to community land and assets. Likely significant accessibility/severance effects are uncertain given the potential reduction in magnitude of impact through good practice construction measures and incorporation of crossings/access for local population.

A change to health outcomes (for example increase in stress and anxiety) in the construction phase would be determined by the level of construction activities and associated environmental effects (for example dust and noise and vibration impacts). As is typical for DMRB Stage 1, there is currently limited information regarding likely construction activities, therefore likely significant health effects cannot be assessed at this stage. Health impacts associated with access to receptors that facilitate positive health outcomes (healthcare facilities and open space for outdoor/physical activities) are also difficult to determine at this early stage without defined design and traffic management, and therefore significance has not been determined.

As is typical for DMRB Stage 1, it is not possible to undertake an assessment of significance on individual receptors and communities due to the limited information available on sensitivity and magnitude of impact. Significant effects also take into account mitigation measures which are influenced by construction good practice measures (for example construction management plans). These measures have not yet been developed; therefore, it is not possible to differentiate between likely significant effects for the improvement strategies.

12.9.2 Operation Phase

Operation of the proposed scheme has the potential to significantly affect residential, commercial and community receptors within the study area and adjacent to all improvement strategies through land take and changes to accessibility. All improvement strategies could result in the permanent acquisition of land from residential, commercial and community receptors and positive or negative changes to accessibility/severance arising from the presence of new road infrastructure and changes to existing accesses and journey times. As is typical at DMRB Stage 1, likely significant effects for receptors in relation to land take and accessibility are not possible to determine at this stage.

Depending on the improvement strategy, positive human health impacts during the operation phase could include improved health outcomes through a reduction in traffic (resulting in

decreased air pollution and noise and vibration) in close proximity to sensitive receptors such as primary schools and private residences. In other areas, some communities may experience an increase in traffic due to displacement and could therefore experience a negative human health outcome. The Air Quality Chapter and Noise Vibration Chapter of this EAR indicate that magnitude of change is not known at this stage and therefore it is not possible to comment on the likelihood of significant health effects. Similarly, limited information is available on significant effects from the Landscape and Visual Chapter and Biodiversity Chapter of this EAR and the land use and accessibility assessment contained in this chapter. It is expected that DMRB Stage 2 will identify the changes to human health outcomes of significant operational effects of the developing route options.

As is typical at DMRB Stage 1, it is not possible to undertake an assessment of significance on individual receptors due to the limited information available on sensitivity and magnitude of impact. Significant effects also take into account mitigation measures which are influenced by route selection and design, mitigation measures proposed for other environmental topics, other forms of good practice committed to as part of the proposed scheme. These measures have not yet been developed; therefore it is not possible to differentiate between likely significant effects for the improvement strategies.

12.10 Proposed Scope of Future Assessment

At DMRB Stage 2, the impacts during construction and operation on residential, commercial and community property will be considered, in addition to the potential impact on health outcomes for communities affected by the developing route options.

The population and human health assessment for DMRB Stage 2 will involve the following:

- Refine study area for developing route options and gather more detailed baseline data.
- Assign sensitivity to receptors/communities.
- Assess magnitude of impact on receptors/communities.
- Consider the outputs of other relevant environmental assessments (for the human health aspect).
- Develop preliminary mitigation/enhancement measures (for example improvements to National Cycle Network Route 7).
- Assess significance of effect on receptors/communities for each developing route option.

12.11 Summary

The population and human health assessment focuses on land take, accessibility and health impacts on communities and receptors in the assessment study area. All improvement strategies potentially involve land take that could impact on residential, agricultural,

commercial and community receptors and could result in likely significant effects. Improvement Strategy 3, which largely involves online improvements, could result in likely significant effects for receptors adjacent to the road, arising from construction activities and operational traffic, but could involve less total land take than the other improvement strategies. The improvement strategies that involve creation of offline road space (1, 2, 4, 5, and 6) may have fewer accessibility impacts for communities through construction and operation as the existing road infrastructure could be utilised; however, community severance could be an issue.

For human health, all improvement strategies have the potential to result in a change to health determinants related to air quality, noise, pollution, landscape amenity and severance/accessibility. Construction traffic and activities have the potential to increase dust and noise and vibration and result in temporary disruption in access to facilities relied upon for health (for example medical facilities). During operation, an increase in traffic could result in an increase in air and noise pollution, which could particularly impact on vulnerable populations (for example children and the elderly). Land take could result in permanent changes in access to community assets relied upon for physical activity and social cohesion (for example green/open space). Outputs of the relevant environmental assessments have been considered and at this stage, it is concluded that it is not possible to differentiate between improvement strategies in terms of likely significant effects on health outcomes.

It is noted that likely significant effects are dependent on design and mitigation that is yet to be determined.

13. Road Drainage and the Water Environment

13.1 Introduction

This chapter presents the Stage 1 Road Drainage and the Water Environment (RDWE) assessment for the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). The assessment has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) [Design Manual for Roads and Bridges \(DMRB\) LA 113 - Road drainage and the water environment \(revision 1\)](#) (hereafter referred to as “DMRB LA 113”) and other relevant guidance set out in this chapter. Where elements of the assessment methods outlined within DMRB LA 113 cannot be followed, this is detailed in the assumptions and limitations section of this chapter.

13.2 Legislative and Policy Framework

Table 13-1 provides a summary of the legislation relevant to the RDWE assessment.

Table 13-1: Legislation Relevant to the RDWE Assessment

Legislation	Relevance to the Proposed Scheme
The Water Environment and Water Services (Scotland) Act 2003 (WEWS)	These regulations cover rivers, lochs, transitional waters (estuaries), coastal waters groundwater and groundwater dependent wetlands.
Flood Risk Management (Scotland) Act 2009	An Act of the Scottish Parliament to make provision about the assessment and sustainable management of flood risks.
Climate Change (Scotland) Act 2009	This Act of the Scottish Parliament creates the statutory framework for greenhouse gas emissions reductions in Scotland.
The Water Environment (Controlled Activities) (Scotland) Regulations 2011	Regulations to control engineering works within inland surface waters, as well as point source discharges, abstractions and impoundments. Regulations define levels of authorisation which require approval from the Scottish Environment Protection Agency (SEPA).
The Pollution Prevention and Control (Scotland) Regulations 2012	The Pollution Prevention and Control (Scotland) Regulations 2012 establish a

Legislation	Relevance to the Proposed Scheme
	system to control pollution from installations or mobile plants carrying out specified activities in Scotland.
The Designation of Nitrate Vulnerable Zones (Scotland) Amendment Regulations 2015	EU Directive 1991/676/EEC on protecting waters against pollution caused by nitrates from agricultural sources requires member states to review and, if necessary, revise action programmes for designated nitrate vulnerable zones.
The Water Environment (River Basin Management Planning etc.) (Miscellaneous Amendments) (Scotland) Regulations 2015	Amends the river basin management planning regulations and the Water Environment Controlled Activities (Scotland) Regulations 2011 to take account of Directive 2013/39/EU, 2014/80/EU relating to water quality standards and priority substances.
The Water Environment (Water Framework Directive (WFD)) (Northumbria and Solway Tweed River Basin Districts) (Amendment) Regulations 2016	The Northumbria Regulations and Solway Tweed Regulations transposed the WFD for river basin districts that are partly in England and partly in Scotland.
Water Environment (Miscellaneous) (Scotland) Regulations 2017	These regulations amended the Water Environment (Controlled Activities) (Scotland) Regulations 2011. The regulations have been revised to provide greater control over activities which may affect Scotland's water environment, whilst also encouraging improvements in construction practice.
Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2021	These regulations make changes to Scottish legislation, as a result of the European Union (EU) Exit, relating to the water environment and flood risk management.

13.2.1 National Policy

The following national policy documents are considered in this assessment:

- [National Planning Framework 4:](#)
 - Policy 22 Flood risk and water management – The intent is to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding.

13.2.2 Local Policy and Plans

The following local policies and plans are considered in this assessment:

- [River Basin Management Plan for Scotland 2021-2027.](#)
- [Dumfries and Galloway Council Local Development Plan 2:](#)
 - NE11: Supporting the Water Environment
 - NE12: Supporting the Water Environment
 - IN7: Flooding and Development
 - IN8: Surface Water Drainage and Sustainable Drainage Systems (SuDS)
- [Flood Risk Management Plan, Solway Local District Plan](#)

13.3 Assessment Methodology

13.3.1 Overview

The RDWE assessment includes the following elements:

- Surface water quality: the importance and potential impacts on surface water quality as a result of the proposed scheme.
- Surface water supply: the importance and potential impacts on the quantity of surface water-fed water supplies as a result of the proposed scheme.
- Hydromorphology: the potential for impacts from the proposed scheme upon fluvial landforms associated with river systems, and the flow and sediment transport processes which create and sustain them.
- Flood risk: potential risk of flooding from all sources to the proposed scheme or elsewhere as a result of the proposed scheme.

13.3.2 Data Sources

The baseline conditions have been assessed using a desktop review. The data sources used to establish the baseline conditions are outlined in Table 13-2.

Table 13-2: Data Sources used in the RDWE Assessment

Data Type	Reference
Aerial Imagery	Aerial imagery
Ordnance Survey (OS) Mapping	OS 1:25,000 to 1:50,000 scale mapping Open Street Map
Water Classification Hub	Water Classification Hub
Flood Maps (including future climate change)	SEPA Flood Maps
National Flood Risk Assessment Data Explorer Tool	Flood risk and historical flood events information
Flood Risk Management Strategies: Solway Local Plan District	Springholm (Potentially Vulnerable Area 14/10)
National River Flow Archive (NRFA)	River gauging information
Environmental Information	Scotland's Environment Web
Newspaper Articles	Heavy rainfall causes road chaos across Dumfries and Galloway Storm Frank brings flooding and New Year chaos to the Stewarty Stewartry roads disappear under floodwater after wind and rain batter Dumfries and Galloway

13.3.3 Assessment of Impacts and Effects

The identification of potentially significant effects on RDWE have been derived from a qualitative desktop review. The assessment accounts for the potential impacts across the river catchments as well as groundwater and surface water receptors. The assessment also accounts for relevant aspects of other environmental factors such as geology, soils and

biodiversity. A full assessment of effects are discussed in the Biodiversity Chapter and Geology, Soils and Groundwater Chapter of this EAR.

13.3.4 Importance Criteria

Where possible, the receptors are assigned an importance based on Table 13-3 to 13-6, which is a development of the typical examples outlined in Table 3.70 of DMRB LA 113. The importance of a potential receptor is typically considered in terms of indicators such as quality, scale, rarity and substitutability and categorised on a scale of low to very high using various sources of information. Surface water supply is assessed 'Very High' or 'High' importance only in relation to the number of properties/receptors a water resource is supplying. To note, Q95 (the 5th percentile flow) presents the flow in cubic metres per second which was equalled or exceeded for 95% of the flow record. The Q95 flow is a significant low flow parameter particularly relevant in the assessment of river water quality consent conditions.

Table 13-3: RDWE Nationally Significant Attribute of Very High Importance Criteria

DMRB LA 113 Typical Examples	Applicable Scheme Examples
Nationally Significant Attribute of High Importance Surface Water: Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and Q_{95}^1 greater than or equal to $1.0\text{m}^3/\text{s}$. Site: protected/designated under European Commission (EC) or UK legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Site of	Surface Water Quality WFD classified water body achieving 'High' Physico-chemical and Biological elements status, 'Pass' for Specific pollutants and /or Priority substances. Q_{95} likely to be greater than or equal to $1.0\text{m}^3/\text{s}$. Watercourse part of a site protected/designated under International/EC/EU or UK legislation (SAC, SPA, SSSI, Ramsar site). Non WFD classified watercourses may be applicable if part of a protected site. Surface Water Supply Water resource extensively exploited for public, private domestic and/or agricultural and/or industrial use, feeding ten or more properties. Hydromorphology WFD classified water body achieving 'High' Morphology status. WFD classified water body considered to be sensitive to additional morphological pressures as it is within 2.5% of a morphological condition limit boundary (for example High/Good, Good/Moderate, Moderate/Poor).

DMRB LA 113 Typical Examples	Applicable Scheme Examples
Special Scientific Interest (SSSI), Ramsar site, salmonid water)/species protected by EC legislation. ▪ Flood Risk: Essential infrastructure or highly vulnerable development.	Non WFD classified watercourses may be applicable if they demonstrate qualities such as: a channel in stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects unconstrained natural function; free from artificial modification or anthropogenic influence. Flood Risk Most Vulnerable Land Uses, including essential infrastructure as defined in Flood Risk and Land Use Vulnerability Guidance (hereafter referred to as "LUPS-GU24") at risk from flooding during the 0.5% Annual Exceedance Probability (AEP) (200-year) plus climate change (CC) event.

Table 13-4: RDWE Nationally Significant Attribute of High Importance Criteria

DMRB LA 113 Typical Examples	Applicable Scheme Examples
Locally Significant Attribute of High Importance ▪ Surface Water: Watercourse having a WFD classification shown in an RBMP and Q₉₅ less than 1.0m³/s. ▪ Flood Risk: More vulnerable development.	Surface Water Quality WFD classified water body achieving or having established RBMP objectives (for a later RBMP cycle) to achieve 'Good' Physico-chemical and Biological elements status ('Good potential' for Heavily Modified Water Bodies (HMWBs)), 'Pass' for Specific pollutants and /or Priority substances. Q₉₅ likely to be less than 1.0m³/s. Contains species protected under EC or UK legislation Ecology and Nature Conservation but is not part of a protected site. Non WFD classified water bodies may be applicable if protected species are present, indicating good water quality and supporting habitat. Surface Water Supply Valuable water supply resource due to exploitation for public, private domestic and/or agricultural and/or industrial use, feeding fewer than ten properties. Hydromorphology

DMRB LA 113 Typical Examples	Applicable Scheme Examples
	WFD classified water body achieving or having established RBMP objectives (for a later RBMP cycle) to achieve 'Good' Morphology status. Non WFD classified watercourses may be applicable if they demonstrate qualities such as: a channel achieving near-stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects relatively unconstrained natural function, with minor artificial modification or anthropogenic influence. Flood Risk. Highly Vulnerable Land Uses as defined in LUPS-GU24 at risk from flooding during the 0.5% AEP (200-year) plus CC event.

Table 13-5: RDWE Nationally Significant Attribute of Medium Importance Criteria

DMRB LA 113 Typical Examples	Applicable Scheme Examples
Moderate Quality and Rarity ▪ Surface Water: Watercourses not having a WFD classification shown in an RBMP and Q_{95} greater than $0.001\text{m}^3/\text{s}$. ▪ Flood Risk: Less vulnerable development.	Surface Water Quality Water body not classified under WFD. May have a number of anthropogenic pressures and/or pollutant inputs from discharges (licenced under Controlled Activities Regulations (CAR)) and/or surrounding land-use relative to flow volume. Q_{95} likely to be greater than $0.001\text{m}^3/\text{s}$. Hydromorphology Water body not classified under WFD. A channel currently showing signs of historical or existing modification and artificial constraints. Attempting to recover to a natural equilibrium and exhibiting a limited range of natural morphological features (such as pools, riffles and bars). Flood Risk Least Vulnerable Land Uses as defined in LUPS-GU24 at risk from flooding during the 0.5% AEP (200-year) plus CC event.

Table 13-6: RDWE Nationally Significant Attribute of Low Importance Criteria

DMRB LA 113 Typical Examples	Applicable Scheme Examples
Lower Quality ▪ Surface Water: Water body not having a WFD classification shown in a RBMP and Q_{95} less than or equal to $0.001\text{m}^3/\text{s}$ ▪ Flood Risk: Water compatible development.	Surface Water Quality Water body not having a WFD classification shown in a RBMP. May have a large number of anthropogenic pressures and/or pollutant inputs from discharges (licensed under CAR) and/or surrounding land-use relative to flow volume. Q_{95} likely to be less than or equal to $0.001\text{m}^3/\text{s}$. Hydromorphology Water body not classified under WFD. A channel currently showing signs of extensive historical or existing modification and artificial constraints. There is no evidence of diverse fluvial processes and morphology and active recovery to a natural equilibrium. Flood Risk Water Compatible Land Uses as defined in LUPS-GU24 at risk from flooding during the 0.5% AEP (200-year) plus CC event.

13.3.5 Magnitude

Impacts are typically assigned a magnitude through a high-level assessment based upon Tables 13-7 to 13-13 which are a development of the typical examples outlined in Table 3.71 of DMRB LA 113. The assessment is based on the degree of direct and indirect impact and whether the impact would be temporary or permanent. The magnitude of impact is then categorised on a scale of 'Major' to 'Negligible' for both adverse and beneficial impacts.

However, due to the limited design information available at this stage, it has not been possible to assign a specific magnitude of impact to each receptor potentially impacted by each of the improvement strategies. Tables 13-7 to 13-13 have therefore been used only as a guide to determine where likely significant effects may occur. A more detailed assessment of magnitude following the approach outlined in Tables 13-7 to 13-13 will be carried out as proposed scheme design information becomes available at DMRB Stage 2.

Table 13-7: RWDE Magnitude Criteria and Examples – Major Adverse Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in loss of attribute	Surface Water Quality

DMRB LA 113 Criteria	Applicable Scheme Examples
and/or quality and integrity of the attribute.	Construction works in-channel and/or extensive construction works adjacent to a watercourse which are therefore likely to risk a major, measurable shift from baseline water quality. Risk of adverse impacts on protected aquatic species. Construction works on multiple tributaries of a watercourse resulting in the risk of a significant cumulative impacts on water quality. Loss or extensive change to a designated nature conservation site. Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. Calculated risk of pollution from a spillage greater than or equal to 2% annually (spillage assessment). For WFD classified water bodies, water quality impacts have the potential to cause deterioration in WFD status. Surface Water Supply Long term loss or change to water supply. Hydromorphology Loss of, or extensive adverse changes to the watercourse bed, banks and vegetated riparian corridor resulting in changes to existing morphological features and/or channel planform and cross section and/or natural fluvial processes. Impacts would be at the water body scale. For WFD classified water bodies, impacts have the potential to cause deterioration on morphology status or prevent the achievement of 'Good' Morphology status due to an increase in the extent of morphological pressures on the water body. Flood Risk Increase in peak flood water level for the 0.5% AEP (200-year) plus CC event of greater than or equal to 100mm.

Table 13-8: RWDE Magnitude Criteria and Examples – Moderate Adverse Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in effect on integrity of	Surface Water Quality Construction works adjacent to a watercourse which are therefore likely to risk a moderate, measurable shift away from baseline water quality.

DMRB LA 113 Criteria	Applicable Scheme Examples
attribute, or loss of part of attribute.	Failure of both acute-soluble and chronic-sediment related pollutants in Highways England Water Risk Assessment Tool (HEWRAT) but compliance with Environmental Quality Standards (EQS) values. Calculated risk of pollution from spillages greater than or equal to 1% annually and less than 2% annually. Partial loss in productivity of a fishery. For WFD classified water bodies, water quality impacts may contribute to, but not cause a reduction in water body WFD classification. Surface Water Supply Temporary disruption or deterioration in a water supply. Hydromorphology Adverse changes to on the water feature bed, banks and vegetated riparian corridor resulting in changes to existing morphological features and/or channel planform and cross section and/or natural fluvial processes. Impacts would be at the reach scale. For WFD classified water bodies, impacts may increase the extent of morphological pressures. May contribute to, but not cause a deterioration of Morphology status. Flood Risk Increase in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event of greater than or equal to 50mm and less than 100mm.

Table 13-9: RWDE Magnitude Criteria and Examples – Minor Adverse Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in some measurable change in attributes, quality or vulnerability.	Surface Water Quality Construction works within the watercourse catchment that may result in a risk of a minor, measurable shift from baseline water quality. Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages greater than or equal to 0.5% annually and less than 1% annually. Hydromorphology

DMRB LA 113 Criteria	Applicable Scheme Examples
	Slight adverse changes to/impacts on the water feature bed, banks and vegetated riparian corridor resulting in changes to existing morphological features and/or channel planform and cross section and/or natural fluvial processes. Impacts would be at the local scale. For WFD classified water bodies, impacts may result in a slight increase the extent of morphological pressures or occur where there are existing morphological pressures. Morphology status unaffected. Flood Risk Increase in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event of greater than or equal to 10mm and less than 50mm.

Table 13-10: RWDE Magnitude Criteria and Examples – Negligible Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	Surface Water Quality Construction works within the watercourse catchment that are not anticipated to result in a risk of a change in water quality. No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages less than 0.5%. Hydromorphology Minimal or no measurable change from baseline conditions in terms of sediment transport, channel morphology and natural fluvial processes. Any impacts are likely to be highly localised. Flood Risk Negligible change in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event of up to less than plus or minus 10mm.

Table 13-11: RWDE Magnitude Criteria and Examples – Minor Beneficial Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in some beneficial	Surface Water Quality HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a

effect on attribute or a reduced risk of negative effect occurring	fail condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is less than 1% annually). Hydromorphology Potential for slight improvements to channel morphology. For WFD classified water bodies, impacts may result in a slight decrease in the extent of morphological pressures but insufficient in extent to improve water body WFD morphology classification. Flood Risk Creation of additional flood storage and decrease in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event greater than or equal to 10mm and less than 50mm.
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Table 13-12: RWDE Magnitude Criteria and Examples – Moderate Beneficial Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in moderate improvement of attribute quality	Surface Water Quality HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk greater than 1% annually). Contribution to improvement in water body WFD classification. Hydromorphology Potential for modest improvements to channel morphology. For WFD classified water bodies, impacts may decrease the extent of morphological pressures and contributes to (but does not cause) an improvement in WFD Morphology classification. Flood Risk Creation of flood storage and decrease in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event greater than 50mm and less than or equal to 100mm.

Table 13-13: RWDE Magnitude Criteria and Examples – Major Beneficial Magnitude

DMRB LA 113 Criteria	Applicable Scheme Examples
Results in major improvement	Surface Water Quality Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse.

DMRB LA 113 Criteria	Applicable Scheme Examples
of attribute quality	Improvement in water body WFD classification. Hydromorphology Potential for major improvements to channel morphology. For WFD classified water bodies, impacts would decrease the extent of morphological pressures sufficiently to result in an improvement in water body WFD Morphology classification. Flood Risk Creation of flood storage and decrease in peak flood water level for the 0.5% AEP (200-year) plus CC design flood event greater than or equal to 100mm.

13.3.6 Significance of Effect

Once the importance of each attribute and the magnitude of the potential impact are established, the significance of the potential effect is determined in accordance with Table 3.8.1 of [DMRB LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as "DMRB LA 104"). This is presented as Table 13-14, with effects of 'Moderate' or greater regarded as significant. The matrix has been adapted from Table 3.8.1 of DMRB LA 104 and does not include a magnitude of 'No Change' or an importance of 'Negligible' as these categories are not included in DMRB LA 113.

Table 13-14: Matrix for Determining Significance of Effect

Importance	Negligible Magnitude	Minor Magnitude	Moderate Magnitude	Major Magnitude
Very High	Slight	Moderate or Large	Large or Very Large	Very Large
High	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

Where the matrix indicates two alternative options (for example 'Slight' or 'Moderate'), evidence would be provided which supports the reporting of a single significance category.

This would be based on professional judgement, considering the importance of receptor and duration or extent of works, in accordance with the DMRB LA 104 guidance.

13.4 Assumptions and Limitations

13.4.1 Assumptions

The scale of the impact each improvement strategy may have on receptors is determined by the phase of the proposed scheme. The scale of impact for surface water quality receptors has been assumed to be temporary for the construction phase and permanent for the operational phase. The scale of impact for hydromorphology environment receptors has been assumed by the likely duration of the effects from each impact.

To date, there is no information on surface water outfalls. It is assumed that outfalls along the existing A75 carriageway would likely be retained and utilised for online sections of the improvement strategies. However, where offline sections of the improvement strategies are proposed, it is likely that new outfalls would be required. Where existing outfalls are to be retained for any of the improvement strategies it is assumed that appropriate treatment and flooding requirements will be factored into the wider drainage network design. Further information on the drainage design will be confirmed at DMRB Stage 2.

13.4.2 Limitations

The assignment of impact magnitude and potential significance for each receptor affected by the improvement strategies may be revised in subsequent DMRB stages, depending on consultation with key stakeholders and site survey data. The receptor-specific significance of effects will be confirmed as proposed scheme design details are further developed at DMRB Stage 2.

The approach of DMRB LA 113 of assigning magnitude of impact on flood risk receptors requires hydraulic modelling or detailed assessment of the design. Hydraulic modelling has not been undertaken to assess the impact of each improvement strategy on flood risk. This is considered proportionate at this early stage of assessment. The assessment of impacts is based on fluvial and surface water (pluvial) sources as the principal sources of flood risk. Groundwater flooding information will be considered during DMRB Stage 2 when further proposed scheme design information is available.

To date, no site surveys or ground investigations (GI) have been undertaken to inform this stage of assessment. This is a desktop review-based assessment using publicly available information and therefore there are data gaps. Additional information and datasets will be requested at later design stages to ensure these data gaps are covered.

At this stage, no data on abstraction or discharge licences/permissions or private water supplies has been sourced. This assessment has primarily considered publicly available information, and any additional information and datasets will be requested at DMRB Stage 2.

13.5 Study Areas

For the purposes of this assessment, a 500m buffer around each improvement strategy has been adopted for RDWE, this is shown on Figures 13-1 to 13-4. The study areas have been assigned based on professional judgement and will allow for an assessment of potential direct effects, as well as providing a broader catchment context appropriate for the purpose of this stage of assessment. It should be noted that the study areas may increase or decrease as the proposed scheme design evolves at later assessment stages. The term 'study areas' has been used when referring to all/multiple improvement strategy study areas. When referring to a specific improvement strategy study area, this will be specifically mentioned.

The receptors that are outside of the RDWE study areas are assumed to not be impacted by the proposed scheme, due to distance from and/or lack of hydrological connectivity to the six improvement strategies.

13.6 Baseline Conditions

13.6.1 Surface Water

Hydrological Setting

The study areas lie within the Solway Tweed River Basin District. There are 19 named watercourses within the study areas. These watercourses are shown on Figure 13-1. Of these watercourses, seven are designated WFD Regulation water bodies as shown in Figure 13-2. There are also a number of other non-WFD Regulation named watercourses. Table 13-15 outlines which improvement strategy crosses each of these WFD Regulation and non-WFD regulation named watercourses.

Table 13-15: WFD Regulation and Non-WFD Regulation Named Watercourses Within the Study Areas

Watercourse	Watercourse Type	Overall Status	Relevant Improvement Strategy
Urr Water (d/s Drumhumprey Burn)	WFD Regulation water body	Good	1, 5, 6
Spottes Burn	WFD Regulation water body	Good	1, 2, 3, 4, 5

Watercourse	Watercourse Type	Overall Status	Relevant Improvement Strategy
Cargen Pow/ Bogrie Lane	WFD Regulation water body	Moderate	1, 2, 3, 4, 5
Lochfoot Burn	WFD Regulation water body	Moderate	1, 6
Under Brae Lane	WFD Regulation water body	Good	6
Culloch Burn (u/s Milton Loch)	WFD Regulation water body	Good	5
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	WFD Regulation water body	Good	6
Barnshalloch Burn	Non-WFD Regulation water body	Not applicable	None (within Improvement Strategy 1 study area)
Bettyknowes Burn	Non-WFD Regulation water body	Not applicable	1, 2
Culmain Burn	Part of Culloch Burn (Milton Loch to Kirkgunzeon Lane) WFD Regulation water body	Good	None (within Improvement Strategy 6 study area)
Larglea Burn	Non-WFD Regulation water body	Not applicable	1, 2
Glenhead Burn	Non-WFD Regulation water body	Not applicable	1, 2
Crocketford Burn	Part of Cargen Pow/ Bogrie Lane WFD Regulation water body	Moderate	1, 2, 3
Cronie Burn	Non-WFD Regulation water body	Not applicable	1, 2
Brooklands Burn	Non-WFD Regulation water body	Not applicable	1, 2

Watercourse	Watercourse Type	Overall Status	Relevant Improvement Strategy
Minnydow Burn	Non-WFD Regulation water body	Not applicable	1, 2
Culshan Burn	Non-WFD Regulation water body	Not applicable	3
Barncailzie Lane	Non-WFD Regulation water body	Not applicable	3
Garmartin Burn	Non-WFD Regulation water body	Not applicable	2, 5

There are also numerous artificial drainage ditches and unnamed watercourses in the study areas. All the improvement strategies would cross over some of these minor surface water receptors.

The study areas include numerous ponds, lochs and areas of standing water of varying sizes. There are a total of four named ponds, lochs and areas of standing water. These comprise the following:

- Milton Loch is a loch located immediately-east of Improvement Strategy 5. This water body is designated under the WFD Regulations and has a 'Moderate' overall status.
- Auchenreoch Loch is a loch located immediately north-west of Improvement Strategies 3, 4 and 5 and is not a WFD Regulations designated water body.
- Grange Dam is a pond located in the west of Improvement Strategy 2 study area and is not a WFD Regulations designated water body.
- Brooklands Pond is located within the Improvement Strategies 1 and 2 study areas and is not a WFD Regulations designated water body.

Lochrutton Loch is also important to consider because, while not located within the study areas, it is within 50m of the southern edge of the Improvement Strategy 6 study area. Lochrutton Loch is a WFD Regulations water body with a 'Moderate' overall status.

Surface Water Quality

The current (2023) river water body attributes for the eight WFD Regulation water bodies in the study areas have been obtained from SEPA's [Water Classification Hub](#). The attributes and applicable WFD Regulation classification for the water bodies and the improvement strategies that interact with them are presented in Table 13-16 and shown in Figure 13-2.

Table 13-16: WFD Regulation Water Bodies Within the Study Areas

Watercourse	WFD Regulations Water Body ID	Length (km)/ Area (km ²)	Heavily Modified or Artificial Water Body	Overall Ecology	Physico-chemical Status	Relevant Improvement Strategy
Urr Water (d/s Drumhumprey Burn)	10583	20	Not designated as heavily modified	Good	High	1, 5, 6
Spottes Burn	10588	12.7	Heavily modified	Moderate	High	1, 2, 3, 4, 5
Cargen Pow/ Bogrie Lane	10600	20.9	Heavily modified	Bad	High	1, 2, 3, 4, 5
Lochfoot Burn	10601	1.9	Heavily modified	Moderate	Good	1, 6
Under Brae Lane	10602	6.3	Heavily modified	Bad	Not listed	6
Culloch Burn (u/s Milton Loch)	10592	2.3	Not designated as heavily modified	Good	Not listed	5
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	10591	11.1	Heavily modified	Poor	Good	6
Milton Loch	100330	0.6	Not designated as heavily modified	Moderate	Poor	None (within Improvement Strategy 5 study area)

Table 13-17 outlines the physico-chemical quality elements for the river water bodies within the DMRB Stage 1 Assessment Corridor and the improvement strategies that interact with them.

Table 13-17: Physico-Chemical Quality Elements of WFD Regulation River Water Bodies Within the Study Areas

WFD Regulations Water Body (ID)	Physico-Chemical Quality Elements - Temperature	Physico-Chemical Quality Elements - Dissolved Oxygen	Physico-Chemical Quality Elements - Reactive Phosphorous	Physico-Chemical Quality Elements - pH	Physico-Chemical Quality Elements - Overall	Relevant Improvement Strategy
Urr Water (d/s Drumhumprey Burn) (10583)	High	High	High	High	High	1, 5, 6
Spottes Burn (10588)	High	High	High	High	High	1, 2, 3, 4, 5
Cargen Pow/ Bogrie Lane (10600)	High	High	High	High	High	1, 2, 3, 4, 5
Lochfoot Burn (10601)	High	High	Good	High	Good	1,6
Under Brae Lane (10602)	Not listed	Not listed	Not listed	Not listed	Not listed	6

WFD Regulations Water Body (ID)	Physico-Chemical Quality Elements - Temperature	Physico-Chemical Quality Elements - Dissolved Oxygen	Physico-Chemical Quality Elements - Reactive Phosphorous	Physico-Chemical Quality Elements - pH	Physico-Chemical Quality Elements - Overall	Relevant Improvement Strategy
Culloch Burn (u/s Milton Loch) (10592)	Not listed	Not listed	Not listed	Not listed	Not listed	5
Culloch Burn (Milton Loch to Kirkgunzeon Lane) (10592)	High	High	Good	High	Good	6

All of the water bodies with listed physico-chemical quality elements are currently achieving 'Good' or 'High' status. However, there are still pressures listed on Brae Under Lane, Cargen Pow/Bogrie Lane, Spottes Burn and Lochfoot Burn which are as follows:

- Modifications to bed, banks and shores from farming.
- Rural diffuse pollution.
- Invasive species pressures.

Table 13-18 outlines the physico-chemical quality elements for Milton Loch.

Table 13-18: Physico-Chemical Quality Elements of WFD Regulation Lake Water Bodies Within the Study Areas

WFD Regulations Water Body (ID)	Relevant Improvement Strategy	Physico-chemical Quality Elements - Dissolved Oxygen	Physico-chemical Quality Elements - Total Phosphorous	Physico-chemical Quality Elements - Salinity	Physico-chemical Quality Elements - Overall
Milton Loch (100330)	None (immediately south-east of Improvement Strategy 5 study area)	High	Poor	High	Poor

Pressures on Milton Loch water body are:

- Unknown pressure on water animals and plants.
- Diffuse pollution from rural sources.

Nitrate Vulnerable Zones (NVZ)

A review of [Scotland's Environment Map](#) indicates that the study areas are not located within any NVZs. There is an NVZ in proximity, the Lower Nithsdale NVZ, located approximately 2.5 km east of Improvement Strategies 1 and 6 study areas.

Hydrology and Low Flows

The ability of a receiving watercourse to provide dilution for runoff from roads is dependent upon the flows within the watercourse whereby higher flow values indicate greater dilution potential. There are no gauging stations within the study areas available from the [National River Flow Archive](#) (NRFA). However, there is an NRFA gauging station on the Urr Water at Dalbeattie, approximately 5 km downstream of Improvement Strategy 6 study area. This station is the nearest located downstream of the study areas and provides information on a major river that flows through three of the improvement strategy study areas. Table 13-19 outlines the available information from the gauging station on the Urr Water at Dalbeattie.

Table 13-19: Flow Data for the Urr Water at Dalbeattie

Station Name	Location	Gauging Station ID Number	Q95 (m ³ /s)	BFI (Base Flow Index)	Median Flow (QMED) (m ³ /s)	Max Gauging Flow (m ³ /s)
Urr at Dalbeattie	5 km downstream of the study area at NGR NX821610	80001	0.316	0.380	88.1	120.3

13.6.2 Surface Water Supply

Abstractions and Discharges

No abstraction or discharge licences/permissions data has been sourced at this stage.

Drinking Water Protected Areas (DWPA)

A review of [Scotland's Environment Map](#) indicates that there are no DWPAs within the study areas.

Private Water Supplies

No data on private water supplies have been accessed at this stage.

13.6.3 Hydromorphology

Aerial imagery and LiDAR data suggest that the Urr Water and Spottes Burn exhibit evidence of geomorphologically active channels. The Cargen Pow/Bogrie Lane, Culloch Burn and the Barncailzie Lane exhibit moderately active channels with moderate sinuosity and some limited geomorphological features. Other watercourses identified within the study areas are modified channels or straightened drainage ditches and lack evidence of hydromorphological processes and depositional features. Table 13-20 below details these hydromorphological receptors and the improvement strategies that they interact with.

Table 13-20: Receptors Within the Study Areas for Hydromorphology

Watercourse	Description	Importance	Justification	Relevant Improvement Strategy
Urr Water	Not designated as heavily modified with 'Good' overall status and 'Good' hydromorphological status. Existing crossings within the study area include the Old Military Road at Haugh of Urr (Grid reference (GR) NX805659), the A75 near Chapleton Farm (GR NX792663) and the Old Bridge of Urr (GR NX775677).	High	WFD Regulations water body with 'Good' hydromorphological status. Range of natural morphological features and processes.	1, 5, 6
Spottes Burn	Designated as heavily modified with 'Good' overall status and 'Moderate' hydromorphological status. Existing crossings within the study area include the Old Military road at Haugh of Urr (GR NX805660), the B794 (GR NX805665), a minor road bridge (GR NX805674) and the A75 (GR NX805695).	High	WFD Regulations water body with. Range of natural morphological features and processes.	3, 4, 5

Watercourse	Description	Importance	Justification	Relevant Improvement Strategy
Cargen Pow/Bogrie Lane	Designated as heavily modified with 'Moderate' overall status and 'Bad' hydromorphological status. Existing crossings within the study area include a minor local road (GR NX905749), a farm track (GR NX887754), a minor local road (GR NX872752), private farm roads (GR NX855739 and NX839731), is culverted under much of Crocketford and is crossed by a farm access track at (GR NX816728).	High	WFD Regulations water body.	1, 2, 3, 4, 5
Culloch Burn (u/s of Milton Loch)	Not designated as heavily modified with 'Good' overall status and 'Good' hydromorphological status. Only one existing crossing of a farm track (GR NX843729).	High	WFD Regulations water body.	5
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	Designated as heavily modified with 'Good' overall status and 'Poor' hydromorphological status.	High	WFD Regulations water body.	6

Watercourse	Description	Importance	Justification	Relevant Improvement Strategy
	Existing crossings within the study area include two crossing of the Old Military road at Milton (GR NX848708 and NX846702) and a private farm access road (GR NX846704).			
Barncailzie Lane	Watercourse not designated under the WFD Regulations. Some evidence of morphological features and moderately sinuous channel in some sections. Only one existing crossing of a minor road (GR NX810707).	Medium	Water body not classified under WFD Regulations. A channel currently showing signs of historical or exiting modification and artificial constraints, attempting to recover to a natural equilibrium and exhibiting a limited range of natural hydromorphological features.	3
Other named watercourses	Watercourses not designated under the WFD Regulations. Limited evidence of morphological features with straightened and modified sections.	Low	Water bodies not classified under WFD Regulations. A channel currently showing signs of extensive historical or existing modification and artificial constraints. There is no evidence of diverse fluvial processes and	All

Watercourse	Description	Importance	Justification	Relevant Improvement Strategy
			morphology and active recovery to a natural equilibrium.	
Unnamed watercourses	Primarily straightened drainage channels. No natural features likely.	Negligible	Water bodies not classified under WFD Regulations. A channel currently showing signs of extensive historical or existing modification and artificial constraints. There is no evidence of diverse fluvial processes and morphology and active recovery to a natural equilibrium.	All

Table 13-21 shows how many watercourses in total are crossed by each of the improvement strategies.

Table 13-21: Number of Water Bodies Crossed by Each Improvement Strategy

Improvement Strategy	Number of WFD Water Bodies Crossed	Number of non-WFD Water Bodies Crossed	Names of WFD Water Bodies Crossed
1	4	10	Lochfoot Burn, Cargen Pow/Bogrie Lane, Spottes Burn, Urr Water (d/s Drumhumprey Burn)
2	2	9	Cargen Pow/Bogrie Lane, Spottes Burn
3	2	3	Cargen Pow/Bogrie Lane, Spottes Burn

Improvement Strategy	Number of WFD Water Bodies Crossed	Number of non-WFD Water Bodies Crossed	Names of WFD Water Bodies Crossed
4	2	2	Cargen Pow/Bogrie Lane, Spottes Burn
5	3	5	Culloch Burn (u/s of Milton Loch), Spottes Burn, Urr Water (d/s Drumh Humphrey Burn)
6	4	5	Lochfoot Burn, Under Brae Lane, Culloch Burn (Milton Loch to Kirkgunzeon Lane), Urr Water (d/s Drumh Humphrey Burn)

Structures are observed on numerous watercourses within the study areas, including minor and major road crossings via bridges/culverts. [Scotland's Environment Map](#) indicates that there are no obstacles to fish migration identified within the study areas.

There are two lochs within the study areas, Milton Loch and Auchenreoch Loch. Milton Loch is approximately 0.6 km² in area and is designated under the WFD Regulations. It has a hydromorphology status of 'High'. Auchenreoch Loch is not designated under the WFD Regulations and is approximately 0.3km² in area. In addition to these lochs, there are numerous smaller water bodies (such as the Grange Dam and Brooklands Pond) throughout the study areas and numerous ponds. Lochrutton Loch, while not within any of the improvement strategy study areas, is located less than 50m south of the Improvement Strategy 5 study area and has an area of approximately 0.5 km².

13.6.4 Flood Risk

Fluvial Flood Risk

A significant portion of the all the improvement strategy study areas are within the Springholm Potentially Vulnerable Area (PVA), as identified in 2018 under the [National Flood Risk Assessment](#) (NFRA) which is in the Urr water catchment. The majority of the flood risk in this area is from fluvial (river) sources.

Principal rivers with modelled flood risk have been identified using [SEPA Flood Maps](#) (hereafter referred to as "SEPA Flood Maps") and identifying which watercourses have flood extents associated with them.

Minor watercourses have been identified through OS mapping. These include tributaries of the Urr Water such as the Garmartin Burn and two smaller unnamed tributaries upstream. A small unnamed tributary of the Spottes Burn near Hardgate has also been identified along with the Culloch Burn (u/s of Milton Loch) and the Under Brae Lane. This dataset also includes tributaries of the Cargen Pow/Bogrie Lane such as the Cronie Burn, Glenhead Burn and Lochfoot Burn as well as four other unnamed tributaries. A tributary of the Barncailzie lane to the west of Auchenreoch Loch is also apparent. Finally, the Crocketford Burn and two unnamed watercourses feeding into the northern side of Auchenreoch Loch have been identified.

SEPA Flood Maps indicate that there are areas of 'Low' likelihood flooding (a 0.1% (1 in 1000 year) annual exceedance probability (AEP)), 'Medium' likelihood flooding (a 0.5% (1 in 200 year) AEP) and 'High' likelihood flooding (a 10% (1 in 10 year) AEP) in the study areas. This is associated with the following watercourses:

- Urr Water
- Spottes Burn
- Barncailzie Lane
- Brooklands Burn
- Minnydow Burn
- Lochfoot Burn
- Culloch Burn (Milton Loch to Kirkgunzeon Lane)

Areas of 'Low', 'Medium' and 'High' likelihood flooding interact with all improvement strategies. Table 13-22 shows the approximate area of flooding within each improvement strategy as well as the water bodies where flood risk comes from. Figure 13-3 shows the 'Low', 'Medium' and 'High' fluvial flood extents across the study area.

Future flooding as a result of climate change is provided through the SEPA Flood Maps. This shows areas that may have a 'Medium' likelihood of fluvial flooding by the 2080s. This data has not been considered at this stage but will be assessed in later assessment stages.

Surface Water Flood Risk

The [Springholm PVA](#) lists surface water flooding as a potential flood source within the study areas.

The 'Surface Water and Small Watercourses Flooding' presented on the SEPA Flood Maps identifies areas of pluvial flood risk as well as flooding from small watercourses, field drains and areas of standing water (such as ponds and lochs).

SEPA Flood Maps indicates that there are areas of 'Low', 'Medium' and 'High' likelihood flooding in the study areas. Areas of 'Low', 'Medium' and 'High' likelihood flooding interact with all improvement strategies. Table 13-22 shows the approximate area of flooding within each improvement. Surface water flood sources primarily consist of small pockets of surface water flooding, small watercourses, field drains, from areas of standing water (for example lochs and ponds) and rainfall collecting in surface depressions in the landscape.

Figure 13-4 shows the 'Low', 'Medium' and 'High' surface water flood extents across the study areas.

Future flooding as a result of climate change is provided though the SEPA Flood Maps. This shows areas that may have a 'Medium' likelihood of surface flooding by the 2070s. This data has not been considered at this stage but will be assessed in later assessment stages.

Table 13-22: Fluvial and Surface Water Flood Risk Within the Study Areas

Improvement Strategy	Approximate Area of 'Medium' Probability Fluvial Flood Risk (km2)	Fluvial Flood Sources	Approximate Area of 'Medium' Probability Surface Water Flood Risk (km2)
1	0.30	Cargen Pow/Bogrie Lane, Minnydow Burn, Urr Water	0.40
2	0.15	Cargen Pow/Bogrie Lane, Minnydow Burn	0.15
3	0.15	Auchenreoch Loch, Spottes Burn	0.05
4	0.02	Cargen Pow/Bogrie Lane, Auchenreoch Loch, Spottes Burn	0.08
5	0.05	Spottes Burn, Urr Water	0.075
6	0.20	Spottes Burn, Urr Water	0.15

Groundwater Flood Risk

Mapping of areas susceptible to groundwater flooding will be obtained and assessed at later assessment stages.

Reservoir Flood Risk

Reservoir flood risk data will be considered at later assessment stages.

Historical Flooding

There have been historic instances of river and surface water flooding reported within the study areas. Historical fluvial (river) flooding events have been reported near Springholm and Crocketford in 2002 and 2003 and surface water flooding has been observed when heavy rainfall combined with high water levels in Auchenreoch Loch, impacting parts of the A75.

From searches of newspaper articles, there is a record of flooding in Springholm and Crocketford during Storm Frank in 2016, with a number of people being evacuated. Another, more recent, flood event occurred in January 2019, following persistent, heavy rainfall. This led to significant flooding of the A75 at Crocketford.

Other Sources

The areas are not at risk of coastal flooding due to its distance from the coast and lack of tidal influence on watercourses in the study areas. Therefore, coastal flooding has not been considered for further assessment.

The areas are not at risk of flooding from canals as there are none located within or within close proximity to the study areas. Therefore, canal flooding has not been considered for further assessment.

No sewer flooding data has been sourced at this stage. Sewer flood risk data will be requested from Scottish Water at a later assessment stage.

13.7 Potential Impacts

13.7.1 Construction Phase

Potential generic impacts on the water environment, which are likely to arise on typical linear infrastructure projects could arise from several direct and indirect sources during the construction of the proposed scheme. These are outlined in Table 13-23 and are applicable to all improvement strategies.

Table 13-23: Potential Generic Construction Phase Impacts

Assessment Element	Description of Potential Construction Phase Impacts
Surface water quality	The mobilisation of silts and sediments from the removal of vegetation, movement of heavy plant, runoff from haul roads and

Assessment Element	Description of Potential Construction Phase Impacts
	stockpiles and during earthworks (such as regrading and construction of new embankments). This could impact on the physical, chemical and microbiological water quality characteristics of receiving watercourses. ▪ Discharges from poor site drainage provision, washing and cleaning activities and after rainfall events that exceed the capacity of the existing drainage system. ▪ The risk of pollution to surface water from activities involving polluting substances such as fuels, concrete, oils, lubricants and chemicals. There is a higher risk of pollution occurring to surface waters where works occur within or immediately adjacent to a watercourse, such as during the construction or modifications of outfall structures and culverts or bridges. There is also a higher risk where works would take place close to existing gullies or drains forming part of the existing roads drainage network, creating a pathway for pollutants to reach the watercourses. ▪ Construction plant generating a diffuse source of hydrocarbons and to a lesser extent heavy metals, that could enter the drainage network or leach into the subsoil and find their way into watercourses. There would also be the risk of accidental spillage events from the movement of plant around the site.
Hydromorphology	▪ Increase in fine sediment delivery via silt-laden runoff. ▪ Temporary changes to flow dynamics and regimes from the discharge of construction drainage. ▪ Increase in impermeable areas (hardstanding, compacted soil) during construction altering drainage networks. ▪ Loss of marginal or riparian vegetation adjacent to watercourses. ▪ Temporary change to flow dynamics and sediment transport dynamics (for example bed and/or bank scour) caused by in-channel and/or bankside works.
Flood risk	▪ Loss of floodplain storage due to construction activities taking place within the floodplain or construction compounds being located in the floodplain, resulting in increased flood risk.

Assessment Element	Description of Potential Construction Phase Impacts
	- Change in flow paths due to construction activities either blocking existing or creating new flow paths, resulting in reduced channel capacity and increased flood risk. - Works required for construction of bridges and culverts could reduce channel width if a dry working area is required within the channel and floodplain. - Alterations to or blockage of culverts and other structures conveying water could result in a temporary loss of capacity resulting in increased flood risk. - The temporary increase in impermeable surface due to haul routes or construction compounds during construction could lead to increased surface water volume and rates of runoff, resulting in increased flood risk. - Water abstracted from groundwater control activities or dewatering could be discharged to nearby watercourses or back to groundwater through a recharge arrangement. This could lead to a temporary localised increase in flood risk.

13.7.2 Operational Phase

Potential generic impacts on the water environment, typical of linear infrastructure projects could arise from a number of direct and indirect sources during the operation as detailed in Table 13-24 and are applicable to all improvement strategies.

Table 13-24: Potential Generic Operational Phase Impacts

Assessment Element	Description of Potential Operational Phase Impacts
Surface water quality	- New discharges of road runoff, shading by new structures and vegetation and use of herbicides could cause changes to dissolved oxygen levels and temperature. - Pollutants in road runoff such as oils and hydrocarbons from fuel combustion, and metals such as copper and zinc from vehicles would be deposited on the road surfaces. This road runoff would enter watercourses with a potential to cause water pollution and impact both the chemical and biological water quality or receiving watercourses.

Assessment Element	Description of Potential Operational Phase Impacts
	▪ Pollutants, when combined with rainfall, can run-off into the road drainage system and have an adverse effect on the receiving watercourses. There are a number of factors which influence both the pollutant concentrations in routine runoff and whether the runoff is likely to have an impact on the receiving water body. ▪ Suspended sediments in road runoff associated with larger and/or new impermeable areas could lead to sediment pollution in receiving watercourses. ▪ De-icing materials such as road salt could impact the chemical and biological quality of receiving watercourses.
Hydromorphology	▪ New alignment of watercourses could cause changes in flow regime. Changes in channel gradient could alter flow and sediment erosion/deposition processes. ▪ New drainage (such as outfall structures or change to discharges) could result in loss of riparian vegetation around structures or removal of a length of natural channel bank (if an outfall is required). ▪ New discharges (from outfalls) could cause localised changes in flow regime within the channel with the potential to alter local substrate structure by erosion of the bed or banks. Potential to alter existing morphological features. ▪ New crossings have the potential to change the volume and rate of surface water runoff (including riparian drainage) entering a channel, potentially affecting the flow regime and sediment erosion/deposition processes within the channel. ▪ Extended culverts have the potential to lead to a loss of bed and bank material. ▪ New culverts have the potential to alter bed substrate, flow dynamics, flow velocities and sediment mobilisation/transport processes. ▪ Earthworks might result in reduction in lateral connectivity between watercourses and their riparian zone and floodplain, where embankments are in close proximity to watercourses. ▪ Increase of impermeable surfaces might result in altering the local drainage network and increasing surface water runoff leading to

Assessment Element	Description of Potential Operational Phase Impacts
	changes in sediment erosion/deposition processes and channel adjustment.
Flood risk	- Changed flow paths due to operation resulting in either the blocking of existing flow paths or the creation of new flow paths, resulting in increased flood risk. - Any new river crossings could reduce channel conveyance. Extended culverts have increased chance of blockages. - Permanent increase in impermeable areas during operation resulting in increased surface water runoff volume and rate, resulting in an increased risk of flooding. - Loss of floodplain storage due to infrastructure encroaching into the floodplain, resulting in increased flood risk. - Alterations to or blockage of culverts and other structures conveying water could result in a temporary loss of capacity resulting in increased flood risk. - Cuttings may provide a route ingress for groundwater, potentially placing the new road at risk.

13.8 Design, Mitigation and Enhancement Measures

13.8.1 Embedded Mitigation Measures

Embedded mitigation for all improvement strategies would be integrated into the design as the proposed scheme progresses.

13.8.2 Mitigation Measures – Construction Phase

Table 13-25 provides an overview of potential mitigation measures that could be applied to mitigate the impacts for surface water quality, surface water supply, hydromorphology and flood risk during construction. It should be noted, this is a preliminary assessment based on the improvement strategies. Alternative and bespoke mitigation measures could be required as the proposed scheme progresses.

Many of the construction mitigation measures set out in Table 13-25 would be secured via the production and implementation of an Environmental Management Plan (EMP). These are applicable to all improvement strategies.

Table 13-25: Potential Mitigation Measures – Construction Phase

Element	Potential Construction Phase Mitigation Measures
Surface water quality	- Undertake work in line with good practice for pollution prevention and relevant code of construction practices. - Develop an Emergency Pollution Response Plan in accordance with guidance for pollution prevention. - Programme and sequence activities to ensure work within the watercourses is undertaken during periods of low flow to reduce the risk of scour/erosion mobilising fine sediments around the riverbed and/or structure. - Drainage to prioritise the use of Sustainable Drainage Systems (SuDS) where practicable. Runoff from the haul roads should be attenuated then discharged in accordance with the drainage hierarchy. As such, in line with the drainage hierarchy discharge to ground should be sought first. Where this is not practicable, discharge to watercourse then surface water sewer would be considered.
Hydromorphology	- Undertake work in line with good practice for pollution prevention and relevant code of construction practices. - Programme and sequence activities to ensure work within the watercourses is undertaken during periods of low flow to reduce the risk of scour/erosion mobilising fine sediments around the riverbed and/or structure. - During any modifications to culverts or other crossings, allow the watercourse to continue to flow, for example using a flume. - Where practicable, avoid/minimise any in-channel working, including avoidance of key migratory periods for fish; and minimise any removal of riparian and bankside vegetation. Where practicable, replant any lost riparian vegetation. - Limit the extent of vegetation clearance to only the minimum areas necessary to reduce sediment input during clearance and from bare ground following clearance. - Locate construction activities (including stock piling, construction compounds and vehicle washing) at suitable distances away from watercourses. - Any watercourse realignments would be constructed offline to allow the existing watercourse to continue to flow. These would

Element	Potential Construction Phase Mitigation Measures
	also be appropriately tied into the existing watercourse to reduce the risk of significant channel adjustment and/or bed and bank scour.
Flood risk	- Locate work areas outside the floodplain where possible. Where this is not possible, temporary floodplain compensation may be required to offset storage losses. - Design site areas to avoid changing fluvial and surface water flow routes where possible. Use permeable surfaces in compounds. - Temporary dewatering may be required for below ground works, any discharges may need to be attenuated, or paused during flood events to prevent increase in risk elsewhere. - Provide attenuation storage within site drainage to restrict runoff to existing rates. - Construction in areas at high risk to take place during period of reduced fluvial flood risk (spring/summer), where reasonably practicable. - New crossings should be designed to accommodate temporary increases to flood risk in addition to a pre-determined flood risk. - Sign up to Scotland's Flood Forecast and develop a flood response plan.

13.8.3 Mitigation Measures – Operational Phase

Table 13-26 provides an overview of potential mitigation measures that could be applied to mitigate the impacts for surface water quality, surface water supply, hydromorphology and flood risk during operation. It should be noted, this is a preliminary assessment based on the improvement strategies. Alternative and bespoke mitigation measures could be required as the proposed scheme progresses. These would be applicable to all improvement strategies.

Table 13-26: Potential Mitigation Measures – Operational Phase

Element	Potential Operation Phase Mitigation Measures
Surface water quality	The drainage design would incorporate mitigation measures to treat and attenuate road runoff (such as SuDS features) to the standard required by DMRB LA 113 and other standards contained within the DMRB.

Element	Potential Operation Phase Mitigation Measures
	Following the SuDS hierarchy, discharges to ground are preferable if determined to be feasible and appropriate through a risk assessment, with appropriate treatment provided where necessary. Where this is not practicable, road runoff would be treated and attenuated prior to discharge.
Hydromorphology	- The drainage design should aim to avoid discharges of routine runoff to the smaller watercourses where practicable. - At this stage outfalls have not been assessed, but in the instance that new outfalls are required they should remain compliant with good guidance and design standards. They would be designed to mitigate impacts on hydromorphology, therefore aligned downstream at a 45° angle, submerged below the water line, if practicable, and attenuate flows to match existing discharge rates along the receiving watercourse. - Design of permanent structures (such as culverts, bridges, and outfalls) in line with good practice and CIRIA guidance including facilitating fish passage and the use of soft-engineering techniques where practicable to mitigate impacts on hydromorphology. - Any potential channel realignments would be appropriately tied into the existing watercourse to reduce the risk of significant channel adjustment and/or bed and bank scour. - For the assumed bridges, consider a clear span structure so abutments are set back from the channel banks and do not impact in-channel hydromorphological processes. - Avoiding removal of water features through appropriate proposed scheme design. Potential for addition of morphological features in watercourses to provide habitat enhancement.
Flood risk	- Structures to be designed outside the floodplain where possible. Where this is not possible, clear span structures should be considered to minimise effects as far as practicable. Bridges to be sized taking into account climate change over the life of the structure. Compensatory flood storage may be required to offset floodplain losses that result from the proposed scheme. - Drainage to prioritise the use of SuDS where practicable. Runoff from the carriageways should be attenuated then discharged in accordance with the drainage hierarchy. As such, in line with the

Element	Potential Operation Phase Mitigation Measures
	drainage hierarchy discharge to ground should be sought first. This is dependent on the geology of the land and the risk of the water being a pollutant. Where this is not practicable, discharge to watercourse then surface water sewer will be considered. This is to prevent increased flood risk elsewhere. ▪ Provision of crossings or culverts to maintain existing surface water overland flow paths. ▪ Regularly inspect and maintain drainage infrastructure for defects and blockages to ensure they remain effective. ▪ Where required, drainage design to restrict discharge rates and volumes to ensure no increase in flood risk as a result of increased impermeable area.

13.8.4 Enhancement Measures

Enhancement Measures – Construction Phase

There is no potential enhancement measures identified for the construction phase at this stage. This is applicable to all improvement strategies. However, further potential enhancement measures may be identified in later assessment stages.

Enhancement Measures – Operational Phase

Potential enhancement measures that could be incorporated into the design, which would be applicable to all improvement strategies, and would be effective during the operation phase may include:

- Consideration of the use of new embankments or larger drainage measures to intercept and attenuate flood flows to reduce flood risk downstream.
- Provision of treatment facilities (such as SuDS) to improve surface water quality beyond that required to meet statutory water quality standards, or provision of treatment of water quality where none currently exists.
- Install additional pollution prevention measures for existing drainage systems.
- The opening up (daylighting) of existing culverts can improve the water quality, fish passage and hydromorphology of watercourses.
- Removal or reconstruction and improvement of existing crossings to make more environmentally sympathetic crossings.

- Indirect landscape enhancements to the existing landscape via Biodiversity Net Gain (BNG) in-channel improvements.
- Identifying and implementing needed environmental improvements based on River Basin Management Plans (RBMPs).

13.9 Assessment of Likely Significant Effects

13.9.1 Construction Phase

Surface Water Quality

Construction activities, particularly those requiring in-channel works or extensive works in proximity to the proposed road structure, have the potential to result in significant effects on surface water quality of the watercourses in the study areas in the absence of mitigation.

These impacts are largely associated with the construction of bridges, new outfalls, culverts and their extensions that are proposed near to, or on a channel meander or an extensive section of the proposed road structure. Culverts are more likely to require in-channel works than bridges.

Typically, improvement strategies with a greater number and extent of in-channel works result in greater effects on surface water during construction. Table 13-27 shows the significance of construction phase effects (pre-mitigation) on the surface water quality receptors within the study areas. The construction phase effect considered in this instance is the release of fine sediments and pollutants from construction runoff and other construction activities (for example use and fuelling of plant, runoff from stockpiles and stripped land).

Table 13-27: Significance of Construction Phase Effects (Pre-Mitigation) on Surface Water Quality Receptors Within the Study Areas

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Urr Water	High	1, 5, 6	Major Adverse	Large or Very Large
Spottes Burn	High	1, 2, 3, 4, 5	Major Adverse	Large or Very Large
Cargen Pow/Bogrie Lane	High	1, 2, 3, 4, 5	Major Adverse	Large or Very Large
Lochfoot Burn	High	1, 6	Major Adverse	Large or Very Large

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Under Brae Lane	High	6	Major Adverse	Large or Very Large
Culloch Burn (u/s of Milton Loch)	High	5	Major Adverse	Large or Very Large
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	High	6	Major Adverse	Large or Very Large
Milton Loch	High	None (immediately south-east of Improvement Strategy 5 study area)	Moderate Adverse	Moderate or Large
Other named watercourses	Medium	All improvement strategies	Moderate Adverse	Moderate
Unnamed watercourses	Low	All improvement strategies	Moderate Adverse	Slight

Subject to the implementation of appropriate mitigation measures (to be listed in an EMP), it is anticipated that there would be no significant adverse effects on surface water quality during the construction phase.

Surface Water Supply

As is typical at DMRB Stage 1, an assessment of the likely significant effects for the construction phase for surface water supply cannot be undertaken due to a lack of detailed information. Therefore, this sub-element of the RDWE assessment has been retained and will be fully assessed at DMRB Stage 2 when the relevant information and datasets will be acquired.

Hydromorphology

In the absence of mitigation measures, construction activities, particularly those requiring in-channel works or extensive works near water bodies, have the potential to result in significant impacts on the hydromorphology of the water bodies within the study areas. These impacts are largely associated with the construction of bridges, new outfalls, culverts, and their extensions. Table 13-28 shows the significance of construction phase effects (pre-mitigation) on the hydromorphology receptors within the study areas. The construction phase effect considered in this instance is the temporary alterations to the bed and banks of watercourses and release of sediment during construction with the potential to alter morphological features, sediment dynamics and flow dynamics.

Table 13-28: Significance of Construction Phase Effects (Pre-Mitigation) on Hydromorphology Receptors Within the Study Areas

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Urr Water	High	1, 5, 6	Major Adverse	Large or Very Large
Spottes Burn	High	3, 4, 5	Moderate Adverse	Moderate or Large
Cargen Pow/Bogrie Lane	High	1, 2, 3, 4, 5	Moderate Adverse	Moderate or Large
Culloch Burn (u/s of Milton Loch)	High	5	Major Adverse	Large or Very Large
Culloch Burn (Milton Loch to	High	6	Minor Adverse	Slight or Moderate

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Kirkgunzeon Lane)				
Barncailzie Lane	Medium	3	Minor Adverse	Slight
Other named watercourses	Low	All improvement strategies	Minor Adverse	Slight
Unnamed watercourses	Low	All improvement strategies	Minor Adverse	Slight

Subject to the successful implementation of mitigation measures (to be listed in an EMP), it is anticipated that there would be no significant adverse effects on hydromorphology during the construction phase.

Flood Risk

All improvement strategies cross 'Low', 'Medium' and 'High' likelihood flood extents for fluvial and surface water flooding. Therefore, all improvement strategies could impact flood risk from these sources during construction.

All improvement strategies are likely to require drainage upgrades to attenuate the increased runoff rates, including the possibility of new outfalls into watercourses, involving in-channel works or temporary dewatering. The extent of additional drainage requirements is unknown at this stage, but any in-channel works would require mitigation to avoid altering channel capacity or flows.

Construction compound/s have not been confirmed at this stage, but it is unlikely that they would be located within areas of 'Medium' or 'High' likelihood flooding. If it is not possible to locate the construction compound/s outside of these flood risk areas, additional mitigation would be required to mitigate the impacts of potential temporary floodplain reduction.

The creation of construction compounds and access tracks would require the compaction of land to create level surfaces. This would interfere with infiltration rates and increase runoff rates. Additional temporary attenuation or dewatering may be required to mitigate increased levels of runoff.

Below ground works have the potential to disrupt below ground level flows and infiltration rates, which may increase groundwater flood risk elsewhere. Any below ground level works

could require mitigation to divert flows elsewhere. It is unknown at this stage whether below ground works would be required for the improvement strategies.

Without mitigation, construction could have significant effects that impact flood risk through temporary alteration of surface water and below ground flow paths, decreased floodplain storage, increased rates of runoff and the potential for in-channel works. It is assumed that post-construction, access routes and compound areas would be returned to their existing condition and therefore any effects would be temporary and not significant.

The flood risk receptors are presented with their importance in Table 13-29.

Table 13-29: Importance Assignment of Flood Risk Receptors in the Study Areas

Receptor	Importance
A75, A712, B794 and B795	Essential infrastructure
Residential properties, schools, hotels and village halls	More vulnerable
Buildings used for shops or general industry, storage and distribution; land used for agriculture; local roads	Less vulnerable
Amenity open space	Water compatible

It should be noted that flood risk magnitude and significance, as outlined in Tables 13-7 to 13-13, has not been assigned at this stage. This is because it is not possible for increases in flood levels to be ascertained from the available data. The magnitude and significance will be assigned at subsequent design stages when further information is requested and assessed.

At this stage, subject to the implementation of mitigation measures (to be listed in an EMP), it is anticipated that post-mitigation, there would be no significant adverse effects on flood risk during the construction phase.

13.9.2 Operation Phase

Surface Water Quality

In the absence of mitigation measures, for all improvement strategies, there is potential for significant effects from polluted runoff entering the roads drainage system which discharges into watercourses. There is also the risk of accidental spillages.

There are eight WFD Regulations water bodies within the study areas, seven of which interact with the improvement strategies. This means that there is the potential for direct impacts on these WFD Regulations water bodies. Furthermore, there is potential for indirect impacts on Milton Loch water body as the Culloch Burn (u/s of Milton Loch), which is impacted by

Improvement Strategy 5, feeds into the loch. There are also a number of named and unnamed watercourses that are directly impacted by the improvement strategies. Table 13-30 shows the significance of operational phase effects (pre-mitigation) on the surface water quality receptors within the study areas. The operational effect considered in this instance is polluted runoff or accidental spillages from new road surfaces entering the road drainage system and entering into watercourses.

Table 13-30: Significance of Operational Phase Effects (Pre-Mitigation) on Surface Water Quality Receptors Within the Study Areas

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Urr Water	High	1, 5, 6	Major Adverse	Large or Very Large
Spottes Burn	High	1, 2, 3, 4, 5	Major Adverse	Large or Very Large
Cargen Pow/Bogrie Lane	High	1, 2, 3, 4, 5	Major Adverse	Large or Very Large
Lochfoot Burn	High	1, 6	Major Adverse	Large or Very Large
Under Brae Lane	High	6	Major Adverse	Large or Very Large
Culloch Burn (u/s of Milton Loch)	High	5	Major Adverse	Large or Very Large
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	High	6	Major Adverse	Large or Very Large
Milton Loch	High	None (immediately south-east of Improvement)	Moderate Adverse	Moderate or Large

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
		Strategy 5 study area)		
Other named watercourses	Medium	All improvement strategies	Moderate Adverse	Moderate
Unnamed watercourses	Low	All improvement strategies	Moderate Adverse	Slight

Surface Water Supply

As is typical at DMRB Stage 1 an assessment of the likely significant effects for the operational phase for surface water supply cannot be undertaken due to a lack of detailed information. Therefore, this sub-element of the RDWE assessment has been retained and will be fully assessed at later assessment stages when the relevant information and datasets will be acquired.

Hydromorphology

The operation of culverts, bridges and outfalls have the potential to result in significant impacts on the hydromorphology of the watercourses in the study areas. The associated operational effects of these should be minimal if good design practice is implemented. Table 13-31 shows the significance of operational phase effects (pre-mitigation) on the hydromorphology receptors within the study areas. The operational effect in this instance relates to the operation of culverts, bridges and outfalls. This could represent a change to the morphological condition, sediment dynamics and flow dynamics of the watercourse.

Table 13-31: Significance of Operational Phase Effects (Pre-Mitigation) on Hydromorphology Receptors Within the Study Areas

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Urr Water	High	1, 5, 6	Major Adverse	Large or Very large
Spottes Burn	High	3, 4, 5	Moderate Adverse	Moderate or Large

Receptor	Importance	Relevant Improvement Strategy	Magnitude of Impact	Significance
Cargen Pow/Bogrie Lane	High	1, 2, 3, 4, 5	Moderate Adverse	Moderate or Large
Culloch Burn (u/s of Milton Loch)	Medium	5	Major Adverse	Moderate or Large
Culloch Burn (Milton Loch to Kirkgunzeon Lane)	Medium	6	Minor Adverse	Slight
Barncailzie Lane	Medium	3	Minor Adverse	Slight
Other named watercourses	Low	All improvement strategies	Minor Adverse	Slight
Unnamed watercourses	Low	All improvement strategies	Minor Adverse	Slight

There are notable significant effects for all improvement strategies, especially those requiring significant offline realignment with a large number of new watercourse crossings (Improvement Strategies 1, 2, 4, 5 and 6). New crossings have the potential to lead to changes in flow dynamics and sediment transport dynamics which in turn may lead to channel instabilities propagating upstream and downstream of the proposed crossings.

Improvement Strategy 3 would have the least significant effects due to it being primarily an online realignment of the existing A75 carriageway and not requiring any additional crossings of any watercourses in the Improvement Strategy 3 study area. However, this improvement strategy would potentially require an extension to existing culverts, widening of existing bridges and additional culverts to accommodate these changes.

Flood risk

All improvement strategies involve permanent land take within mapped areas of flood risk. This could result in a decrease in floodplain storage and displaced flood water. Mitigation

would be required to provide additional, permanent floodplain storage, to reduce the significance of effects.

All improvement strategies would involve permanent increases in impermeable surface area from widening of existing carriageways to the creation of new carriageways. This would increase the runoff rates. Assuming the existing drainage network would not have capacity, additional drainage upgrades would be required to attenuate the increased runoff rates for all improvement strategies. The extent of additional drainage requirements is unknown at this stage.

Permanent below ground features such as retaining walls can alter below groundwater flows and if not properly mitigated, cause groundwater flooding elsewhere. It is unknown at this stage if any permanent below ground features are required for the improvement strategies. Should below ground features be required post construction, additional mitigation would be implemented to reroute any flows, if necessary.

The flood risk receptors are presented with their importance in Table 13-29.

It should be noted that flood risk magnitude and significance, as outlined in Tables 13-7 to 13-13, has not been assigned at this stage. This is because it is not possible for increases in flood levels to be ascertained from the available data. The magnitude and significance will be assigned at subsequent design stages when further information is requested and assessed.

In addition, further assessment may be needed following confirmation of proposed scheme design. Embedded and additional mitigation would be expected to eliminate any proposed scheme-induced increases in flood risk.

No significant flood risk impacts are anticipated as a result of the improvement strategies. It should be noted that any potential increase in flood risk to third parties, regardless of the significance of effect, may need to be mitigated to comply with planning policy.

13.10 Proposed Scope of Future Assessment

The assessment for future DMRB stages will require additional, more detailed datasets and design information to quantify the impacts of the proposed scheme on the surrounding water environment. The types of datasets required have been identified through various sections of this report and will be requested from the relevant authority at subsequent DMRB stages. A more robust assessment of the improvement strategies will be carried out during future DMRB stages with reference to additional data and design information.

The main objective of the assessment will be to ensure that:

- The need for the avoidance and reduction of impacts on the water environment is accounted for in the selection of improvement strategies and environmental evaluation of the proposed scheme.
- The selection of appropriate mitigation measures against any significant predicted impacts of the improvement strategies is made with the aim to design out potential adverse environmental impacts.

13.11 Summary

The RDWE assessment reviewed a range of baseline data to identify relevant surface water, hydromorphology and flood risk receptors within the study areas.

The assessment was undertaken in accordance with relevant industry guidance to identify the potential effects on these receptors and their significance from the implementation of the proposed scheme. Table 13-32 shows the potential significant effects identified (pre-mitigation) for the sub-elements of the RDWE. All sub-elements of the RDWE DMRB Stage 1 Assessment have been scoped in for both the construction and operation phases and will be assessed as part of DMRB Stage 2. Surface water supply has not been assessed due to the high-level information available at this stage in the process. This sub-element has been retained for full assessment at DMRB Stage 2.

Table 13-32: Scope of the RDWE Assessment for DMRB Stage 1

Sub-element	Effect Identified (Construction Phase)	Effect Identified (Operational Phase)	Improvement Strategy	Potential Significance of Effect (pre- mitigation) (Construction and Operational phases)
Surface water quality	Release of fine sediments and pollutants from construction runoff and other construction activities (for example use and fuelling of plant, runoff from stockpiles and stripped land).	Polluted runoff/accidental spillages from new road surfaces entering the road drainage system and entering into watercourses.	All improvement strategies.	Large or Very Large

Sub-element	Effect Identified (Construction Phase)	Effect Identified (Operational Phase)	Improvement Strategy	Potential Significance of Effect (pre-mitigation) (Construction and Operational phases)
Hydromorphology	Temporary alterations to the bed and banks of watercourses and release of sediment during construction with the potential to alter morphological features, sediment dynamics and flow dynamics.	Operation of culverts, bridges and outfalls, representing changes to the morphological condition, sediment dynamics and flow dynamics of the watercourse.	1 2 3 4 5 6	- Large or Very Large - Moderate or Large - Moderate or Large - Moderate or Large - Large or Very Large - Large or Very Large
Flood risk	Temporary decreases in floodplain storage and displacement of flood water.	Decrease in floodplain storage and displacement of flood water.	All improvement strategies.	To be determined at later design stage.
Flood risk	Compaction of land to create level surfaces leading to changes in infiltration rates and increased runoff rates.	Increases in runoff rates due to increases in impermeable areas.	All improvement strategies.	To be determined at later design stage.

Sub-element	Effect Identified (Construction Phase)	Effect Identified (Operational Phase)	Improvement Strategy	Potential Significance of Effect (pre- mitigation) (Construction and Operational phases)
Flood risk	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	All improvement strategies.	To be determined at later design stage.
Flood risk	Potential for in-channel works in areas of flood risk.	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	All improvement strategies.	To be determined at later design stage.

The identified effects on RDWE, as shown in Table 13-32, are those considered without mitigation. Some of these effects would be mitigated using the measures outlined in the Design, Mitigation and Enhancement Measures section of this chapter. At later design stages, as more detailed design information becomes available, additional mitigation measures, including embedded mitigation, may be required to reduce any potential effect as far as reasonably practicable.

14. Climate

14.1 Introduction

This chapter describes the assessment of climate related impacts of the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”). The assessment has been undertaken with reference to the [Design Manual for Roads and Bridges \(DMBR\) LA 114 - Climate \(revision 0.01\)](#) (hereafter referred to as “DMRB LA 114”) and other relevant guidance set out in this chapter.

14.2 Legislative and Policy Framework

14.2.1 Legislation

Table 14-1 provides a summary of the legislation that is relevant to this climate change assessment.

Table 14-1: Legislation Relevant to the Climate Change Assessment

Legislation	Relevance to the Proposed Scheme
Paris Agreement (United Nations Framework Convention on Climate Change, 2016)	The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping the rise in average global temperature this century well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The UK was one of the 160 countries who signed the agreement. The UK’s response to meeting its commitments under the Paris Agreement resulted in the UK Climate Change Act 2008.
UK Climate Change Act 2008	Commits the UK to reducing carbon emissions to net zero by 2050. 'Net zero' means that the UK carbon account for the year 2050 is at least 100% lower than the net UK emissions of Greenhouse Gases (GHGs) for the 1990 baseline. The Climate Change Act 2008 also requires the Secretary of State (SoS) to set legally binding carbon budgets over five-year periods and to ensure that net UK carbon emissions do not exceed these budgets.

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Legislation	Relevance to the Proposed Scheme
Carbon Budget Order 2011, Carbon Budget Order 2016 and The Carbon Budget Order 2021	The UK Government carbon budgets which have been set to-date and that are relevant to the improvement strategies are as follows: The fourth carbon budget: 2023 – 2027 defined within The Carbon Budget Order 2011 – 1,950 million tonnes carbon dioxide equivalent (MtCO_{2e}), equivalent to a 50% reduction in annual emissions from a 1990 baseline. The fifth carbon budget: 2028 – 2032 defined within The Carbon Budget Order 2016 – 1,725MtCO_{2e}, equivalent to a 57% reduction in annual emissions from a 1990 baseline. The sixth carbon budget: 2033 – 2037 defined within The Carbon Budget Order 2021 – 965MtCO_{2e}, equivalent to a 78% reduction in annual emissions from a 1990 baseline. It is the first budget which is in line with the 2050 net zero carbon target. In February 2025, the Climate Change Committee (CCC) advised the UK Government to set the 7th Carbon Budget at 535 MtCO_{2e} for the period 2038-2042, aiming for an 87% reduction in emissions compared to 1990 levels by 2040. This had not been adopted at the time of writing.
The Climate Change (Scotland) Act 2009	The Climate Change (Scotland) Act 2009 established a framework for Scotland to achieve its long-term goals of reducing GHG emissions by at least 80% by 2050. An interim target of a 42% reduction by 2020 was also set.
The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019	Amends the target to 'net-zero emissions target' for all GHG emissions by 2045. It also amends the interim targets to become 56% by 2020, 75% by 2030 and 90% by 2040.

The UK Government carbon budgets use carbon dioxide equivalent (CO_{2e}) to represent the emissions of the seven GHGs included in the [Kyoto Protocol](#) (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur).

In March 2024, the Climate Change Committee (CCC) concluded that it was unlikely that the Scottish Government would meet its statutory 2030 goal to reduce emissions by 75%. This conclusion was accepted by the Scottish Government. In response, the Scottish Government intends to bring forward expedited legislation to introduce a target approach based on five-yearly carbon budgets, whilst retaining the 2045 net zero target. Until such time as these carbon budgets are defined and legislated, and for the purposes of this assessment, it is assumed that the interim targets, under The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, in Table 14-1 are still applicable.

14.2.2 National Policy

In the context of the Climate Change (Scotland) Act 2009, Scottish Ministers are obliged to lay a report in Parliament setting out their proposals and policies for meeting annual emissions reduction targets. This [Climate Change Plan](#) is the Scottish Government's third Report on Proposals and Policies (RPP3) for meeting climate change targets for the period 2018–2032. In RPP3, special reference is made to Transport Scotland and the related policies and plans.

In December 2020, the Scottish Government released the [Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update](#) (hereafter referred to as the “CCP update”), which recognised the enormous challenges caused by the COVID-19 pandemic and the effect these could have on the ability of the Scottish Government to meet its greenhouse gas (GHG) emissions reduction targets. The update makes clear, however, that the Scottish Government remains absolutely committed to ending Scotland's contribution to climate change, despite these challenges. As such, it aims for a ‘green recovery’ that captures opportunities to transition towards ‘net zero’ through the creation of green jobs, by developing sustainability skills, improving wellbeing and addressing inequalities.

The CCP update includes commitments to reduce car kilometres by 20% by 2030, to phase out the ‘need’ for new petrol and diesel cars and vans by 2030 and new petrol and light commercial vehicles within the public sector fleet by 2025. Such activities are likely to result in a substantial reduction in Scottish road traffic related GHG emissions over time. The climate targets are under periodic review and therefore may be subject to change.

The CCP update presents proposals and policies to meet Scotland's annual emissions reduction targets to 2032. This is done through a sectoral approach, and each sector has an ‘emissions envelope’. The seven sectors for which ‘emissions envelopes’ have been estimated are: electricity; buildings; transport; industry; waste; land use, land use change and forestry (LULUCF); and agriculture (as illustrated in Figure 14-1 below). Figure 14.1 depicts the different emission envelopes over time from 2018 to 2032 as a bar chart: agriculture and LULUCF remain broadly the same; with the remaining emission envelopes reducing over time.

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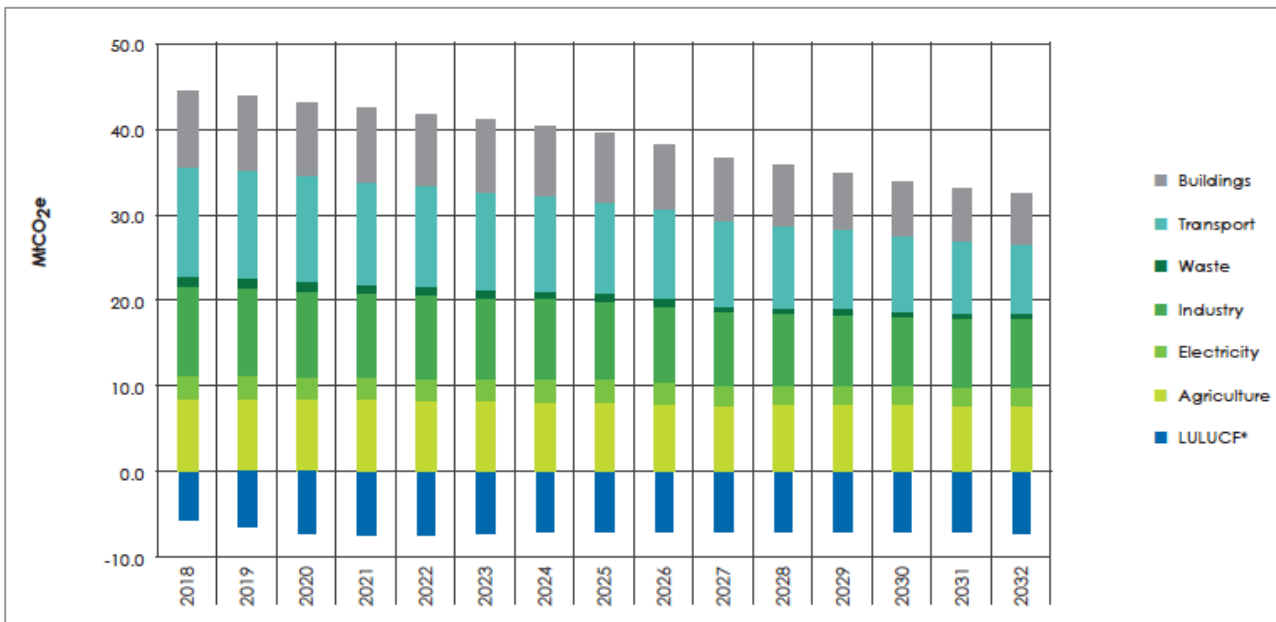


Figure 14-1: RPP3 Sectoral Emissions Envelopes (CCP)

The [Climate Ready Scotland: climate change adaptation programme 2019-2024](#) (hereafter referred to as “SCCAP”) is the second Scottish Climate Change Adaptation Programme which sets out policies and proposals to prepare Scotland for the challenges that will be faced as climate continues to change in the decades ahead. The SCCAP is a requirement of the Climate Change (Scotland) Act 2009 and addresses the risks set out in the UK’s second [UK Climate Change Risk Assessment 2017](#) published under Section 56 of the UK Climate Change Act 2008. A [Climate change: Scottish National Adaptation Plan 2024-2029](#) has since been produced in response to [UK Climate Change Risk Assessment 2022](#), which includes policy proposals for adaptation and resilience to be embedded across trunk road transport networks, supported by the Transport Scotland adaptation strategy as set out in [Transport Scotland’s Approach to Climate Change Adaptation and Resilience](#).

The [National Planning Framework 4](#) (hereafter referred to as “NPF4”) was published in February 2023 and provides a spatial planning response to the global climate emergency up to 2050. As per the NPF4 document, the proposed key objective of NPF4 is to ensure planning policy results in spatial and land use change that facilitates Scotland’s ambition to have ‘net-zero’ emissions by 2045 and meet other statutory emissions reduction targets, whilst also supporting communities and businesses in making the necessary changes to meet the targets. One of the main issues to be considered is the policy criteria needed to ensure that new development, including transport and infrastructure, contribute as far as possible to meeting emission reduction targets.

NPF4 includes key policies focused on climate. Policy 1 Tackling the climate and nature crisis states:

- 'When considering all development proposals significant weight will be given to the global climate and nature crises'.

Policy 2 Climate mitigation and adaptation states:

- 'Development proposals will be sited and designed to minimise lifecycle greenhouse gas emissions as far as possible
- Development proposals will be sited and designed to adapt to current and future risks from climate change
- Development proposals to retrofit measures to existing developments that reduce emissions or support adaptation to climate change will be supported'.

In February 2020, the Scottish Government released [The Environment Strategy for Scotland: vision and outcomes](#). In the strategy it is stated that:

- 'By 2045: By restoring nature and ending Scotland's contribution to climate change, our country is transformed for the better - helping to secure the wellbeing of our people and planet for generations to come'.

14.2.3 Transport Scotland Policy

The Road Asset Management Plan for Scottish Trunk Roads identifies environmental sustainability as one of its main objectives and specifically commits '...to protect the environment by minimising carbon emissions and promote the use of sustainable materials used on road maintenance work'. Furthermore, it identifies weather related disruption due to climate change as one of the major risks in network management.

Transport Scotland's Approach to Climate Change Adaptation and Resilience outlines the key climate risks affecting Scotland's transport system and sets out a Strategic Outcome for 'Trunk Roads which are well adapted and resilient to the current, projected and unexpected impacts of climate change'.

14.2.4 Local Policy and Plans

Dumfries and Galloway Council, like many other local authorities, declared a climate emergency in 2019. As part of their climate response, they have developed their [Route map for Carbon Neutral in Dumfries and Galloway 2021 to 2026](#) and more recently emission reduction targets outlined in [Climate emergency](#).

The Dumfries and Galloway Council organisational emissions targets are:

- Make a 75% reduction in carbon emissions by 2027 (from 2008/09 baseline) – already achieved 63% reduction by 2022/23.

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- Make a 90% reduction in carbon emissions by 2031.
- Become a carbon neutral organisation by 2033.

The Dumfries and Galloway Council regional emissions targets are:

- Become a net zero region on or before 2040.
- Transition to a carbon negative region by 2045 to align with the wider aspiration outlined by South of Scotland Enterprise.

14.3 Assessment Methodology

14.3.1 Methodology

DMRB LA 114 sets out the requirements for assessing and reporting the potential effects of climate on highway projects (i.e. climate change resilience and adaptation), and the potential effect on climate of GHG emissions from construction, operation and maintenance of highway projects. The methodology for this environmental assessment aligns with DMRB LA 114.

Within DMRB LA 114, Table 3.11.1 outlines the different GHG emission sources and lifecycle stages of a project and suggests activity data that could be used to inform GHG emissions estimates. Details of the methodology adopted within this assessment for the different lifecycle stages described in Table 3.11.1 of DMRB LA 114 are set out in Table 14-2 below.

Typically, at DMRB Stage 1, where detailed design information is not available, either benchmarks (derived from the results of other projects) or a more simplified approach is followed to estimate GHG emissions, whilst some, less sizeable, emission sources are not considered at all. This is in line with the proportionate approach detailed in paragraph 3.7 of DMRB LA 114 which states:

- 'Where there is insufficient, reliable information for quantitative assessment for any life cycle stage of the project, a qualitative assessment of GHG emissions shall be completed in the early stages of project development'.

In addition, paragraph 3.14 of DMRB LA 114 also states:

- 'A proportionate approach shall be applied to capture the principal contributing factors associated with GHG emissions'.

Table 14-2 considers all the construction and operation-related lifecycle sub-stages as listed in Table 3.11.1 of DMRB LA 114 and the associated methodology used within this assessment or alternatively whether a particular life cycle stage or emission generating activity has not been considered at this stage due to the lack of available data.

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At this stage, and as set out in Table 14-2, the assessment comprises a high-level qualitative assessment of potential construction stage emissions applicable to all improvement strategies, given that neither design information nor traffic data are available.

Table 14-2: GHG Emissions Estimation Methodology (Based on Table 3.11.1 of DMRB LA 114)

Stage	Sub-Stage of the Life Cycle	Methodology
Construction stage	Product stage including raw material supply, transport and manufacture (for example embodied GHG emissions associated with the required raw materials for construction).	A qualitative assessment methodology was used for each improvement strategy based on the length of each improvement strategy, if there are any major river crossings (such as Urr Water) and the number of new major structures associated with the improvement strategy.
Construction stage	Construction process stage; including transport to/from works site and construction /installation processes.	A qualitative assessment methodology was used for each improvement strategy based on the length of each improvement strategy, if there are any major river crossings (such as Urr Water) and the number of new major structures associated with the improvement strategy.
Construction stage	Land use change (for example GHG emissions mobilised from vegetation and soil loss/disturbance).	Not calculated at DMRB Stage 1 due to a simple improvement strategy

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Stage	Sub-Stage of the Life Cycle	Methodology
		approach being adopted.
Operation ('use-stage') (to extend 60 years in line with appraisal period)	Operation and maintenance (including repair, replacement and refurbishment) (for example GHG emissions associated with infrastructure operation and activities of organisations conducting routine maintenance, including required raw materials for maintenance and replacement of the proposed scheme components).	Not calculated at DMRB Stage 1 due to a simple improvement strategy approach being adopted. The magnitude of such emissions are, however, likely to be proportionate to construction stage emissions.
Operation ('use-stage') (to extend 60 years in line with appraisal period)	GHG emissions from vehicles using the highways infrastructure.	Not calculated at DMRB Stage 1 due to a simple improvement strategy approach being adopted and no road traffic data being available.
Operation ('use-stage') (to extend 60 years in line with appraisal period)	Ongoing land use GHG emissions/sequestration each year (for example changes in soil carbon resulting from a change in land use).	Not calculated at DMRB Stage 1 due to a simple improvement strategy approach being adopted.

14.3.2 Vulnerability of the Improvement Strategies to Climate Change

Current climate conditions have been identified within the study area for the six improvement strategies and future climate projections analysed in order to assess potential changes in climate over the lifespan of the proposed scheme of 60 years. For this purpose, the 25km UK Climate Projections 2018 (UKCP18) from the [UK Climate Projections](#) probabilistic projections datasets were used under the high emissions scenario. Specifically, the Representative Concentration Pathway 8.5 (RCP8.5) dataset was used, for the 50% probability level. This dataset is likely to provide a more conservative estimate of future climate change, as it represents the highest modelled GHG emissions scenario and typically provides the broadest

ranges of uncertainty in future changes for key UK climate variables and global average temperature.

More detailed information was also obtained from the UKCP18 12km dataset. This regional scale provides coverage over the UK in higher spatial and temporal detail, giving an improved representation of daily metrics and extremes.

Following the determination of potential climate trends in future years, likely proposed scheme-related receptors with the potential to be affected by climate impacts have been identified based on the available designs.

Indications of past vulnerability were identified in relation to historical weather events to understand if there are any particular constraints for any of the improvement strategies, for example heavy rainfall and historical flooding (refer to the Road Drainage and the Water Environment Chapter of this EAR).

At this stage, the proposed scheme design is not sufficiently detailed to undertake a specific vulnerability assessment of the improvement strategies. Therefore, a high-level, qualitative consideration of proposed scheme-related receptors, the key climate variables and potential impacts was undertaken to a similar level of detail to that in Table 3.35N of DMRB LA 114. This level of detail is deemed appropriate for informing the vulnerability assessment at this stage and, together with the information on past vulnerability, was used to identify the following:

- If there are any key risks which need to be addressed at later stages of the design.
- Notable differences in the improvement strategies which could have a bearing on the vulnerability of a particular design option, the required level of essential mitigation, or potential significance of effect.

14.3.3 Data Sources

Baseline data were collected from a variety of sources in compiling this assessment. These are outlined in Table 14-3.

Table 14-3: Climate Assessment Baseline Data Source

Data	Source
Scottish Greenhouse Gas Statistics	Scottish Greenhouse Gas Statistics 2022
UK local authority and regional greenhouse gas emissions national statistics 2005 – 2022.	UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022

Data	Source
UKCP18 baseline and climate projections for 25km spatial resolution dataset for the grid square centred on Easting 287500, Northing 562500 and 12km spatial resolution dataset for the grid square centred on Easting 282000, Northing 570000	UK Climate Projections

14.4 Assumptions and Limitations

A high-level improvement strategy qualitative assessment has been undertaken due to the limited available information at this DMRB Stage 1, refer to the Limitations section of this chapter. Any conclusions should therefore take this into consideration.

14.4.1 Assumptions

No design details other than broad indicative improvement strategies were available at this stage. As suitable data were not available, it was not possible to estimate construction related emissions and therefore a qualitative assessment was undertaken for the construction stage.

The approach used is, however, considered proportionate to a DMRB Stage 1 improvement strategy level assessment, and has allowed each improvement strategy to be compared on a like for like basis and allow for differentiation between each design option in terms of potential construction related emissions (which is likely to be a key source of the proposed scheme-related GHG emissions).

Due to the uncertainty in the exact location of where land take will be required within the improvement strategies, for land use change related GHG emissions, it is assumed that these emissions would be proportional to the overall lengths of road construction (as explained in the Potential Impacts section of this chapter) of the improvement strategies, as discussed in Table 14-2.

14.4.2 Limitations

Traffic data was not available at DMRB Stage 1 and therefore an assessment of road traffic emissions could not be undertaken.

The assessment of vulnerability to climate change was based on a high-level consideration of key asset receptors and was designed to identify any improvement strategies which may be more vulnerable or require specific consideration through design or management.

Paragraph 3.30 of DMRB LA 114 states that assessments should use the “H++ climate scenarios” (a series of low probability, high impact climate projection scenarios) to test the sensitivity of vulnerable safety critical features (for example structures). If such vulnerable safety critical features are included within the proposed scheme, the H++ data would be used at DMRB Stage 3 to test the sensitivity of these features when more detailed design data are available.

In-combination climate change impacts and impacts on receptors within the surrounding environment as a result of the combined impact of the proposed scheme and climate change would be considered at DMRB Stage 2 and 3 when more detailed design data is available to support the assessment. An additional assessment of the combined effects of climate change related impacts on other strategic transport infrastructure beyond the boundary of the proposed scheme would also be undertaken at DMRB Stage 3.

14.5 Study Area

The study area for GHG emissions is defined by the emissions regardless of where they occur, rather than a geographical area (see paragraph 3.8 of DMRB LA 114). However, in the absence of any calculated emissions due to the early stage of the proposed scheme, a 2km buffer of the outer limit of the improvement strategies has been used as a general study area for all elements of this climate change assessment. The study area is located within the administrative boundary of Dumfries and Galloway Council.

The potential vulnerability of the proposed scheme to climate change impacts is based on the UK current and future climate projections for the 25km and 12km nearest grid squares covering the study area, as shown in Figure 14-2 (refer to further explanation in the Vulnerability of the Proposed Scheme to Climate Change section of this chapter).

14.6 Baseline Conditions

14.6.1 National Emissions

At a national level, the latest [Scottish Greenhouse Gas Statistics 2022](#) indicates that GHG emissions in 2022 were down by 50.1% (between the 1990 baseline and 2022), compared to The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 specified target of a 53.8% reduction over the same period. Therefore, the interim target for 2022 has not been met.

Between 1990 and 2022, domestic transport emissions in Scotland are estimated to have decreased by 15.0%, however, such emissions were the largest source of net emissions in Scotland in 2022 (contributing 28.3%).

14.6.2 Dumfries and Galloway Emissions

The proposed scheme is located within the administrative boundary of Dumfries and Galloway Council. Estimated GHG emissions associated with activities within the Dumfries and Galloway Council administrative area obtained from the most recent UK National Atmospheric Emissions Inventory (NAEI) dataset for local authorities (published on [UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022](#)), are presented in Table 14-4 and Table 14-5 and compared with relevant emission totals for Scotland as a whole.

The total net council-wide GHG emissions in 2022 are estimated to have been 2,303 kilotonnes of carbon dioxide equivalent (kt CO₂e), which accounts for approximately 5.9% of total net GHG emissions in Scotland (i.e. 38,857kt CO₂e).

Road transport related GHG emissions in the Dumfries and Galloway Council area (i.e. 520kt CO₂e) are estimated to have accounted for 21.2% of total PKC area emissions (excluding LULUCF net emissions, which are negative) and 5.4% of total road transport related GHG emissions in Scotland. 'A' roads, including the A75, are estimated to have contributed 8.6% of total GHG emissions for the Dumfries and Galloway Council area (excluding LULUCF net emissions) and 2.2% of total road transport related GHG emissions in Scotland.

Table 14-4: Estimated GHG Emissions Associated Within Dumfries and Galloway Council Area (Kt CO₂e) (2022)

Sector	GHG Emissions (kT CO ₂ e)
Industry total	121.1
Commercial total	84.0
Public Sector total	19.6
Domestic total	229.9
Road transport (A roads)	210.6
Road transport (Motorways)	231.0
Road transport (Minor roads)	78.5
Diesel railways	5.4
Transport other	5.4
Agriculture total	1,452.3
Waste total	15.3
LULUCF Net emissions	-150.2

Sector	GHG Emissions (kT CO ₂ e)
Total net emissions	2,302.9

Table 14-5: Percentage of Estimated GHG Emissions Associated Within Dumfries and Galloway Council Area (2022)

Sector	Percentage of GHG Emissions (%)
Area road transport GHG emissions as proportion of total area GHG emissions (excluding LULUCF Net Emissions)	21.2%
Area road transport GHG emissions as proportion of total Scotland road transport GHG emissions	5.4%
Area A roads GHG emissions as a proportion of total area GHG emissions (excluding LULUCF Net Emissions)	8.6%
Area A roads GHG emissions as a proportion of total Scotland road transport GHG emissions	2.2%

14.6.3 Vulnerability of the Proposed Scheme to Climate Change

The Met Office has produced the [HadUK-Grid Gridded Climate Observations](#) which are observed values for climate variables at a 25km resolution, derived from 1km resolution data, and covering the period 1836-2023. From this dataset, values representing the baseline period 1981 – 2010 and for the 25km grid square that encompasses the study area have been used in this assessment. The baseline period 1981 – 2010 and 25km grid resolution allow comparison to the future UK climate projections produced by the Met Office, referred to as the UK Climate Projections 2018 (UKCP18). The UKCP18 uses a 30-year baseline period from which potential climatic changes in future years are projected.

UKCP18 uses scenarios for future greenhouse gases called [Representative Concentration Pathways](#) (RCPs), which cover a range of assumptions around future population, economic development and include the possibility of mitigation of GHG emissions towards international targets. The RCPs are expressed for future radiative forcing targets of 2.6, 4.5, 6.0 and 8.5 watts per square metre (W m²) in 2100 (RCP2.6, RCP4.5, RCP6.0 and RCP8.5 pathways). Each pathway drives a different range of projected global mean temperature increases over the 21st century, taking account of uncertainty in aspects such as the transient climate response and rate of ocean heat uptake.

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The RCP pathways lead to a broad range of climate outcomes but are neither forecasts nor policy recommendations. RCP2.6 represents a scenario where there are sizeable reductions in emissions of GHG. This scenario gives a reasonable chance of limiting global average warming to between 1.5 and 2°C above pre-industrial levels. RCP8.5 represents a scenario in which global GHG emissions continue to rise uncontrolled with temperature increases exceeding 4°C by the end of the century.

The future climate projections considered within this assessment are for the RCP 8.5 high emissions scenario, at a 50% probability of occurrence (i.e. the 50th percentile value of the dataset) in accordance with paragraph 3.28 of DMRB LA114. Climate projections were obtained for the following periods:

- The 2030s (2020 – 2049): covering the period of possible construction and opening years in the short term.
- The 2060s (2050 – 2079): covering a period during operation in the medium term.
- The 2080s (2079 – 2099): covering a period during operation over the long term which represents the end of the temporal scope for the climate change resilience assessment of 60 years after an indicative opening of around 2030 (in accordance with paragraph 3.31 of DMRB LA114).

The 25km UKCP18 probabilistic projections for the 25km-by-25km grid square located centrally within the area where the proposed scheme is located were used. This is centred on the following Easting and Northing: E 287500 N 562500. The 25km-by-25km grid box is shown in Figure 14-2. The climate projections for the proposed scheme location are presented in Table 14-6.

Table 14-6: Baseline Climate Data and Projected Changes for the Proposed Scheme Location (UKCP18 25km dataset)

Climate Variable	Observed Baseline (1981-2010)	Projected Change (RCP8.5, 50% probability) - 2030s	Projected Change (RCP8.5, 50% probability) - 2060s	Projected Change (RCP8.5, 50% probability) - 2080s
Mean summer monthly maximum temperature	18.0 °C	+1.1 °C	+2.7 °C	+4.5 °C

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Climate Variable	Observed Baseline (1981-2010)	Projected Change (RCP8.5, 50% probability) - 2030s	Projected Change (RCP8.5, 50% probability) - 2060s	Projected Change (RCP8.5, 50% probability) - 2080s
Mean winter monthly minimum temperature	0.9 °C	+0.8 °C	+2.0 °C	+2.9 °C
Mean annual monthly temperature	8.7 °C	+0.9 °C	+2.1 °C	+3.2 °C
Mean summer accumulated rainfall	278.7mm/yr	-7.1%	-19.7%	-29.7%
Mean winter accumulated rainfall	382.7mm/yr	+8.9%	+18.6%	+31.4%
Mean annual accumulated rainfall	1336.0mm/yr	+2.5%	+3.7%	+5.9%

The current and future climate projections for the 25km grid square covering the study area indicate that the following have the potential to occur:

- Increases in the annual average temperature for the region of 0.9°C in the 2030s, 2.1°C in the 2060s and 3.2°C in the 2080s, with larger projected increases in maximum summer temperatures.
- Decreases in summer rainfall (around 29.7% by the 2080s) and an increase in rainfall in the winter months (around 31.4% by the 2080s).

Table 14-7 sets out the UKCP18 climate projection data (RCP8.5 scenario) for a number of climate extreme indices, which were derived from the UKCP18 12km daily projections dataset. These daily projections are for the grid square centred on E 282000, N 570000, which contains the study area (see Figure 14-2). The time periods presented broadly align with those of the 25km projected data, albeit with two differences, as the upper limit of the 12km dataset is 2080. Consequently the 2080s period could not be represented in the same

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manner as the 25km dataset, and the 2060s period has been extended by one year to include 2080 so that the full range of available values are incorporated.

The data in Table 14-7 show an increase in the number of days with high temperatures, hot spells, heatwaves, dry spells, and droughts. The number of air frost days is projected to decrease and there is not expected to be a large change in the number of heavy rain days.

Unlike the 25km datasets, there are no equivalent 'observed' data, therefore the data presented for all three periods are projected values. The ranges provided for each metric represent the minimum and maximum 50th percentile (median) projected values from the 12 ensembles (for example, model runs) used by the Met Office in the UKCP18.

Table 14-7: Baseline Climate Data and Projected Changes for the Proposed Scheme Location (UKCP18 12km Dataset)

Climate Extreme Metric	Projected Values (RCP8.5, 50% probability) - Baseline (1981-2010)	Projected Values (RCP8.5, 50% probability) -2030s (2020-2049)	Projected Values (RCP8.5, 50% probability) – 2060s (2050-2080)
Annual number of days when mean temperature >25°C*25 °C is defined by the Met Office as the threshold for heatwaves in this region	0 to 0	0 to 1	0 to 3
Annual air frost days (no. of days with min temp below 0°C)	5 to 34	4 to 20	1 to 8
Annual hot spells (no. of periods with max. daily temp >25°C* for two consecutive days) *25 °C is defined by the Met Office as the threshold for heatwaves in this region	0 to 0	0 to 2	0 to 8
Annual heatwaves	0 to 0	0 to 1	0 to 6

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Climate Extreme Metric	Projected Values (RCP8.5, 50% probability) - Baseline (1981-2010)	Projected Values (RCP8.5, 50% probability) -2030s (2020-2049)	Projected Values (RCP8.5, 50% probability) – 2060s (2050-2080)
(no. of periods with max. daily temp >25°C* for three consecutive days) *25 °C is defined by the Met Office as the threshold for heatwaves in this region			
Annual heavy rain days (no. of days when total precipitation is >25mm)	11 to 11	8 to 14	10 to 15
Annual drought events (no. of periods when daily total precipitation is <0.2mm for 15 consecutive days)	0 to 1	0 to 1	1 to 3
Annual dry spells (no. periods when daily total precipitation is <1mm for 15 consecutive days)	2 to 7	3 to 7	5 to 11

The magnitude of future changes to windstorms is subject to large uncertainty. However, the projections indicate some potential for the number of storms to increase over the UK by the 2080s for RCP8.5, although the increases are relatively small.

14.7 Potential Impacts

14.7.1 Construction

Greenhouse Gas Emissions

As detailed in the [AR6 Synthesis Report: Climate Change 2023](#), human-caused GHG emissions have already had an impact on climate change, affecting many weather and climate extremes across the world and these adverse impacts will continue to intensify. Also, an increase in national GHG emissions has the potential to hinder the UK and Scottish Governments in meeting their respective carbon reduction targets.

It is expected that GHG emissions would be released during the construction of the proposed scheme. During the construction phase, GHGs are expected to be emitted through the carbon embodied in the materials used to construct the proposed scheme and their transport to the construction areas, from the transport and treatment of waste, from the transport of workers to and from construction areas and fuel/energy/water used during construction works.

Changes in land use would also result in GHG emissions during construction, for example, through the disturbance and loss or removal of carbon sinks, for example areas of woodland or peat bogland, refer to the Biodiversity Chapter and Geology, Soils and Groundwater Chapter of this EAR.

Vulnerability of the Proposed Scheme to Climate Change

All improvement strategies could potentially be impacted by climate change related impacts during construction as a result of changes in typical and extreme weather conditions. This could lead to the disruption of construction activities and potentially cause delays and / or increased costs (for example, through the flooding of construction areas causing damage to materials and assets). Proposed scheme-related receptors with the potential to be affected by climate impacts during construction include the workforce, plant and machinery. Highway assets under construction may also be affected, including structures, embankments, soft estate and drainage.

Table 14-8 lists the typical receptors for consideration in the vulnerability assessment and these are anticipated to apply to all improvement strategies. The elements of the receptors likely to be impacted are also presented along with the potential impact on them.

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Table 14-8: Receptors Vulnerable to Climate Change During Construction – All Improvement Strategies

Receptor	Climate Event	Impact	Element Impacted
Geotechnical engineering structures such as embankments	Increased peak rainfall.	Flooding and soil erosion of incomplete structures. Disruption to supply of materials and goods to the construction sites.	Stability of earthworks/slopes and compaction. Drainage ditches. Subcontractors and supply chain.
Structures such as bridges and retaining walls	Increased peak temperatures and peak rainfall.	Flooding and soil erosion of incomplete structures. Weakening or wash-out of structural soils during construction (if relevant). Disruption to supply of materials and goods to the construction sites.	Bridges, retaining walls and other structures, including access tracks Subcontractors and supply chain.
Workforce	Increased peak temperatures and peak rainfall.	Flooding. Exacerbation of dust generation and dispersion by warm and dry conditions. Health risks to on-site personnel.	Workers. Subcontractors. Auditing authorities.
Construction assets	Increased peak temperatures and peak rainfall.	Stress on technology. Damage.	Machinery. Equipment.

Receptor	Climate Event	Impact	Element Impacted
		Increased maintenance costs.	Compounds and temporary structures/facilities.

14.7.2 Operation

Greenhouse Gas Emissions

It is expected that GHG emissions would be released during the operation of all improvement strategies. Once in operation, the proposed scheme would have the potential to alter GHG emissions through the consumption of fuel, energy and raw materials, for example, energy for lighting, carbon embodied in replacement materials and fuel used during maintenance activities.

The proposed scheme would also alter GHG emissions from the use of the road network by end-users, as vehicle flows and speeds on the surrounding road network (and associated fuel consumption) are likely to change compared to the baseline situation.

Changes in land use would also have impacts on climate during operation as land containing carbon sinks such as soils, vegetation and woodland is replaced by the physical assets associated with the proposed scheme. This could lead to ongoing GHG emissions as land use types which typically store carbon in soil are replaced with land use types which would lead to losses of soil carbon sinks, for example areas woodland or peat bogland, refer to the Biodiversity Chapter and Geology, Soils and Groundwater Chapter of this EAR.

Vulnerability of the Proposed Scheme to Climate Change

All improvement strategies could potentially be impacted by climate change during operation as a result of changes in typical and extreme weather conditions. This could lead to adverse impacts on the proposed scheme infrastructure such as damage to assets (for example, road pavements, structures, embankments, soft estate and drainage), disruption on the road network during operation for end users (for example members of the public and commercial operators) through flooding and / or additional stress on, and degradation of, structures and road surfaces from temperature extremes or heavy rainfall events.

Table 14-9 lists the typical receptors for consideration in the vulnerability assessment and these are anticipated to apply to all improvement strategies. The elements of the receptors likely to be impacted are also presented along with the potential impact on them.

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Table 14-9: Receptors Vulnerable to Climate Change During Operation – All Improvement Strategies

Receptor	Climate Event	Impact	Element Impacted
Geotechnical engineering structures, for example, embankments	Increased peak rainfall.	Flooding and soil erosion.	Stability of earthworks/ slopes and compaction. Drainage ditches.
Structures for example, bridges and retaining walls	Increased peak temperatures and peak rainfall.	Flooding and soil erosion. Water scour causing structural damage. Weakening or wash-out of structural soils. Increased thermal range giving rise to increased earth pressures on retaining walls and other structures.	Bridges, retaining walls and other structures.
Workforce	Increased peak temperatures and peak rainfall.	Flooding. Health risks to on-site personnel.	Maintenance workers and subcontractors.
Pavements	Increased mean/peak temperatures and peak rainfall.	Flooding and erosion. Increased requirement for maintenance and repair.	Materials integrity.
Signs, signals and gantries	Increased peak winds.	Damage from wind-borne debris. Damage from wind load.	Stability. Renewal and repair.
Soft estate	Increased mean/peak temperatures, peak	Damage to trees and vegetation. Fire causing damage to soft estate.	Landscaping.

Receptor	Climate Event	Impact	Element Impacted
	wind and peak rainfall. Increased drought and dry spells.		
Operational road users	Increased mean/peak temperatures, peak wind and peak rainfall.	Damage and delays from wind-borne debris. Driving safety.	Private and commercial transportation.

14.8 Design, Mitigation and Enhancement Measures

14.8.1 Mitigation Measures - Construction Phase

Greenhouse Gas Emissions

DMRB LA 114 - states that projects should be designed to minimise GHG emissions in all cases to contribute to the UK's target (and by default Scotland's) for a net reduction in carbon emissions over time, and notes that minimising GHG emissions through design is also a core principle of the [Infrastructure Carbon Review](#) and the specification on carbon management in infrastructure within [PAS 2080:2023 Carbon Management in Infrastructure](#) (hereafter referred to as "PAS 2080:2023").

Potential design and mitigation measures to reduce the magnitude of GHG emissions associated with the proposed scheme would follow the principles for carbon reduction set out in PAS 2080:2023 of avoid, switch and improve. Figure 14-3 reproduced from Figure 5 of PAS 2080:2023 shows the ability to reduce whole life carbon in projects decrease as the proposed scheme progresses through the decision-making process.

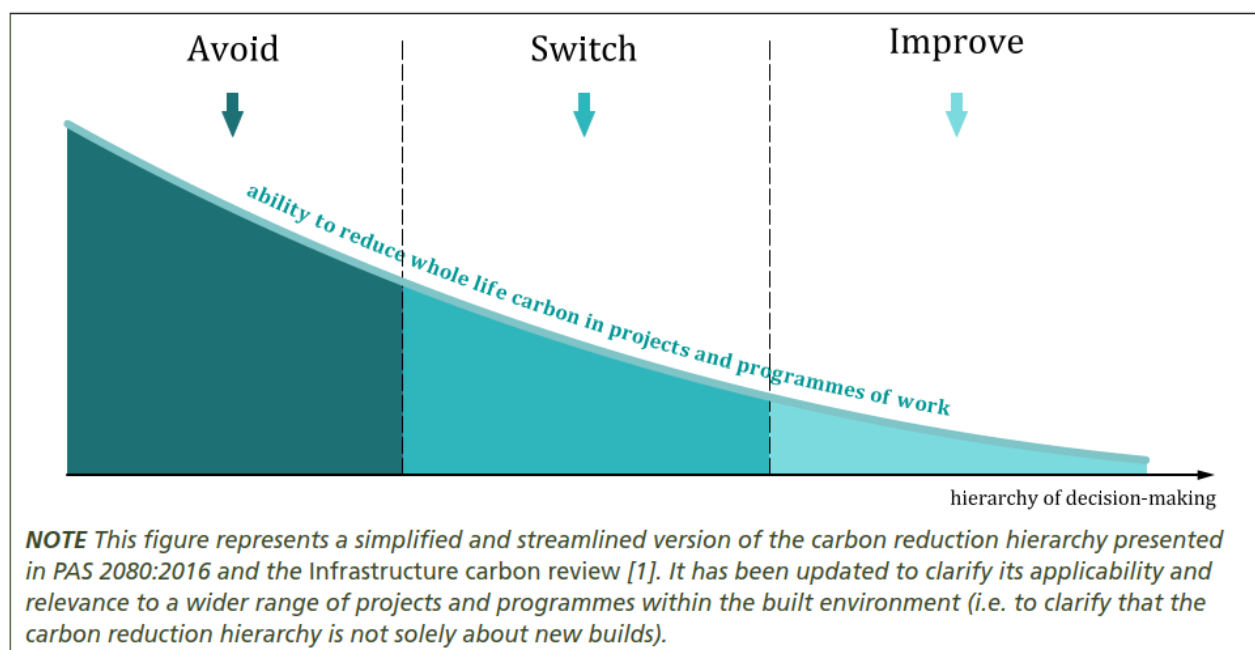


Figure 14-3: Principles of Carbon Reduction

The improvement strategies which reduce the amount of construction required and maximise the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required (such as avoiding emissions) would result in lower GHG emissions.

Some examples of design, mitigation and enhancement measures for the construction phase include:

- Refine the designs to use less materials, for example through optimising the depth of sub-base, the height of embankments or depth of cuttings required or designing structures such as retaining walls that require less material to construct.
- Increased recycled content of asphalt or concrete resulting in lower embodied carbon in construction materials.
- Local sourcing of materials to reduce transport distances and reuse of aggregate and site won material on-site or sharing resources with other nearby construction projects.
- Low carbon/more efficient construction processes and activities. For example, using zero-emission construction plant and use of renewable energy to power construction compounds and site equipment where feasible. Other measures could be considered to increase fuel efficiency during construction or to reduce fuel and / or water use and the generation of waste.

Vulnerability of the Proposed Scheme to Climate Change

Good engineering practice would be applied during construction by the chosen contractors to increase the resilience of the construction activities to extreme weather events. Specific measures would be included in the Environmental Mitigation Plan (EMP), or equivalent, in order for their implementation to be secured and could include:

- Determining appropriate locations for site offices and facilities and storage areas for materials.
- Suitable management of site drainage.
- Using weather forecasting and developing plans for extreme weather events.

Enhancement Measures – Construction Phase

No enhancement measures have been identified at the time of reporting which are over and above those mitigation measures already specified above. Potential enhancement opportunities would be explored and presented for the construction phase at later DMRB stages.

14.8.2 Mitigation Measures – Operational Phase

Greenhouse Gas Emissions

Designing the proposed scheme with a view to maximising the operational lifespan of key materials, such as surfaces and structures and minimising the need for, and frequency of, maintenance and refurbishment would be one of the key mitigation measures to reduce GHG emissions. Others include incorporating renewable energy technology where feasible, for example to power road signs, and the use of energy-efficient roadside signage and lighting (such as Light Emitting Diode (LED) lighting). These would be explored further at later DMRB Stages, for example DMRB Stage 2 and beyond.

Vulnerability of the Proposed Scheme to Climate Change

It is expected that the vulnerability of the proposed scheme to potential long-term weather changes and to intensified extreme weather conditions would be addressed through design in the context of good engineering practice and the application of the most up to date design standards and climate change allowances.

As required by DMRB LA 114, appropriate ongoing asset management procedures to monitor asset performance with regard to weather events and climate change would be implemented. This would be used to feed into adaptive management measures or take corrective action to address any issues which have arisen through climate change.

Enhancement Measures – Operational Phase

Opportunities for enhancement include measures to further mitigate climate related impacts on road surfaces and pavements or to embankments and earthworks such as:

- Consideration of more resilient materials which are less sensitive to temperature extremes or changes in temperature to mitigate against rutting or cracking and fretting of the carriageway.
- Use of a drainage blanket layer to aid drainage and improve slope stability.
- Use of granular materials in embankments which are less susceptible to weathering.
- Additional drainage or sub-surface drainage requirements where groundwater levels are close to the base of embankments.

14.9 Assessment of Likely Significant Effects

14.9.1 Greenhouse Gas Emissions

Due to the limited data available for this DMRB Stage 1 (i.e. only improvement strategies being available) it is assumed that construction (and maintenance and non-user operation emissions) is likely to be proportionate to:

- The improvement strategy length.
- River crossings – there is one substantial river (Urr Water) in the area that several of the improvement strategies cross which would entail bridge construction.
- The total number of new major structures needed.
 - Table 14-10 presents the high-level results of this analysis. This assessment does not take into account other elements of the design such as the need for earthworks and embankments which will be assessed when data is available, such as at DMRB Stage 2.
 - Due to the broadly defined nature of the improvement strategies, the numbers of retaining walls, culverts and minor bridges (expected length of less than 20m) have not been included in Table 14-10. Minor structures will be assessed at DMRB Stage 2.

Table 14-10: High Level Qualitative Assessment

Improvement Strategy	Approximate Length (km)	Crosses Urr Water	Indicative Number of New Major Structures
Improvement Strategy 1	19.0	Yes	4
Improvement Strategy 2	12.4	No	2
Improvement Strategy 3	5.4	No	1
Improvement Strategy 4	6.0	No	2
Improvement Strategy 5	11.0	Yes	1
Improvement Strategy 6	17.2	Yes	3

Improvement Strategy 1 is entirely offline, crosses Urr Water and would likely require the most new major structures. It is therefore likely to require more construction works (and would likely result in higher construction GHG emissions) than the other improvement strategies. Improvement Strategy 3, which is online, would not require as many new major structures to be constructed as most other improvement strategies and is likely to result in the least construction and associated GHG emissions.

No assessment of the increase in road transport emissions can be made at this stage as traffic data is not available. However, if additional capacity is added to a road such as the A75, this has the potential to result in an increase in traffic flows and higher road traffic GHG emissions.

14.9.2 Vulnerability of the Proposed Scheme to Climate Change

The likely receptors related to the proposed scheme's vulnerability to climate change were identified in the Potential Impacts section of this chapter (Table 14-8 and Table 14-9) along with their vulnerable elements and the likely impacts for the relevant climate events. The types of receptors are not expected to differentiate considerably between the improvement strategies as many of the receptor types are common to them all, with the exception of those with major water crossings (for example bridges). As all of the improvement strategies are in relatively close proximity to each other, the climate conditions currently, or projected to be, experienced in the study area are considered to be the same for each improvement strategy. Therefore, in terms of direct exposure to adverse weather conditions, all the receptors, regardless of the improvement strategy, are considered to be at a similar risk, with the exception of those with major water crossings (for example bridges), which would be at a higher risk.

The climate projections, set out in the Baseline Conditions of this chapter, show that there is the potential for increased temperatures to impact on the construction and operation phases, with larger increases in temperatures projected to occur over the operation phase. The increased temperatures, including periods of longer, drier conditions during summer, could impact several proposed scheme receptors identified in Table 14-8 and Table 14-9 including engineering structures, workforce, construction assets, pavement, soft estate and road users.

The projected increased seasonal rainfall, particularly during the winter months, and increased extreme daily rainfall rates could lead to surface water flooding and soil erosion which could also impact on geotechnical structures such as embankments, engineering structures, workforce, construction assets, pavements, soft estate and road users.

The climate projections indicate that impacts to receptors, for example, signs, signals and gantries, soft estate and road users due to increased wind speeds are unlikely to differ substantially compared to the existing situation.

The Road Drainage and the Water Environment Chapter of the EAR acknowledges that climate change can impact flood risk and should be taken into account in the assessment. The chapter further discusses water courses and the likelihood of flooding in the context of the improvement strategies. This indirect exposure of the proposed scheme to flood risk, which could be exacerbated by climate change particularly with regard to flooding from rivers and watercourses, is a key risk which needs to be considered as flooding could impact on several receptors listed in Table 14-8 and Table 14-9.

However, as set out in the Design, Mitigation and Enhancement Measures section of this chapter, it is anticipated that appropriate climate change adaptation measures would be embedded into the designs and via an EMP, which would be aligned to the requirements outlined in [DMRB CG 501 - Design of highway drainage systems \(version 2.1.0\)](#). The implications on the design through the consideration of climate change allowances will be developed and reported on through DMRB Stage 2 and Stage 3.

It is not possible to specify the significance of the adverse effect of climate change on the proposed scheme at this stage, although it is assumed that the vulnerability of each improvement strategy to climate change could be addressed through appropriate design and management practices and thus is unlikely to represent a significant effect. However, this would be assessed in greater detail at later DMRB Stages. As noted in the Assumptions and Limitations section of this chapter, consideration of the in-combination impacts on receptors in the surrounding environment and the potential cumulative effect with other transport infrastructure would be assessed at DMRB Stage 2 and 3.

14.10 Proposed Scope of Future Assessment

At DMRB Stage 2, it is proposed that design and modelled traffic data is used to estimate changes in GHG emissions for each route option, from at least construction and road traffic, to allow a more detailed assessment to be undertaken as well as to inform the design of potential measures to reduce proposed scheme-related GHG emissions going forward. These estimated changes in GHG emissions would allow the potential impact of each option on climate to be compared.

Ideally, impacts on existing carbon stores and sinks such as peat bogs and woodland areas as a result of each route option would be minimised or avoided where possible. Such impacts would not be quantified at DMRB Stage 2 but instead would be considered qualitatively for each route option.

Similarly, from a vulnerability perspective, work would be undertaken to assess climate risks in more detail such as landslide risks and would include working with designers and the flood risk team to help to understand potential flooding issues. Potential climate risks relevant to each route option would then be identified at a high level in order to assess whether there are any potential differentiators between route options.

14.11 Summary

A high level qualitative assessment of the improvement strategies has been undertaken at DMRB Stage 1 as summarised in Table 14-10. This is due to limited design and traffic data which is a common constraint at this early stage of the process. Improvement Strategy 1 is entirely offline, crosses Urr Water and would likely require the most new major structures. It is therefore likely to require more construction works (and would likely result in higher construction GHG emissions) than the other improvement strategies. Improvement Strategy 3, which is online, would not require as many new major structures to be constructed as most other improvement strategies and is likely to result in the least construction and associated GHG emissions.

The likely receptors related to the proposed scheme's vulnerability to climate change were identified in the Potential Impacts section of this chapter (Table 14-8 and Table 14-9) along with their vulnerable elements and the likely impacts for the relevant climate events. The types of receptors are not expected to differ considerably between the improvement strategies as many of the receptor types are common to them all, with the exception of those with major water crossings (for example bridges).

As all six improvement strategies are in relatively close proximity to each other, the climate conditions currently, or projected to be, experienced in the study area are considered to be

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the same for each improvement strategy. Therefore, in terms of direct exposure to adverse weather conditions, all the receptors, regardless of the improvement strategy, are considered to be at a similar risk, with the exception of those with major water crossing (for example bridges), which would be at a higher risk.

Therefore, at DMRB Stage 2 further work is required to inform the selection process for a preferred route option as set out in The Proposed Scope of Future Assessment section of this chapter.

15. Assessment of Cumulative Effects

15.1 Introduction

This chapter describes the assessment of cumulative effects for the A75 Springholm and Crocketford Improvements (hereafter referred to as “the proposed scheme”).

15.2 Cumulative Assessment Methodology

Annex IV of the Environmental Impact Assessment (EIA) Directive (2014/52/EU) (amending Directive 2011/92/EU) (hereafter referred to as the “EIA Directive”) requires the consideration of the cumulative effects within an Environmental Impact Assessment Report. This requirement is reflected within Schedule 1A of the Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017.

While the term 'cumulative' is not defined within the EIA Directive, the European Commission (EC) guidelines define 'cumulative impacts' as follows: 'Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed scheme'.

[Design Manual for Roads and Bridges \(DMRB\) LA 104 - Environmental assessment and monitoring \(revision 1\)](#) (hereafter referred to as “DMRB LA 104”) states that ‘EIAs must include cumulative effects in accordance with the requirements of the EIA Directive 2014/52/EU’ and provides a glossary of technical terms, which expands on the above definition, noting that a cumulative effect may arise as the result of:

- a) the combined impact of a number of different environmental factors - specific impacts from a single project on a single receptor/resource (referred to as Type 1 cumulative effects); and/or
- b) the combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/resource (referred to as Type 2 cumulative effects).

In this chapter, cumulative effects are separated into two main sources as follows:

- Intra-project effects, during this Environmental Appraisal Report (EAR) will be referred to as “combined effects” which are the effects that occur when different environmental aspects from one project, impact a single environmental receptor. An example of this would be local residents being impacted by construction noise, visual changes and dust during the construction phase of the proposed scheme.

- Inter-project effects, during this EAR will be referred to as “cumulative effects”. This effect occurs when impacts from different projects in an area have influence on a receptor. An example of this could be two sets of temporary traffic lights from different projects in one area that cause major congestion for residents.

15.2.1 Combined Effects Methodology

Combined effects are recognised when a receptor is affected by a proposed project that will have multiple environmental impacts.

For each improvement strategy the assessment identifies, with a reasonable assumption, the potential key receptors with a likelihood for significant effects which have been identified in the previous environmental factor chapters. Consideration is then given to how those effects may add up during the construction and operational phases.

Some of the potential combined effects may have already been identified in previous environmental factor chapters. For example, the potential for effects from dust and noise on sites of ecological importance or human receptors have been detailed in the Biodiversity Chapter and Noise and Vibration Chapter of this EAR respectively. Such assessments have not been duplicated in this chapter, but where appropriate, references have been made to the relevant environmental factor chapter without repeating the assessments.

There is potential, in some instances, to highlight the probability for the effects of different outputs acting upon the same receptor, without the ability to provide details of the interactions between those effects. At the current stage of assessment, the potential for these effects is noted, with the intention is that they would be reviewed at a later stage of assessment.

15.2.2 Cumulative Effects Methodology

The guidance for assessing cumulative effects is outlined in Sections 3.19 to 3.22 of the DMRB LA 104. The guidance states that a Zone of Influence (Zoi) should be established for the proposed scheme along with other projects. The Zoi is a defined geographic area that will be used to encompass environmental receptors that could be impacted by the proposed scheme.

For this assessment, the General Zoi was first identified for the proposed scheme and set at 2km from the improvement strategies. This was chosen for the identification of other proposed projects which have the potential to contribute to cumulative effects. The General Zoi is mapped on Figure 15-1. Each environmental factor has an independent Zoi relative to the required study area for each of their assessments, these are identified in Table 15-1 below.

Table 15-1: Zol for Each Environmental Factor

Environmental Factor	Maximum Zol from the Improvement Strategies
Air quality	2km buffer from the improvement strategies
Cultural heritage	1km and 500m buffer from the improvement strategies
Landscape and visual	2km buffer from the improvement strategies
Biodiversity	2km buffer from the improvement strategies
Geology and soils	100m buffer from the improvement strategies
Noise and vibration	600m buffer from the improvement strategies
Population and human health	500m buffer from the improvement strategies
Road drainage and the water environment	500m buffer from the improvement strategies
Material assets and waste	Within the improvement strategies

The next step was to identify a list of developments that have the potential to impact shared receptors with the proposed scheme. DMRB LA 104 lays out the types of developments that the assessment of cumulative effects should report on:

- Roads projects which have been confirmed for delivery over a similar timeframe (2025 – 2035).
- Other development projects with valid planning permissions or consent orders, and for which EIA is a requirement.
- Proposals in adopted development plans with a clear identified programme for delivery.

[Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment](#) details a broader list of developments that should be included within a cumulative effect assessment in comparison to DMRB LA 104. For example, developments that have been submitted for planning but have not yet been determined. The guidance does not relate to the options identification stage as it is not considered proportionate to include such developments during DMRB Stage 1. These aspects would be considered in the cumulative effects assessments during later DMRB stages.

To identify a list of other relevant proposed developments, data has been gathered for the Committed Development Log (CDL). The following types of proposed developments have been searched for, and identified within the General Zol of the proposed scheme:

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- Major developments (as defined in the Town and Country Planning (Hierarchy of Development) (Scotland) Regulations 2009 (the Hierarchy Regulations)) which have been granted planning permission and there is potential for significant environmental effects.

Other major developments, including the following:

- National developments that have been designated by Scottish ministers under the [National Planning Framework 4](#).
- Developments under the Transport and Works (Scotland) Act 2007.
- Allocations in the relevant adopted and emerging development plans.

The following information was included in the search for all relevant developments and allocations identified within the General Zol of the proposed scheme:

For developments:

- Application reference
- Description of the development
- Application type
- Applicant
- Site location
- Development type
- Application status

For allocations:

- Allocation policy
- Local planning authority
- Local planning document
- Site name
- Allocation type
- Size
- Local plan status (adopted/emerging)

All the identified developments and allocations are considered to have the potential to contribute to the cumulative effects with at least one of the improvement strategies. The developments and allocations are discussed in the Assessment of Cumulative Effects section of this chapter, with a list of allocations within the Zol in Table 15-3.

At DMRB Stage 1, it would be deemed disproportionate to evaluate the significance of the cumulative effects for each improvement strategy. As a general assumption, an improvement strategy with more developments or allocations within the study area has a greater potential for cumulative effects compared to an improvement strategy with fewer developments or allocations.

15.3 Assumptions

Projects were provisionally screened against indicative thresholds identified under Schedule 3 of the Town and Country Planning (EIA) (Scotland) Regulations 2017. Projects which exceed those thresholds have the potential to cause significant environmental effects, and such projects were therefore included in the short list. Although the thresholds are indicative only, and the sensitivity of the receiving environment would also be considered in any formal EIA screening determination, the use of the thresholds for shortlisting is considered proportionate at this stage of the assessment to inform options identification.

The Committed Development List (CDL) was based on data available in March 2025, and therefore any developments that are brought into the public domain after this were not included at this current stage of assessment. Development and allocations in the designated Zol will continue to be monitored in the later stages of assessment.

The CDL contains information regarding major applications from March 2020 to March 2025, as this time span is deemed suitable for this current stage.

Applications that have been refused planning permission were excluded from short list as it would be unlikely for these projects to be constructed and to have potential for cumulative effects. Similarly, other applications at various stages of the appeals process have been excluded from the list. Changes to the application status of other projects will continue to be gathered to inform updates to this work in later stages of the proposed scheme.

The climate change assessment (included in the Climate Change Chapter of this EAR) considers the proposed scheme's potential to affect the national climate (as a result of changes in Greenhouse Gas (GHG) emissions) and the effect of changes in climate on the proposed scheme itself, and therefore does not require further assessment in the cumulative effects assessment. It is assumed that a temporal link between identified developments and this proposed scheme is likely, but no online searches have been conducted for construction dates for these developments. The information isn't likely to be readily available online or could be unreliable in nature.

At DMRB Stage 1, the compilation of the list of other projects for cumulative effects assessment has been carried out by the assessor alone, however in later DMRB Stages of the

proposed scheme (to support statutory EIA, if required), it is expected that relevant stakeholders should be consulted to create that list.

15.4 Limitations

At this early stage of assessment there is no way to carry out a meaningful assessment of the likely significance of potential cumulative effects. The current improvement strategy design information is limited, as is expected for DMRB Stage 1. Individual environmental factor assessments are based on preliminary stages of qualitative assessment. The cumulative assessment will be undertaken progressively as the proposed scheme moves into DMRB Stage 2 when a developed understanding of likely significant and potential effects for both the construction and operational phase is known.

15.5 Assessment of Combined Effects

The assessments contained in the environmental factor chapters of this EAR describe specific impacts on the individual receptors in terms of a range of environmental factors. In many of instances the range of potential impacts on receptors are addressed within each environmental factor specific chapter.

DMRB Stage 1 Environmental Appraisal Report Assessment of Cumulative Effects

Table 15-2: Potential Combined Effects across the Proposed Scheme Improvement Strategies.

Affected Receptors	Improvement Strategy	Summary Description of Effects	Aspects with Shared Receptors
Residents in close proximity to the improvement strategies	All Improvement Strategies	There are potential combined adverse effects on residents at properties in the vicinity of the proposed scheme during construction and operation due to: ▪ Changes in views. ▪ Potential risks to human health from soil contamination. ▪ A worsening of human health as a result of increases in noise and vibration. ▪ Disruption to or loss of access/severance. ▪ A potential increase in flood risk.	▪ Air quality ▪ Landscape and visual ▪ Geology, soils and groundwater ▪ Noise and vibration ▪ Population and human health ▪ Road drainage and the water environment

DMRB Stage 1 Environmental Appraisal Report: Assessment of Cumulative Effects

Affected Receptors	Improvement Strategy	Summary Description of Effects	Aspects with Shared Receptors
Users of community facilities, public open space and public rights of way	All Improvement Strategies	There would be combined adverse effects on users of community facilities, public open spaces and public rights of way in the vicinity of the proposed scheme during construction and operation due to: ▪ Changes in views. ▪ Potential risks to human health from soil contamination. ▪ A worsening of human health as a result of increases in noise and vibration. ▪ Disruption to or loss of access/severance. ▪ A potential increase in flood risk.	▪ Air quality ▪ Landscape and visual ▪ Geology, soils and groundwater ▪ Noise and vibration ▪ Population and human health ▪ Road drainage and the water environment

DMRB Stage 1 Environmental Appraisal Report: Assessment of Cumulative Effects

Affected Receptors	Improvement Strategy	Summary Description of Effects	Aspects with Shared Receptors
Agricultural landholdings	All Improvement Strategies	There would be combined adverse effects on agricultural landholdings in the vicinity of the proposed scheme during construction and operation due to: ▪ Loss of agricultural land and degradation of soil quality. ▪ Disruption to or loss of access/severance. ▪ A potential increase in flood risk.	▪ Geology, soils and groundwater ▪ Population and human health ▪ Road drainage and the water environment
Peat bogs	All Improvement Strategies	There would be a combined adverse effect on the identified areas of Peat in the vicinity of the Proposed scheme during the construction and operational phase due to: ▪ Loss of valued peat land in the area ▪ Increase in carbon emissions due to the removal of natural carbon sink.	▪ Geology, soils and groundwater ▪ Population and human health ▪ Climate ▪ Material assets and waste

As the proposed scheme progresses into the next stage, further assessment will be required for the identified combined effects on the specific receptors.

15.6 Assessment of Cumulative Effects

During this DMRB Stage 1 appraisal, a high-level search has been conducted using the methodology above, during the search there were no developments identified within the ZOI that would classify as Major using the guidance from The Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Updated searches will be carried out in DMRB Stage 2.

Using the [Dumfries and Galloway Council Local Development Plan 2](#) (hereafter referred to as "LDP2") to identify land allocations for proposed developments, 11 allocations were identified within 2km of the improvement strategies (10 situated within Castle Douglas and one in Springholm). All 11 allocations are within the boundaries of Improvement Strategies 1 and 6, while the other four improvement strategies have only one allocation within their boundaries. Table 15-3 lists the allocations with the potential for cumulative effects according to guidance.

DMRB Stage 1 Environmental Appraisal Report: Assessment of Cumulative Effects

Table 15-3: Planning Allocations within 2km of the Improvement Strategies

Allocation Policy Reference	Local Planning Authority	Allocation Site Name	Local Plan Document	Size	Adopted or Emerging	Allocation Type	Improvement Strategies Within 2km
CSD.H1	Dumfries and Galloway Council	North of Garden Hill Drive	Dumfries and Galloway Council Local Development Plan 2	15 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.H2	Dumfries and Galloway Council	West of Garden Hill Road	Dumfries and Galloway Council Local Development Plan 2	30 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.H3	Dumfries and Galloway Council	East of Ernespie Road	Dumfries and Galloway Council Local Development Plan 2	130 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.H4	Dumfries and Galloway Council	Cotton Street	Dumfries and Galloway Council Local	16 units allocated up to 2029	Emerging	Housing	1 and 6

DMRB Stage 1 Environmental Appraisal Report: Assessment of Cumulative Effects

Allocation Policy Reference	Local Planning Authority	Allocation Site Name	Local Plan Document	Size	Adopted or Emerging	Allocation Type	Improvement Strategies Within 2km
			Development Plan 2				
CSD.H5	Dumfries and Galloway Council	West of Torrs Road	Dumfries and Galloway Council Local Development Plan 2	133 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.H6	Dumfries and Galloway Council	South of Jenny's Loaning	Dumfries and Galloway Council Local Development Plan 2	190 units allocated beyond 2029	Emerging	Housing	1 and 6
CSD.H10	Dumfries and Galloway Council	Land to south of Ernespie Lodge	Dumfries and Galloway Council Local Development Plan 2	25 units allocated up to 2029	Emerging	Housing	1 and 6

DMRB Stage 1 Environmental Appraisal Report: Assessment of Cumulative Effects

Allocation Policy Reference	Local Planning Authority	Allocation Site Name	Local Plan Document	Size	Adopted or Emerging	Allocation Type	Improvement Strategies Within 2km
CSD.H11	Dumfries and Galloway Council	Land to south of Kilmichael, Abercromby Road	Dumfries and Galloway Council Local Development Plan 2	35 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.H203	Dumfries and Galloway Council	Land at The Stables	Dumfries and Galloway Council Local Development Plan 2	180 units allocated up to 2029	Emerging	Housing	1 and 6
CSD.B&I1	Dumfries and Galloway Council	Land at Oakwell Road	Dumfries and Galloway Council Local Development Plan 2	1.48 hectares	Emerging	Business and Industry	1 and 6
SPR.H1	Dumfries and Galloway Council	Land off Ewart Place	Dumfries and Galloway Council Local Development Plan 2	40 units allocated up to 2029	Adopted	Housing	1, 2, 3, 4, 5 and 6

15.7 Summary of Effects

The cumulative effect assessment identified that the following receptors may be subject to combined effects:

- Residents in close proximity to the improvement strategies.
- Users of community facilities.
- Public open spaces.
- Public Rights of Way (PRoW).
- Agricultural land holdings.
- Peatland.

There have been no major developments identified during searches that would contribute to cumulative effects. Land allocated for development by Dumfries and Galloway Council though the LDP2 was recorded within 2 km of the improvement strategies. All 11 of the allocations are situated within 2km of Improvement Strategies 1 and 6. This means that Improvement Strategy 1 and 6 are likely to have the largest potential for cumulative effect on the surrounding area, given the number of allocations.

The list of developments and allocations will be reviewed at DMRB Stage 2.

16. Summary of Assessment

16.1 Introduction

This section presents the findings from the Environmental Appraisal Report (EAR), detailing the key impacts of the identified improvement strategies on each of the environmental factors

For the purpose of this EAR, and to ensure a 'worst case' approach, the full improvement strategy width of 200 meters has been considered. However, on selection of improvement strategies to take forward to Design Manual for Roads and Bridges (DMRB) Stage 2 for route option development, it is recognised that some of the impacts identified could be avoided or reduced as the route options will likely not have a width of 200m, for example direct impacts on listed buildings and Milton Loch Site of Special Scientific Interest. This will be acknowledged when undertaking comparative assessment at DMRB Stage 2.

16.2 Air Quality

It is unlikely there will be exceedances of Air Quality Objectives (AQO) or Limit Values (LV) for human receptors, however, there may be significant effects at designated sites (for example ancient woodland) within 200m of the affected road network (ARN). Therefore, a simple DMRB assessment (based on [DMRB LA 105 - Air quality \(revision 0.1.0\)](#)) should be undertaken at DMRB Stage 2 to assess the operational opening year impacts at designated sites within 200m of the ARN. A small number of human receptors close to the improvement strategies could also be assessed for illustrative purposes using a simple approach to show that concentrations at human health receptors will be significantly below the AQOs/LVs.

It is proposed that construction assessment is not undertaken until DMRB Stage 3.

16.3 Cultural Heritage

Table 16-1 shows the heritage assets that have potential to experience likely significant effects during construction of the proposed scheme. The table also shows a comparison of the numbers of heritage assets within each improvement strategy. At DMRB Stage 2, the location of these heritage assets will be taken into consideration during design development with the aim of avoiding or reducing impacts.

DMRB Stage 1 Environmental Appraisal Report: Summary of Assessment

Table 16-1: Number of Cultural Heritage Assets Potentially Experiencing Likely Significant Effects during Construction for each Improvement Strategy

Likely Significant Adverse Effects	Improve- ment Strategy 1	Improve- ment Strategy 2	Improve- ment Strategy 3	Improve- ment Strategy 4	Improve- ment Strategy 5	Improve- ment Strategy 6
Number of Category B Listed Buildings potentially impacted	3	2	7	4	0	1
Number of non-designated Historic Buildings potentially impacted	2	0	9	1	4	2
Number of non-designated Archaeological Sites potentially impacted	1	6	2	2	3	3

At this stage no significant impacts are anticipated during construction or operation to the Conservation Area or Scheduled Monuments.

Cultural Heritage assets are considered to be an irreplaceable resource and as stated in [DMRB LA 106 - Cultural heritage assessment \(revision 1\)](#), the 'need for development' should be balanced against the requirement to 'protect and enhance our national cultural heritage resource' in line with national and local legislation, policy and good practice guidance.

16.4 Landscape and Visual

All six improvement strategies have been assessed with regards to their potential impacts on landscape and visual receptors. Each improvement strategy presents differing levels of

potential impact to landscape and visual receptors. All improvement strategies would result in changes to the rural landscape character and views from residential properties, active travel routes, local roads and other locations within the surrounding landscape.

Improvement Strategy 6 is the second longest and would likely have the most significant adverse effect to landscape and visual receptors south of the existing A75. Significant effects would result from permanent changes to the landform on high ground including several hills, impacts on the landscape pattern, severance and loss of woodland (including native woodlands), habitat corridors and green networks (including along the Urr Water and various minor watercourses) together with the introduction of the new road infrastructure and traffic into the rural landscape. There is also potential for indirect effects (on views) of this improvement strategy from Terregles LLA. The length of the improvement strategy, its elevated position in the landscape and its proximity to numerous individual properties and several settlements, most notably Hardgate and Haugh of Urr, would be likely to result in significant visual effects. Parts of this improvement strategy run close to National Cycle Network (NCN) 7 so would likely have adverse visual effects on cyclists. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route resulting from reductions in traffic including improved townscape and visual amenity within Springholm and Crocketford.

Similar in length to Improvement Strategy 6, Improvement Strategy 1 would also be likely to have a significant adverse effect on both landscape and visual receptors. Significant effects would result from permanent changes to the landform and pattern on high ground with several hills and surrounding topography permanently altered, impacts on the landscape pattern, severance and loss of woodland (including Ancient Woodland Inventory (AWI)), habitat corridors, green networks (including along the Urr Water and various minor watercourses) and boundary features including drystone walls together with the introduction of the new road infrastructure and traffic into the rural landscape. This improvement strategy would result in loss and severance of AWI woodlands and likely impacts on undulating landform north of Auchenreoch Loch. There is also potential for indirect effects (on views) of this option from Terregles Local Landscape Area (LLA). The length of the improvement strategy, its partly elevated position in the landscape proximity to settlements including Brae, Kirkpatrick Durham, Old Bridge of Urr, Clarebrand, Crocketford and numerous individual properties to the north of the existing A75 would be likely to result in significant visual effects. The rural setting north of Auchenreoch Loch would be affected, with the visual receptors at The Inn on the Loch impacted, though there would be benefits on the south side of the loch from reduced traffic on the existing A75. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route, including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 2 would be likely to have a significant adverse effect on both landscape and visual receptors. Significant effects would result from permanent changes to the landform and pattern on high ground with several hills and surrounding topography permanently altered, impacts on the landscape pattern, severance and loss of woodland (including AWI), habitat corridors, green networks and boundary features. The central section of this improvement strategy, which follows the same route as Improvement Strategy 1, would result in loss and severance of AWI woodlands and likely impacts on undulating landform north of Auchenreoch Loch. Residents of Kirkpatrick Durham, Brae and north facing properties in Crocketford and rural properties would be likely to experience adverse visual effects. The rural landscape north of Auchenreoch Loch would be affected, with the visual receptors at The Inn on the Loch impacted, though there would be benefits on the south side of the loch from reduced traffic on the existing A75. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 5 is considered likely to have broadly similar overall levels of landscape and visual effects to Improvement Strategy 2, but with the most significant landscape and visual effects likely to result from the route crossing high ground of Barfil Hill, Cairny Hill, Longshot Hill and the northern slopes of Tan Hill. This improvement strategy would also result in changes to the landscape pattern and severance and loss of woodland, habitat corridors, green networks and boundary features. Visual receptors in Springholm, Crocketford and Hardgate as well as rural properties would likely be affected by views of this improvement strategy. The reduction/ removal of traffic on the existing A75 alongside Auchenreoch Loch would improve the landscape setting of the loch and enhance visual amenity. This improvement strategy would result in beneficial landscape and visual effects along the existing A75 route including improved townscape and visual amenity within Springholm and Crocketford.

Improvement Strategy 4 is considerably shorter than Improvement Strategies 1,2, 5 and 6 and closer to the existing A75. This improvement strategy, which follows the lower valley slopes and valley floor avoiding hills and AWI woodland, and severing a relatively small number of field boundary features/ green corridors would have less significant adverse landscape effects than Improvement Strategies 1,2,5 and 6, while providing improved townscape and visual amenity in the bypassed settlements of Springholm and Crocketford. However, it would potentially affect the landscape setting of a group of listed buildings at Newbank Mill. The reduction/ removal of traffic on the existing A75 alongside Auchenreoch Loch would improve the landscape setting of the loch and enhance visual amenity. There is the potential for significant effects on rural views currently experienced from residential properties in Springholm, Crocketford and Brandedleys Holiday Park.

Improvement Strategy 3 is online and would therefore result in the least adverse effects on the rural landscape and visual effects on rural properties but would have significant adverse effects on the townscape and visual amenity within Springholm and Crocketford. Visual effects on residents, workers and visitors in the two villages during construction are likely to be significant, as a result of widening and potential demolition of properties along the existing A75 corridor. During operation, visual effects are likely to be significantly worse than those currently experienced, due to road widening and removal of existing screening features, including buildings which currently screen the existing A75 from neighbouring areas, particularly as space for mitigation measures would be limited.

Improvement Strategy 3 would be likely to have the least adverse effects on the rural landscape and least visual effects on scattered rural properties of all the improvement strategies but the most significant effects on the townscape and visual receptors along the existing A75 within Springholm and Crocketford. Of the remaining (offline) improvement strategies, Improvement Strategy 4 would be likely to have the least adverse landscape and visual effects, followed by Improvement Strategies 2 and 5, then Improvement Strategy 1 and Improvement Strategy 6 likely to have the greatest adverse effects.

16.5 Biodiversity

A high-level assessment of the improvement strategies in relation to biodiversity was undertaken. The proposed scheme, regardless of the improvement strategies selected, is likely to result in some adverse effects to biodiversity at a local level in relation to habitat loss and fragmentation, and the associated effects on notable and protected species.

Improvement Strategies 1 and 6 would likely have the greatest impact on biodiversity in general as they cover the greatest total area and both will involve construction of a river crossing over Urr Water, resulting in a greater potential impact on aquatic habitats and species. Improvement Strategy 1 is also likely to result in a greater loss of Ancient Woodland Inventory (AWI), which is considered to be irreplaceable habitat, compared to other improvement strategies.

Improvement Strategy 5 will also involve construction of a river crossing over Urr Water. In addition, Improvement Strategy 5 lies partially within Milton Loch Site of Special Scientific Interest (SSSI), therefore, construction and operation of the proposed scheme may directly and indirectly impact the SSSI. Improvement Strategy 5 also covers the largest area of Native Woodland Survey of Scotland (NWSS) of all improvement strategies.

As all six improvement strategies are in relatively close proximity to each other, the protected and notable species present are likely to be similar across all improvement strategies, provided habitat across the improvement strategies is similar. The proposed scheme may provide minor beneficial effects to biodiversity if habitat enhancement is employed beyond

the level required for mitigation. Field surveys will be required at DMRB Stage 2 to provide further information on the habitats and species likely to be impacted by the proposed scheme.

16.6 Geology, Soils and Groundwater

A range of baseline data has been reviewed and used to identify relevant geology, soils and groundwater receptors. The receptors identified for the improvement strategies are agricultural soils, human health, groundwater and surface waters.

In accordance with relevant industry guidance, an assessment was undertaken on the potential effects on these receptors from the implementation of the proposed scheme and also on their potential significance. The following significant effects were identified for all improvement strategies unless otherwise stated:

- Physical removal or permanent sealing of agricultural land and/or peat.
- Reduction or loss of soil function(s) due to stripping, handling and storage, through mechanisms such as compaction or erosion.
- Potential mobilisation of contamination and/or surface water runoff into Milton Loch SSSI (Improvement Strategy 5 only).
- Spills and leaks of construction runoff could impact groundwater quality.
- Routine road runoff discharge or spills and leaks increase the risk of pollution.

In conclusion, potential significant effects were similarly identified across all improvement strategies. With the exception of Improvement Strategy 5 where additional potential significant effects were identified for surface water due to its proximity to Milton Loch SSSI.

The risk of potential significant effects being realised is highest for Improvement Strategies 1 and 6 as they cover the greatest total area. Improvement Strategy 5 is the next most likely to have significant effects due to its length and proximity to Milton Loch SSSI, followed by Improvement Strategy 2, then Improvement Strategy 4 and 3 due to their smaller total areas.

The identified effects on soils are due to land take and would need to be mitigated through route optioneering or future design mitigation measures.

16.7 Material Assets and Waste

At this stage of assessment, all improvement strategies have been assessed to have similar significance for adverse effects. All improvement strategies are likely to have moderate and significant effects on regional and Scotland-wide waste receptors and are likely to have Large and Significant effects on regional material asset and mineral safeguarding area receptors.

As is proportionate at DMRB Stage 1, estimated quantities for materials required and waste generated from the proposed scheme have not been taken into consideration. Assumptions have been made based on the approximate improvement strategy lengths and indicative maximum number of major structures required to be built. Table 16-2 summarises the outcome of this assessment, using a ranking from 1st (likely to have the most significant effect) to 6th (likely to have the least significant effect).

Table 16-2: Likely Significance of Effect of Material Assets and Waste from Improvement Strategies

Improvement Strategy	Likely Significance of Effect of Material Assets and Waste (Ranked in Order from Most to Least)
Improvement Strategy 1	1st
Improvement Strategy 6	2nd
Improvement Strategy 2	3rd
Improvement Strategy 5	4th
Improvement Strategy 4	5th
Improvement Strategy 3	6th

However, due to the high-level nature of information available at this stage, Table 16-2 does not account for the potential effects of demolition waste as a result of the proposed scheme. This will need to be assessed in further stages of assessment in order to gain clarity on the effects of construction, excavation and demolition waste generated by the proposed scheme.

16.8 Noise and Vibration

It is likely that the construction phase would result in some temporary significant adverse effects for some noise sensitive receptors close to the construction works with any of the improvement strategies. Significant adverse effects can usually be mitigated through the implementation of a Construction Environmental Mitigation Plan (CEMP). Construction phase impacts and effects will be considered in more detail at DMRB Stage 2 and Stage 3.

The operation phase would result in changes in road traffic noise for noise sensitive receptors, depending on their location relative to the proposed scheme. The overall effects are likely to be similar whichever improvement strategy is selected, although Improvement Strategy 3 is less likely to result in any significant beneficial effects. Operational phase impacts and effects will be considered in more detail at DMRB Stage 2 and 3.

16.9 Population and Human Health

The population and human health assessment focuses on land take, accessibility and health impacts on communities and receptors in the assessment study area. All improvement strategies potentially involve land take that could impact on residential, agricultural, commercial and community receptors and could result in likely significant effects. Improvement Strategy 3, which largely involves online improvements, could result in likely significant effects for receptors adjacent to the road, arising from construction activities and operational traffic, but could involve less land take than the other improvement strategies. The improvement strategies that involve creation of offline road space (1, 2, 4, 5, and 6) may have fewer accessibility impacts for communities through construction and operation as the existing road infrastructure could be utilised; however, community severance could be an issue.

For human health, all improvement strategies have the potential to result in a change to health determinants related to air quality, noise, pollution, landscape amenity and severance/accessibility. Construction traffic and activities have the potential to increase dust and noise and vibration and result in temporary disruption in access to facilities relied upon for health (for example medical facilities). During operation, an increase in traffic could result in an increase in air and noise pollution, which could particularly impact on vulnerable populations (for example children and the elderly). Land take could result in permanent changes in access to community assets relied upon for physical activity and social cohesion (for example green/open space). Outputs of the relevant environmental assessments have been considered and at this stage, it is concluded that it is not possible to differentiate between improvement strategies in terms of likely significant effects on health outcomes.

It is noted that likely significant effects are dependent on design and mitigation that is yet to be determined.

16.10 Road Drainage and the Water Environment (RDWE)

The RDWE assessment reviewed a range of baseline data to identify relevant surface water, hydromorphology and flood risk receptors.

The assessment was undertaken in accordance with relevant industry guidance to identify the potential effects on these receptors and their significance from the implementation of the proposed scheme. Table 16-3 shows the potential significant effects identified (pre-mitigation) for the sub-elements of the RDWE. All sub-elements of the RDWE DMRB Stage 1 Assessment have been scoped in for both the construction and operation phases and will be assessed as part of DMRB Stage 2. Surface water supply has not been assessed due to the high-level information available at this stage in the process. This sub-element has been retained for full assessment at DMRB Stage 2.

DMRB Stage 1 Environmental Appraisal Report: Summary of Assessment

Table 16-3: Scope of the RDWE Assessment for DMRB Stage 1

Sub-element	Effect Identified (Construction Phase)	Effect Identified (Operational Phase)	Improvement Strategy	Potential Significance of Effect (pre-mitigation) (Construction and Operational phases)
Surface water quality	Release of fine sediments and pollutants from construction runoff and other construction activities (for example use and fuelling of plant, runoff from stockpiles and stripped land).	Polluted runoff/accidental spillages from new road surfaces entering the road drainage system and entering into watercourses.	All improvement strategies	Large or Very Large
Hydro-morphology	Temporary alterations to the bed and banks of watercourses and release of sediment during construction with the potential to alter morphological features, sediment dynamics and flow dynamics.	Operation of culverts, bridges and outfalls, representing changes to the morphological condition, sediment dynamics and flow dynamics of the watercourse.	▪ 1 ▪ 2 ▪ 3 ▪ 4 ▪ 5 ▪ 6	▪ Large or Very Large ▪ Moderate or Large ▪ Moderate or Large ▪ Moderate or Large ▪ Large or Very Large ▪ Large or Very Large

DMRB Stage 1 Environmental Appraisal Report: Summary of Assessment

Sub-element	Effect Identified (Construction Phase)	Effect Identified (Operational Phase)	Improvement Strategy	Potential Significance of Effect (pre-mitigation) (Construction and Operational phases)
Flood risk	Temporary decreases in floodplain storage and displacement of flood water.	Decrease in floodplain storage and displacement of flood water.	All improvement strategies	To be determined at later design stage
Flood risk	Compaction of land to create level surfaces leading to changes in infiltration rates and increased runoff rates.	Increases in runoff rates due to increases in impermeable areas.	All improvement strategies	To be determined at later design stage
Flood risk	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	All improvement strategies	To be determined at later design stage
Flood risk	Potential for in-channel works in areas of flood risk	Alteration of below ground level flows potentially leading to groundwater flooding elsewhere.	All improvement strategies	To be determined at later design stage

DMRB Stage 1 Environmental Appraisal Report: Summary of Assessment

The identified effects on RDWE, as shown in Table 16-3, are those considered without mitigation. Some of these effects would be mitigated using the measures outlined in the Road Drainage and the Water Environment Chapter of this EAR. At later design stages, as more detailed design information becomes available, additional mitigation measures, including embedded mitigation, may be required to reduce any potential effect as far as reasonably practicable.

16.11 Climate

A high-level qualitative assessment of the improvement strategies has been undertaken at DMRB Stage 1 as summarised in Table 16-4. This is due to limited design and traffic data which is a common constraint at this early stage of the process. Improvement Strategy 1 is entirely offline, crosses Urr Water and would likely require the most new major structures. It is therefore likely to require more construction works (and would likely result in higher construction GHG emissions) than the other improvement strategies. Improvement Strategy 3, which is online, would not require as many new major structures to be constructed as most other improvement strategies and is likely to result in the least construction and associated GHG emissions.

Due to the broadly defined nature of the improvement strategies, the numbers of retaining walls, culverts and minor bridges (expected length of less than 20m) have not been included in Table 16-4. Minor structures will be assessed at DMRB Stage 2.

Table 16-4: High Level Qualitative Assessment

Improvement Strategy	Approximate Length (km)	Crosses Urr Water	Indicative Number of New Major Structures
Improvement Strategy 1	19.0	Yes	4
Improvement Strategy 2	12.4	No	2
Improvement Strategy 3	5.4	No	1
Improvement Strategy 4	6.0	No	2
Improvement Strategy 5	11.0	Yes	1
Improvement Strategy 6	17.2	Yes	3

The likely receptors related to the proposed scheme's vulnerability to climate change were identified in the Climate Chapter of this EAR (Table 14-8 and Table 14-9) along with their vulnerable elements and the likely impacts for the relevant climate events. The types of receptors are not expected to differ considerably between the improvement strategies as many of the receptor types are common to them all, with the exception of those with major water crossings (for example bridges).

As all six improvement strategies are in relatively close proximity to each other, the climate conditions currently, or projected to be, experienced in the study area are considered to be the same for each improvement strategy. Therefore, in terms of direct exposure to adverse weather conditions, all the receptors, regardless of the improvement strategy, are considered to be at a similar risk, with the exception of those with major water crossing (for example bridges), which would be at a higher risk.

Therefore, at DMRB Stage 2, further work is required to inform the selection process for a preferred route option.

16.12 Assessment of Cumulative Effect

The cumulative effect assessment identified that the following receptors may be subject to combined effects:

- Residents in close proximity to the improvement strategies.
- Users of community facilities.
- Public open spaces.
- Public Rights of Way (PRoW).
- Agricultural land holdings.
- Peatland.

There have been no major developments identified during searches that would contribute to cumulative effects. Land allocated for development by Dumfries and Galloway Council through the Local Development Plan (LDP2) was recorded within 2 km of the improvement strategies. All 11 of the allocations are situated within 2km of Improvement Strategies 1 and 6. This means that Improvement Strategy 1 and 6 are likely to have the largest potential for cumulative effect on the surrounding area, given the number of allocations.

The list of developments and allocations will be reviewed at DMRB Stage 2.

16.13 Summary

Of all the environmental factors included as part of the EAR, only Air Quality concluded at this stage that the proposed scheme is likely to have no significant effects.

The following environmental factors reported the potential for likely significant (adverse) environmental effects:

- Landscape and Visual - changes to the rural landscape character and views from residential properties, active travel routes, local roads and other locations within the surrounding landscape.

DMRB Stage 1 Environmental Appraisal Report: Summary of Assessment

- Biodiversity - habitat loss and fragmentation and loss of protected species.
- Geology, Soils and Groundwater - disturbance and runoff of contaminants, loss of agricultural land and or peat, reduction or loss of soil function(s), groundwater contamination and impacts to groundwater levels.
- Material Assets and Waste - potential impacts to regional material assets and mineral safeguarding area receptors.
- Noise and Vibration - temporary construction noise may impact sensitive receptors in the surrounding area.
- Road Drainage and the Water Environment - potential for likely significant effects was reported in relation to surface water quality, hydromorphology and flood risk.
- Climate - Increase in GHG emissions dependent on improvement strategy selected and the vulnerability of the proposed scheme to climate change as all improvement strategies will be impacted equally by extreme weather conditions.

The potential effects identified are based on a worst-case, high-level, desktop review. It is expected that through design development and implementation of mitigation measures at subsequent DMRB stages that the effects could be reduced.

17. Acronyms

An explanation of acronyms used in this EAR is provided in Table 17-1.

Table 17-1: Acronyms used in EAR

Abbreviation	Explanation
AADT	Annual Average Daily Traffic
ACCAR	Approach to Climate Change Adaptation & Resilience
AEP	Annual Exceedance Probability
ARN	Affected Road Network
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
ATS2	Active Travel Strategy 2
AWI	Ancient Woodland Inventory
BGS	British Geological Society
BoCC	Birds of Conservation Concern
BNG	Biodiversity Net Gain
BTO	British Trust for Ornithology
CA	Conservation Area
CAR	Controlled Activities Regulations
CAFS	Cleaner Air for Scotland
CBD	Convention on Biological Diversity
CC	Climate Change
CCC	Climate Change Committee
CCP	Climate Change Plan
CCRA2	Second Climate Change Risk Assessment
CCRA3	Third Climate Change Risk Assessment

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
C&D	Construction and Demolition (Waste)
CDL	Committed Development Log
CDW	Construction Demolition Waste
CEH	Centre for Ecology and Hydrology
CEMP	Construction Environmental Mitigation Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CMS	Convention on the conservation of Migratory Species of Wild Animals
CNMA	Candidate Noise Management Area
COCP	Code of Construction Practice
CO ₂ e	Carbon Dioxide Equivalent
COSLA	Convention of Scottish Local Authorities
CSM	Conceptual Site Model
dB	Decibels
DDA	Disability Discrimination Act
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DMRB	Design Manual for Roads and Bridges
DWPA	Drinking Water Protected Areas
EA	Environment Agency
EAR	Environmental Appraisal Report
EC	European Commission
EC	European Community
EEE	Electrical and Electronic Equipment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
EMP	Environmental Mitigation Plan
END	Environmental Noise Directive
EQS	Environmental Quality Standards
EU	European Union
FLS	Forestry and Land Scotland
FWS	Forestry and Woodland Strategy
GDL	Garden and Designed Landscapes
GHG	Greenhouse Gas
GI	Ground Investigation
GR	Grid Reference
GWDTE	Groundwater Dependent Terrestrial Ecosystems
kt CO ₂ e	Kilotonnes of carbon dioxide equivalent
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HES	Historic Environment Scotland
HEWRAT	Highways England Water Risk Assessment Tool
HiAP	Health in All Policies
HMSO	Her Majesty's Stationary Office
HMWB	Heavily Modified Water Body
HRA	Habitats Regulations Appraisal
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IIP	Infrastructure Investment Plan
IPCC	Intergovernmental Panel on Climate Change
KSI	Killed or Seriously Injured

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
LAQM	Local Air Quality Management
LBAP	Local Biodiversity Action Plan
LCA	Land Capability Agriculture
LCT	Landscape Character Type
LCRM	Land Contamination Risk Management
LDP	Local Development Plan
LDP2	Local Development Plan 2
LDP3	Local Development Plan 3
LDR	Long Distance Routes
LED	Light Emitting Diode
LEPO	Long Established woodland of Plantation Origin
LLA	Local Landscape Area
LULUCF	Land Use, Land Use Change and Forestry
LV	Limit Values
LWS	Local Wildlife Site
MPA	Mineral Planning Authority
MSS	Mineral Safeguarding Sites
MSW	Municipal Solid Waste
MtCO ₂ e	Million tonnes carbon dioxide equivalent
NAEI	National Atmospheric Emissions Inventory
NBN	National Biodiversity Network
NCN	National Cycle Network
NFRA	National Flood Risk Assessment
NHBC	National House Building Council
NIA	Noise Impact Assessment
NISR	Noise Insulation Scotland Regulations
NNR	National Nature Reserve

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
NNS	Non-Native Species
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxide
NPF4	National Planning Framework 4
NRFA	National River Flow Archive
NSA	National Scenic Area
NTS	National Transport Strategy
NTS2	National Transport Strategy 2
NVZ	Nitrate Vulnerable Zones
NWSS	Native Woodland Survey of Scotland
OS	Ordnance Survey
OSM	Open Street Map
PAN	Planning Advice Notes
PAQAP	Project Air Quality Action Plan
PCM	Pollution Climate Mapping
PM ₁₀ and PM _{2.5}	Particulate Matter
PSSR	Preliminary Sources Study Report
PVA	Potentially Vulnerable Area
RAMP	Road Assessment Management Plan
RBD	River Basin District
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathways
RDWE	Road Drainage and the Water Environment
RIGS	Regionally Important Geological Sites
RPP3	Report on Proposals and Policies
RSS	Regional Spatial Strategy
RTS	Regional Transport Strategy
SAC	Special Area of Conservation

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
SBL	Scottish Biodiversity List
SBS	Scottish Biodiversity Strategy
SCCAP	Scottish Climate Change Adaptation Programme
SDG	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SIMD	Scottish Index of Multiple Deprivation
SM	Scheduled Monument
SNH	Scottish Natural Heritage
SoS	Secretary of State
SPA	Special Protection Area
SPP	Scottish Planning Policy
SPZ	Source Protection Zone
SoS	Secretary of State
SSSI	Site of Special Scientific Interest
STPR	Strategic Transport Projects Review
STPR2	Strategic Transport Projects Review 2
SuDS	Sustainable drainage systems
SWestrans	South West of Scotland Transport Partnership
SWMP	Site Waste Management Plan
SWSTS	South West Scotland Transport Study
TAN	Technical Advice Note
TG	Technical Guidance
TPO	Tree Preservation Order
UCR	Union Connectivity Review
UKCP18	UK Climate Projections 2018

DMRB Stage 1 Environmental Appraisal Report: Acronyms

Abbreviation	Explanation
UKG	UK Government
UKHab	UK Habitat Classification
UN	United Nations
WANE	Wildlife and Natural Environment
WCH	Walking, Cycling and Horse-riding
WEEE	Waste Electrical and Electronic Equipment
WEWS	The Water Environment and Water Services (Scotland) Act
WFD	Water Framework Directive
WHO	World Health Organisation
W m2	Watts per square metre
WS2+1	Wide Single 2+1
Zol	Zone of Influence

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