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A96
DUALLING
EAST OF HUNTLY TO ABERDEEN

A96 Dualling

East of Huntly to Aberdeen scheme

DMRB Stage 2 Scheme Assessment Report

Volume 2 - Part 3

Environmental Assessment

December 2020

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a96-dualling-inverness-to-aberdeen/
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A96 Dualling East of Huntly to Aberdeen

DMRB Stage 2 Scheme Assessment Report Volume 2 Part 3 – Environmental Assessment

A96PEA-AMAR-GEN-SWI-RP-ZM-000003

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8 Introduction and Approach to Environmental Assessment

8.1 Introduction

- 8.1.1 This part of the Design Manual for Roads and Bridges (DMRB) Stage 2 Scheme Assessment Report presents the results of the environmental assessment of the route options for the scheme and provides information to inform the multi-disciplinary comparison of these route options.
- 8.1.2 The assessment findings are presented in a series of environmental topic chapters (Chapters 9 to 22). The assessment is structured according to 14 environment topics which are reported in two groups, as shown in Table 8.1, and are based on relevant trunk road environmental assessment guidance and best practice (see Section 8.3, Approach to Environmental Assessment). The environmental topics have been identified to help achieve the six Scheme Objectives for the DMRB Stage 2 Scheme Assessment Report outlined in Table 8.2. The two groups also reflect the Environmental Scheme Objectives. Refer to Volume 1, Part 1, The Scheme (East of Huntly to Kintore), for more information on the Scheme Objectives.
- 8.1.3 The assessment has been undertaken in accordance with the DMRB, Volume 11, Environmental Assessment, which was the appropriate guidance at the time of commencing the assessment. It should be noted that new DMRB guidance was published in late 2019 / spring 2020 and the assessment also takes cognisance of this. A sensitivity test was undertaken of the New Guidance, comparing it to DMRB Volume 11, to confirm that the outcome of the environmental assessment for all chapters would not be different by maintaining the Withdrawn Guidance. Details of how the New Guidance is taken into account are outlined in the individual environmental topic chapters.

Table 8.1 Environmental Topics

Topics	Group
Plans and Policies	Communities and People
Air Quality	
Noise and Vibration	
People and Communities	
Agriculture, Forestry and Sporting Interests	
Materials	
Visual Effects	
Human Health	
Cultural Heritage	Natural and Cultural Heritage
Landscape	
Nature Conservation	
Geology, Soils, Contaminated Land and Groundwater	
Road Drainage and the Water Environment	
Climate	

Table 8.2 Scheme Objectives

Scheme Objectives
To improve the operation of the A96 and inter-urban connectivity through: <ul style="list-style-type: none"> • Reduced journey times; • Improved journey time reliability; • Increased overtaking opportunities; • Improved efficiency of freight movements along the transport corridor; and • Improved network resilience.
To improve safety for motorised and Non-Motorised Users (NMUs) through: <ul style="list-style-type: none"> • Reduced accident rates and severity; • Reduced driver stress; and • Reduced potential conflicts between motorised and Non-Motorised (NMUs).
To provide opportunities to grow the regional economies on the corridor through: <ul style="list-style-type: none"> • Improved access to the wider strategic transport network; and • Enhanced access to jobs and services.
To facilitate active travel in the corridor.
To facilitate integration with public transport facilities.
To avoid significant environmental impacts and, where this is not possible, to minimise the environmental effect on: <ul style="list-style-type: none"> • The communities and people in the corridor; and • Natural and cultural heritage assets.

8.1.4 The majority of the topics identified have been considered as part of the assessment process throughout the early stages of the scheme development and option assessment, however both the Climate and Human Health assessments have only been undertaken since the new DMRB guidance was published. The technical scope of the environmental assessment is set out further in Section 8.3 of this chapter.

8.2 Sources of Information

8.2.1 The following sources of information have been used in the environmental assessment:

- DMRB, Volume 11, Environmental Assessment;
- DMRB, Interim Advice Note 125/15, Environmental Assessment Update (superseded by LA 104, outlined below);
- DMRB, Sustainability & Environment Appraisal, LA 104, Environmental assessment and monitoring;
- Aberdeenshire Local Development Plan 2017;
- Ordnance Survey mapping of the study area: OS Explorer 1:25,000 scale sheets 423 & 424;
- Transport Scotland (2016) A96 Dualling Programme, Strategic Environmental Principles, October 2016;
- Transport Scotland (2015) A96 Dualling Programme, Strategic Environmental Assessment (SEA), Tier 2 Environmental Report, May 2015;
- Transport Scotland (2015) A96 Dualling Programme SEA Post Adoption Statement, February 2016; and

- Transport Scotland (2014) Fitting Landscapes, Securing More Sustainable Landscapes, March 2014.

8.2.2 Topic specific sources and references are included in each technical chapter (Chapters 9 to 22). The policy context is set out in Chapter 9 (Section 9.1), Policies and Plans. A summary of the cumulative effects of the environmental assessment is presented in Chapter 23, and an overall summary in Volume 3, Part 5, Assessment Summary and Preferred Option Recommendation.

8.3 Approach to Environmental Assessment

Environmental Design

8.3.1 Route option designs have been developed to minimise the potential for significant environmental effects from the construction and operation of the scheme. This means the route options were designed to avoid (where possible):

- designated areas;
- key environmental constraints; and
- private property.

8.3.2 The key environmental designations and constraints identified along the route option corridors are shown in Volume 5, Figures 8.1 to 8.13.

Mitigation

8.3.3 Where potentially significant environmental effects are identified, mitigation has been defined and recorded to avoid or reduce effects where possible. The residual effects of the mitigation have been evaluated and include measures which are known to be effective and which follow good environmental practice and legislative standards and can be reasonably assumed to be implemented in scheme delivery.

8.3.4 Mitigation measures draw from higher level mitigation commitments made in key DMRB Stage 1 A96 Dualling Programme documents including the SEA and in Transport Scotland's Strategic Environmental Principles. Where more detailed mitigation has the potential to further reduce environmental effects, this has been recorded in the assessment and will be developed in greater detail during DMRB Stage 3.

8.3.5 Mitigation of potentially significant traffic related environmental effects resulting from the scheme operation has not been developed or modelled at this stage. A quantitative assessment of the effects of traffic noise and air emissions without mitigation of the route options has been undertaken (see Chapters 10, Air Quality and Chapter 11, Noise and Vibration) to inform the selection of the Preferred Option. At DMRB Stage 3, detailed modelling will be undertaken and the Environmental Impact Assessment (EIA) Report will set out the expected noise changes as a result of the Preferred Option, including the effects of the mitigation measures.

Route Options Assessment

8.3.6 Details of the route options being assessed are set out in Volume 1, Part 2, Engineering Assessment (East of Huntly to Kintore). A general study area for the assessment has been generally defined within a buffer area of approximately 500m around each route option (see Volume 5, Figures 8.1 to 8.13). Specific assessment

study areas have been used for each technical assessment when required and are described in the relevant chapter. Where required study areas are split by geographical section of the scheme, namely:

- East of Huntly to Colpy: The Cyan and Red route options commence to the east of the town of Huntly, to the west of Leys of Dummuis. The Cyan route option broadly follows the existing A96 road corridor, passing the western extent of Colpy in cutting and finishes at Colpy Junction. The Red route option passes over the higher ground between Hill of Foudland and Hill of Skares, crosses over the C68S Inch to Colpy Road, and finishes at Colpy Junction;
- Colpy to Pitcaple: The Pink and Brown route options commence south of Colpy and both pass Loch Inch Fishery. The Pink route option passes to the east of Old Rayne and to the west of Durno. The Brown route option passes to the west of Old Rayne in close proximity to the existing A96, and passes between Old Logie Cottages and Logie Durno Farm; and
- Pitcaple to Kintore: The Violet and Orange route options commence north of Pitcaple Quarry. The Violet route option then passes to the east and south of Inverurie, before crossing the River Don and floodplain. The Orange route option crosses the River Urie at Inveramsay, and crosses the River Don as it passes to the west of Inverurie.

8.3.7 The land take identified for the scheme at this stage includes the road, structures, side roads, drainage basins, earthworks and a strip of land adjacent to the edge of the earthworks to allow for maintenance access. This does not include land take for site compounds, temporary construction access, or permanent ecological mitigation features. The land take varies according to ground topography and the lateral extent of required cuttings and embankments and drainage basins where required.

Consultation

8.3.8 Environmental consultations have been undertaken to:

- Obtain relevant baseline information to inform the assessments;
- Agree survey and assessment methods;
- Seek feedback and comments from consultees on environmental aspects of the scheme to date;
- Gain an understanding of the significant environment issues, and to enable an understanding on which issues would require further assessment; and
- To understand the views of consultees on the various route options.

8.3.9 A range of statutory and environmental consultees have been consulted during the DMRB Stage 2 process on environment specific issues (see Table 8.3). Regular engagement has been held with Scottish Natural Heritage (SNH¹), the Scottish Environment Protection Agency (SEPA) and Historic Environment Scotland (HES) through meetings and the forum provided by the A96 Dualling Programme

¹ SNH has now re-branded as NatureScot, however as ongoing consultation and the assessment was largely undertaken whilst SNH were still known by this name, NatureScot has been referred to throughout the DMRB Stage 2 Scheme Assessment Report as SNH.

Environmental Steering Group (ESG). Meetings have also been held with Aberdeen City Council and Aberdeenshire Council (planning and other relevant services) and with other key stakeholders including Scottish Forestry, and Forestry and Land Scotland (formerly Forestry Commission Scotland). Discussions with key non-statutory stakeholder groups have also taken place throughout the DMRB Stage 2 process.

8.3.10 In addition, a range of other non-statutory consultees were invited to provide views on the route options shown at the public engagement events held in October 2018 and May 2019.

8.3.11 This consultation process has provided an understanding of the environmental sensitivities associated with the baseline identified in the scheme study area and with aspects of the route options being assessed. A full list of all the organisations consulted about the environmental assessment is outlined in Table 8.3 (statutory consultees are shown in the shaded cells). Feedback from consultation responses has, where appropriate, fed into the design of routes options and the assessment of the environmental impacts and effects.

Table 8.3 Sources of Information

Consultee Organisations	
Historic Environment Scotland	Baillies of Bennachie
Scottish Environment Protection Agency	Scottish Raptors
Scottish Natural Heritage	Aberdeenshire Council Archaeological Service (ACAS)
Aberdeen City Council	Don District Salmon Fishery Board
Aberdeenshire Council	Scottish Wildcat Action
Forestry and Land Scotland	Deveron, Bogie and Isla Rivers Trust
Scottish Forestry	River Don Trust
Wildfowl and Wetlands Trust	Sustrans
ScotWays ²	Nestrans
Aberdeenshire Local Access Forum	British Horse Society
Association of British Riding Schools	Cycling UK Grampian
Grampian Ramblers	Scottish Wildlife Trust
Aberdeen Entomological Club	Aberdeenshire Environmental Forum
Butterfly Conservation	North East Scotland Biological Records Centre
River Don Brown Trout Improvement Association	Rivers and Fisheries Trust for Scotland
Royal Society for the Protection of Birds	'Saving Scotland's Red Squirrel' project
Scotland's Bird Club - North East Scotland Branch	Scottish Badgers
Vincent Wildlife Trust	Wildfowl and Wetlands Trust

² ScotWays - Scottish Rights of Way & Access Society available at: <https://www.scotways.com/>

Baselines and Surveys

- 8.3.12 The assessment of predicted environmental effects for each topic draws on baseline information collated from desk reviews, site visits, specific survey, relevant consultation feedback, and feedback from public exhibition events. The description of the relevant baseline in each chapter is primarily based on current conditions, however, individual assessments have taken account of the likely 2030 (forecast scheme opening year) baseline where this could affect the assessment findings. The noise assessment also takes account of projected design year (2045) traffic flows with and without the scheme. The type of changes between current conditions and 2030/2045 could include (but are not restricted to):
- Completion of development on sites, in particular, those identified in the Aberdeenshire Local Development Plan (LDP) 2017. These sites are primarily close to the edges of the principal settlements and could be progressed before the scheme is developed;
 - Natural succession in habitats over the period before (and after) 2030; and
 - Changes in land boundaries and agricultural practices.
- 8.3.13 Further details of surveys which have been undertaken to inform the environmental assessments are presented in Chapters 9 to 22 and their accompanying appendices in Volume 4b. An overview of key environmental designations is provided in Volume 5, Figures 8.1 to 8.13.

Overall Approach to Options Assessment

- 8.3.14 The approach to the environmental assessment of the route options has been adapted from current practice for EIA including guidance in DMRB (Volume 11, Section 2, General Principles of Environmental Assessment) and the new DMRB guidance of Sustainability & Environment Appraisal: DMRB (LA 104, Environmental assessment and monitoring). Each individual chapter has explained how it has addressed the environmental assessment guidance changes in the 'Limitations and Assumptions' part of the 'Approach to Assessment' sections. The assessments are not undertaken in the same level of detail as an EIA but the principles of impact assessment from EIA provide a robust basis for examination of the route options. An EIA will be undertaken on the Preferred Option at DMRB Stage 3.

Impact Prediction and Evaluation of Effects

- 8.3.15 The assessment focuses on the effects from the permanent development and change in use of the land (e.g. land take, habitat loss) and existence of development, and from the operational effect of traffic using the road. Whilst effects may come about because of scheme construction, their significance is related to the long-term change in the affected receptor and they are, therefore, considered to be as a result of the permanent development of the scheme. At DMRB Stage 2, there is only preliminary information available on the methods of scheme construction and these have generally not been considered within this assessment.
- 8.3.16 In this assessment, environmental effects have been assessed with and without mitigation as appropriate. This has helped to provide a clear and auditable approach to consideration of effects and their significance for each route option.
- 8.3.17 The EIA Regulations (The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017) require significant effects to be described but do

not define significance. The definition of a significant effect which has been adopted is one which when considered in isolation or in combination with others, is material to the environment and should be considered in decision-making.

8.3.18 The significance of an effect results from the interaction between the impact magnitude (which is related to the extent of the physical change, its spatial extent, duration and frequency) and the value of the resource or the number and sensitivity of stakeholders who may be affected. The process of assessing those affected and the significance of it includes:

- Selecting criteria (for each discipline) from recognised sources (including legal standards, policy and best practice guidance and accepted practice) against which effects can be assessed (assessment criteria);
- Establishing significance thresholds drawing on the above sources, consultations, site survey information and professional judgement; and
- Comparing the predicted impacts with the significance thresholds and defining the nature of the residual effect taking account of the reversibility of the effect, its probability of occurring and confidence including any uncertainty.

8.3.19 The predicted effects of the route options (including their magnitude) have been considered including the potential for these to be significant. Where effects are considered unlikely to be significant, they have not been assessed or reported further in detail, and the assessment has focused on the potentially significant effects of each route option. This is a proportionate approach in line with good practice in EIA and allows the material differences between route options to be identified more clearly.

8.3.20 Residual effects are reported taking account of mitigation. In this assessment, effects are categorised into:

- None or negligible: no detectable change to the environment;
- Minor: a detectable but non-material change to the environment;
- Moderate: a material and important but non-fundamental change to the environment; and
- Major: a fundamental change to the environment and a principal consideration.

Scope of Assessment

8.3.21 The scope of the assessment is broad and all key technical guidance from DMRB has been considered with the assessment reported in a series of 14 topics (see Table 8.1).

8.3.22 The potential for significant cumulative environmental effects to arise has been considered for the route options, considering future development proposals.

8.3.23 The assessment of cumulative effects with other future developments has been considered in the relevant topic-specific assessments. The assessment has focused on potentially significant effects in combination with future developments identified in the Aberdeenshire LDP 2017.

8.3.24 Aberdeenshire Council has also begun the process of updating the LDP. In January 2019 Aberdeenshire Council published an LDP 2021 Main Issues Report (MIR) for consultation, which included several proposed policy revisions and sites

to be considered for designation in the emerging Aberdeenshire LDP 2021. This DMRB Stage 2 assessment, however, focusses on the current adopted Aberdeenshire LDP. An assessment of the content of the MIR or proposed plan has not been undertaken as these currently have no material planning weight.

- 8.3.25 The potential for in-combination effects for each route option is addressed in Chapter 23, Summary of Cumulative Effects. There is some potential for cumulative effects of the A96 Dualling East of Huntly to Aberdeen scheme with other parts of the A96 Dualling Programme between Inverness and Aberdeen. This is addressed in the A96 Dualling SEA reporting, and at the DMRB Stage 2 level of assessment it is not considered there would be materially different cumulative effects for each of the route options which have been assessed. The traffic modelling for the scheme assumes that full dualling of the A96 between Inverness and Aberdeen is completed. This has informed some parts of the environmental assessment. Future land use change and its effects on traffic generation and demand has been accounted for in the air quality, and noise and vibration assessments which draw from traffic model outputs.
- 8.3.26 The Environmental Impact Assessment (EIA) Directive (2014/52/EU) entered into force in 2014, and was transposed into UK legislation in 2017. The introduction of new Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 for the assessment of trunk roads has widened the scope of topics to be assessed in an EIA, in particular, now that Climate (Chapter 21) and Human Health (Chapter 22) are considered within this DMRB Stage 2 assessment, they will also be addressed within the EIA at DMRB Stage 3. For the purposes of this DMRB Stage 2 assessment, the topics assessed are comprehensive and representative of all key environmental impact types.

Assumptions and Limitations

- 8.3.27 The assessments have been completed drawing on baseline information collated in 2018 to 2020 including the results of habitat surveys and land use information including properties known to have planning consent.
- 8.3.28 There is inherent uncertainty in forecasting baseline (Do-Minimum) conditions because of the scheme opening year of 2030 but this is not considered to materially limit the route options assessments. The Preferred Option will be developed in more detail at DMRB Stage 3 and the approach to the assessment recognises the scope for further design development.
- 8.3.29 Other assumptions and limitations on a topic specific basis are reported where relevant in the technical chapters of this report.

8.4 Structure of Environmental Assessment

- 8.4.1 The Environmental Assessment Report is structured into a series of chapters which report the findings of the environmental assessment of each route option by topic. These are:
- Chapter 9: Policies and Plans
 - Chapter 10: Air Quality
 - Chapter 11: Noise and Vibration
 - Chapter 12: People and Communities
 - Chapter 13: Agriculture, Forestry and Sporting Interests

- Chapter 14: Materials
- Chapter 15: Visual Effects
- Chapter 16: Cultural Heritage
- Chapter 17: Landscape
- Chapter 18: Nature Conservation
- Chapter 19: Geology, Soils, Contaminated Land and Groundwater
- Chapter 20: Road Drainage and the Water Environment
- Chapter 21: Climate
- Chapter 22: Human Health

8.4.2 A consistent approach to the structure of the chapters within this report has been adopted for the presentation of key information on approach, baseline, mitigation, predicted effects and a summary of findings.

8.5 Assessment Summary

8.5.1 A summary of the key overall findings of the environmental assessment of each route option is presented in Volume 3, Part 5, Assessment Summary and Preferred Option Recommendation and a summary of the cumulative environmental assessment is set out in Chapter 23, Summary of Cumulative Effects.

9 Policies and Plans

9.1 Introduction

- 9.1.1 This chapter presents the assessment of the route options in terms of their potential impacts on planning policies, land use planning allocations and planning applications.
- 9.1.2 The assessment has been undertaken with reference to the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Part 12, Impact of Road Schemes on Policies and Plans which was the current guidance at the time of undertaking the assessment. This guidance is now withdrawn but is still considered relevant and, after discussion with Transport Scotland and the Statutory Consultees, it was decided that use of the previous guidance, in this case, would ensure consistency in approach across all sections of the A96 Dualling Programme.
- 9.1.3 The assessment has also been undertaken in the context of DMRB Volume 11, Section 3, Part 6, Land Use – Amendment No 1 concerning land which fall within planning authority land use planning allocations which need to be taken into account in developing and refining route options.
- 9.1.4 This chapter is supported by the following figures (see Volume 5) and appendices (see Volume 4b):
- Figures 9.1 and 9.2: Local Development Plan Designated Sites and Planning Applications Red Route Option;
 - Figures 9.3 and 9.4: Local Development Plan Designated Sites and Planning Applications Pink Route Option;
 - Figures 9.5 and 9.6: Local Development Plan Designated Sites and Planning Applications Brown Route Option;
 - Figures 9.7 and 9.8: Local Development Plan Designated Sites and Planning Applications Violet Route Option;
 - Figures 9.9 to 9.11: Local Development Plan Designated Sites and Planning Applications Orange Route Option;
 - Appendix A9.1: LDP Policies Baseline and Assessment;
 - Appendix A9.2: LDP Designated Sites Baseline and Assessment;
 - Appendix A9.3: Planning Applications Baseline and Assessment; and
 - Appendix A9.4: Aberdeenshire Proposed Local Development Plan 2020 Designated Sites Assessment.

Policy Context

9.1.5 Scotland's National Transport Strategy (NTS2)³ sets out Scottish Government's Vision for Scotland's transport system over the next 20 years. The vision states that:

'We will have a sustainable, inclusive, safe and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors'.

9.1.6 The strategy does not identify or present specific projects, schemes, initiatives or interventions, but sets out the strategic framework within which future decisions on investment will be made. It aims to deliver this vision through four priorities, each with three associated outcomes:

- Reduce Inequalities;
 - Provide fair access to services we need
 - Be easy to use for all
 - Affordable for all
- Take Climate Action;
 - Help deliver the net-zero target
 - Adapt to the effects of climate change
 - Promote greener cleaner choices
- Help Deliver Inclusive Economic Growth; and
 - Get people and goods where they need to get to
 - Be reliable efficient and high quality
 - Use beneficial innovation
- Improve our Health and Wellbeing.
 - Safe and secure for all
 - Enable us to make healthier travel choices
 - Help make our communities great places to live

9.1.7 The strategy sets out the strategic framework within which future decisions on investment will be made and is not an appropriate tool in assessing the potential route options. Notwithstanding this most aspects of NTS2's vision, priorities and outcomes are echoed by the content of the development plans, outlined below, which forms the appropriate framework to assess the route options for this scheme against.

³ National Transport Strategy 2, Transport Scotland. Available at:
<https://www.transport.gov.scot/publication/national-transport-strategy-2/>

- 9.1.8 The Scottish Government's Strategic Transport Projects Review (STPR[1]), published in 2008, set out a number of transport priorities for the Aberdeen to Inverness corridor. These transport priorities included: rail enhancements, strategic park and rides, upgrading of the A96 to dual carriageway between Inverness and Nairn, a bypass of Nairn, a new bridge at Inveramsay, and a targeted programme of measures to reduce accident severity. See Volume 1, Part 1, The Scheme, for further detail. It should be noted that the second Strategic Transport Projects Review (STPR2) will replace the first STPR and is due to be delivered in two phases which are planned for completion in 2021.
- 9.1.9 The current Infrastructure Investment Plan, Scottish Government, 2015 (IIP 2015)⁴ provides an overview of the Scottish Government's plans for infrastructure investment. The vision for the IIP 2015 underlines the Scottish Government's 'commitment to connecting Scotland's cities with a high quality transport system that will generate economic growth and will ensure the road network between all Scottish cities is of dual carriageway standard.' The IIP 2015 is focused on improving connections across Scotland and states that 'The Scottish Government has given a commitment to complete to dual the A96 between Inverness and Aberdeen by 2030.' See Volume 1, Part 1, The Scheme, for further detail.
- 9.1.10 It should be noted that the Scottish Government is currently consulting on a Draft Infrastructure Investment Plan for Scotland 2021 22 to 2025 26 (Draft IIP). A key theme of the Draft IIP is driving inclusive economic growth with the aim to strengthen connectivity to 'ensure the right connections within Scotland and internationally' and that the Scottish Government will 'Continue design and development work to dual the A96.'
- 9.1.11 The Town and Country Planning (Scotland) Act 1997 ('the 1997 Act'), (as amended by the Planning etc. (Scotland) Act 2006) ('the 2006 Act')⁵ and by the Planning (Scotland) Act 2019)⁶, provides the framework for land use planning and the development of planning policy in Scotland. The 2006 Act provides for the statutory role of the National Planning Framework (NPF) and its application.
- 9.1.12 NPF and Scottish Planning Policy (SPP)⁷ provide the policy and spatial framework for the planning system and how it is to facilitate delivering Scottish Government's sustainable development. The SPP is a statement of Scottish Government policy on how nationally important land use planning matters should be addressed across the country, but it is a non-statutory document.
- 9.1.13 Scotland's Third National Planning Framework (NPF3)⁸ sets out a commitment to better connect Scotland's cities and specifically includes the A96 Dualling Programme, which states:

⁴ 2015 Scottish Government Infrastructure Investment Plan, available at <https://www.gov.scot/collections/infrastructure-investment-plan-2015-progress-reports/>

⁵ The Planning etc. (Scotland) Act 2006, 2007, available at: http://www.legislation.gov.uk/asp/2006/17/pdfs/asp_20060017_en.pdf

⁶ The Planning (Scotland) Act 2019, available at: <https://www.legislation.gov.uk/asp/2019/13/contents/enacted>

⁷ The Scottish Government, 2014, *Scottish Planning Policy*, available at: <http://www.gov.scot/Resource/0045/00453827.pdf>

⁸ The Scottish Government, 2014, *Ambition, Opportunity, Place, Scotland's Third National Planning Framework (NPF3)*, available at: <https://beta.gov.scot/publications/national-planning-framework-3/>

‘We will complete dualling of the trunk roads between cities, with dualling of the A9 from Perth to Inverness complete by 2025 and dualling of the A96 from Inverness to Aberdeen by 2030’.

NPF3 provides a statutory framework for Scotland’s long term spatial development.

- 9.1.14 The Scottish planning system requires that all local authorities prepare Local Development Plans (LDPs) which respond to the Government’s national plans and policies and specifically to NPF3. In addition, a Strategic Development Plan (SDP) is required for the four largest city regions, which includes Aberdeen.
- 9.1.15 The route options fall within the adopted Aberdeen City and Shire SDP (2020)⁹ area. The SDP sets out the long-term vision for where development should and should not happen, a vision and spatial strategy, supported by a series of objectives and targets. The SDP identifies ‘Aberdeen to Huntly’, the area to which this assessment relates, as a ‘Strategic Growth Area’ and acknowledges that ‘the Scottish Government has committed to upgrading the A96 between Aberdeen and Inverness over the lifetime of this Plan’.
- 9.1.16 The route options fall within the Aberdeenshire Council area and at a local level planning policy is set out in the adopted Aberdeenshire Local Development Plan 2017 (LDP)¹⁰. In addition to the LDP, the local authority has adopted a range of Supplementary Guidance which provides additional detail to the policies contained within the LDP.
- 9.1.17 In March 2020, Aberdeenshire Council presented the Proposed Local Development Plan (LDP 2020) to Full Council on 5th March 2020 where local members agreed that the content of the proposed plan 2020 provides the settled view of the council on the plan they wish to see adopted in 2021. As such, the proposed LDP 2020 is a material consideration in the determination of planning applications.
- 9.1.18 The Scottish Government is currently engaged in a review of the planning system, with the Planning (Scotland) Act 2019 passed by the Scottish Parliament in June 2019¹¹. The detail of how the new Act’s provisions will work in practice will be contained within secondary legislation and guidance. The Scottish Government have advised that the intention is that most aspects of the Act will be implemented by Q2 2021. The timescale associated with this review of the planning system is such that it will not impact upon this DMRB Stage 2 assessment.
- 9.1.19 The Scottish Government has now begun a process of review and preparation of a new framework - NPF4. NPF4 will differ from NPF3, with a longer time horizon to 2050, fuller regional coverage and additional alignment with wider programmes and strategies, including on infrastructure and economic investment. NPF4 will also incorporate Scottish Planning Policy so that spatial and thematic planning policies will be addressed in one place. NPF4 will have the status of a development plan for planning purposes. The NPF4 Call for Ideas was launched on 9 January 2020 and run to 30 April 2020. The Scottish Government has published an

⁹ Aberdeen City and Shire Strategic Development Planning Authority, 20120, *Aberdeen City and Shire Strategic Development Plan (2020)*, available at:

<http://www.aberdeencityandshire-sdpa.gov.uk/AboutUs/Publications.aspx>

¹⁰ Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan 2017*, available at:

<https://www.aberdeenshire.gov.uk/planning/plans-and-policies/aberdeenshire-local-development-plan-2017/>

¹¹ Scottish Government, 2019, *Planning (Scotland) Act 2019*, available at:

<http://www.legislation.gov.uk/asp/2019/13/contents/enacted>,

independent analysis of responses to the Call for Ideas to inform the preparation of NPF4¹².

- 9.1.20 Notwithstanding the above, this assessment focusses on the current adopted Aberdeenshire LDP.
- 9.1.21 An assessment of the potential allocations of the Proposed LDP 2020 is included in Volume 4b, Appendix A9.4 for reference, however as the proposed LDP 2020 is still to be subject to examination by an independent reporter, it is considered that the level of weight that should be applied to it is not significant. As such it has not formed a formal part of this DMRB Stage 2 assessment.

9.2 Approach to Assessment

9.2.1 This DMRB Stage 2 assessment of policies and plans considers:

- LDP policies;
- LDP land use allocations for future development and safeguarding or protection; and
- Planning applications.

9.2.2 Relevant policies and policy documents specific to individual environmental considerations, including Historic Environment Policy for Scotland (Chapter 16, Cultural Heritage) and Scottish Government's Climate Change Act 2019 and Climate change Plan 2018 (Chapter 21, Climate), are assessed within the individual relevant chapters and do not form part of this chapter's assessment.

Data Sources

9.2.3 The policies and plans baseline have been established using the following data sources provided by the local authority:

- Aberdeenshire LDP 2017;
- Planning application and consents data provided by the local authority in February and August 2020 and available on the Council's planning portal;
- Consultation with the Aberdeenshire Council planning department undertaken in January 2018, February and July 2019; and
- Site visits to gain insight into local context and appreciate local considerations, undertaken in late 2018 and early 2019.

Consultation

9.2.4 Consultations have been held with the Aberdeenshire Council planning department, which provided information on the current adopted LDP designations and on the ongoing LDP review process for the proposed Aberdeenshire LDP (2021). In addition, Aberdeenshire Council planning department provided information on development management constraints.

¹² NPF4 call for ideas: analysis of responses, available at <https://www.gov.scot/publications/npf4-analysis-reponses-call-ideas/>

Methodology

- 9.2.5 The approach to the assessment of impacts on Policies and Plans is to consider whether the route options are compliant with planning policies and to determine the likely magnitude of any predicted impact on potential future land uses. This assessment considers impacts on LDP policies, LDP site allocations and on planning applications.
- 9.2.6 The A96 Dualling Programme is a key national project supported by the Scottish Government and is included in NPF3 and the Aberdeenshire LDP 2017. The A96 Dualling Programme fully reflects the aims of NPF3 and SPP, and support the Scottish Governments overall objective of sustainable development. This assessment therefore focuses on the LDP.

LDP Policy Assessment Criteria

- 9.2.7 The first stage of this assessment involved a review of the LDP policies, which cover numerous current and proposed land uses, and environmental aspects of the land uses. Following the identification of the relevant policies, each route option was assessed against each of the policies.
- 9.2.8 The majority of the planning policies relate to environment and resource topics which are considered in detail in this DMRB Stage 2 assessment; and cross references are provided to the relevant technical chapters which inform the assessment where applicable.
- 9.2.9 All LDP policies were initially assessed to determine their relevance to the route options; not all policies are relevant due to the geographical location of the route options. In contrast, other policies were considered relevant at a scheme-wide level only, such as those relating to climate change.
- 9.2.10 For this assessment, 'scheme-wide policies' are defined as those policies applicable to the A96 Dualling East of Huntly to Aberdeen scheme and 'route option-specific policies' are defined as those policies specifically applicable to the DMRB Stage 2 route options by virtue of their specific geographical location.
- 9.2.11 Each route option has been assessed against the criteria in Table 9.1, which shows the impact categories and the assessment criteria definitions adopted; scheme-wide policies are assessed separately using the same criteria. The policy assessment was undertaken with input from other environmental disciplines. When considering each of the individual policies, professional judgement was used to form a view as to the overall performance of each route option against each policy.

Table 9.1 LDP Policy Assessment Criteria

Compliance with Policy	Definition
Complies	Route option complies with policy.
Potential non-compliance	Route option would potentially conflict with policy or hinder the achievement of the policy, pending detailed environmental assessment, consideration of mitigation and further consultation. Full assessment against policy will be undertaken during DMRB Stage 3.
Non-compliance	Route option clearly does not comply with policy.

Compliance with Policy	Definition
Uncertain	Information is not yet available to consider performance against policy.
Not relevant	Policy not relevant to route option.

LDP Designated Sites Criteria

9.2.12 The second stage of the assessment was to consider the impact of the scheme on LDP land use designations.

9.2.13 The impact of each route option on LDP land use allocations will be assessed as major, moderate or minor, based on the approximate area of potential land take from the designated site, expressed as a percentage of the land area of the designation. See Table 9.2.

Table 9.2 LDP Designated Site Assessment Criteria

Impact	Definition
Major	>50% land take resulting in a fundamental reduction in the development capacity of the designated site.
Moderate	10% - 50% land take having a material impact on the capacity of the designated site.
Minor	<10% land take representing a relatively small reduction in capacity of the designated site.

9.2.14 The study area is defined as a buffer of 500m around the outer edge of route options i.e. the top or toe of the earthworks slope, which was used to identify LDP designations that lie close to the route options. The designations within the study area that are not directly affected by a route option may be affected indirectly e.g. air quality, noise, or visual impacts, and these key potential impacts have been considered in other chapters of the environmental assessment where it has been possible to comment on effects on future land uses.

Planning Application Assessment Criteria

9.2.15 The third stage in this assessment considered the impacts of the route options on planning applications. This has included current planning applications (which were awaiting a decision at the time of the assessment) and valid consented applications which were not built at the time of the assessment. The assessment was prepared based on publicly available planning application information up to August 2020.

9.2.16 Planning application data provided by Aberdeenshire Council was initially sifted to exclude the following types of applications which were not considered to be relevant to this assessment:

- Applications more than 500m from a route option;
- Applications submitted to, but not yet validated by, the planning authority for consideration;

- Applications consented (full planning consent and planning consent in principle) more than three years ago;
- Advertisement consents, Listed Building consents, and Certificate of Lawful Development applications;
- Minor applications for building extensions or internal alterations;
- Applications for EIA screening or scoping opinions; and
- Applications that have been withdrawn or refused and the appeal period expired.

9.2.17 The method of assessment of impact of each route option on planning applications is similar to that applied in the assessment of impacts on LDP land use allocations, see Table 9.3. It is, however, also subject to a level of professional judgement, concerning the scale and nature of the proposed development, and how the potential land take will impact upon the delivery of the development site.

Table 9.3 Planning Application Assessment Criteria

Impact	Definition
Major	>50% land take resulting in a fundamental reduction in the development capacity of the development site.
Moderate	10% - 50% land take having a material impact on the capacity of the development site.
Minor	<10% land take representing a relatively small reduction in capacity of the development site.

Assumptions and Limitations

New Guidance

- 9.2.18 An update to the DMRB was released in late 2019/Spring 2020 (hereafter referred to as the 'New Guidance'). This update included the removal of DMRB, Volume 11, Section 3, Part 12, Impact of Road Schemes on Policies and Plans. The DMRB Stage 2 environmental assessment for this scheme had commenced at the time of the release of the New Guidance and this followed a structure outlined in the previous published DMRB guidance (hereafter referred to as the 'Withdrawn Guidance'). It has been agreed with Transport Scotland that following a review of the New Guidance, the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is little material difference between it and any report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.
- 9.2.19 This section outlines key differences between the Withdrawn Guidance and New Guidance and describes how this chapter meets the objectives of the New Guidance.
- 9.2.20 The New Guidance does not include any replacement for Withdrawn Guidance DMRB, Volume 11, Section 3, Part 12, Impact of Road Schemes on Policies and Plans.

- 9.2.21 The New Guidance, however, does still require that planning policy, designated sites and committed development are given due consideration and 'LA 104: Environmental assessment and monitoring' states the following:
- 'Environmental assessment, reporting and monitoring shall meet the requirements of the national planning policy for each relevant Overseeing Organisation'.
- 9.2.22 The Scottish planning system requires that all local authorities prepare LDPs which respond to the Scottish Government's national plans and policies and specifically to NPF3, and as such an assessment against the Aberdeenshire LDP policies, which reflect the requirements of national planning policy at a local level, remains a requirement of the New Guidance.
- 9.2.23 With regards to committed development and LDP allocated sites, the New Guidance LA 104 states that, 'the assessment of cumulative effects should report on:
- roads projects which have been confirmed for delivery over a similar timeframe;
 - 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'; and
 - 'The assessment of cumulative impacts can be established through a desk study and mapping exercise, together with a review of planning/development applications and development plans'.

Effects of New Guidance

- 9.2.24 No update to the 'Impact of Road Schemes on Policies and Plans' Guidance has been issued, instead the requirement to undertake a dedicated Policies and Plans assessment has been removed.
- 9.2.25 Taking into account the requirements of the New Guidance as a whole, it is apparent that the assessments undertaken in accordance with 'Impact of Road Schemes on Policies and Plans' in line with the Withdrawn Guidance are still required to be undertaken under the New Guidance, and in a similar manner, during DMRB Stage 2. Where the New Guidance differs is that these assessments will not be presented in one single chapter titled 'Policies and Plans'. Instead these assessments will be presented within the topic specific chapters, i.e. assessment of the proposal against planning policies relevant to Biodiversity would be presented in the Biodiversity chapter. This has no material change on the assessment conducted as part of the DMRB Stage 2 Scheme Assessment Report for this project.
- 9.2.26 The purpose of the DMRB Stage 2 Scheme Assessment Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance.
- 9.2.27 At DMRB Stage 3, the Preferred Option will be assessed using the New Guidance, which will mean the impacts on policies and plans will be outlined in the specific topic chapters.

Other Assumptions and Limitations

- 9.2.28 The land take impacts presented in this assessment are all considered to be adverse and permanent. Land take calculations have been derived using Geographic Information System (GIS). It is possible that areas calculated could change for any route option as the design is further developed during DMRB Stage 3.
- 9.2.29 This assessment does not include construction impacts or any additional construction-related land take, which may be required for any future mitigation such as compensatory landscape or ecology planting. These would be identified and assessed during DMRB Stage 3.
- 9.2.30 This assessment has been undertaken based on information available at this stage and has focused on the clear policy compliance differences at this stage.
- 9.2.31 This assessment does not consider indirect impacts on LDP designations or planning applications, such as impacts on setting, views from a site, etc; these will be considered during DMRB Stage 3.

9.3 Baseline

- 9.3.1 This section sets out the policies and plans which have been considered in this assessment.

Local Development Plan Policy

- 9.3.2 The Aberdeenshire LDP 2017 sets out the Council's vision for Aberdeenshire delivering on SPP's vision of 'the right development in the right place'. The Aberdeenshire LDP 2017 promotes the efficient use of land to deliver long-term benefits for the public, while protecting and improving nature and local culture. It sets out policies and development land allocations that deliver the four outcomes that the Scottish Government expects: successful, sustainable places; low carbon places; natural and resilient places; and better-connected places.
- 9.3.3 The Aberdeenshire LDP 2017 sets out a number of policies grouped into categories. Table 9.4 sets out the relevant policy categories in the LDP and summarises the key aims of the policies within each category.
- 9.3.4 The full list of Aberdeenshire LDP 2017 policies is set out in Volume 4b, Appendix A9.1: LDP Policies Baseline and Assessment. This table lists each policy by reference number and name and indicates whether it is relevant or not to this assessment and if so whether it applies at a scheme wide level or if it is geographically relevant to the route options (see Table 9.1 for definitions). The Aberdeenshire LDP 2017 should be referred to for full details of the policy wording.
- 9.3.5 In total, one Aberdeenshire Council policy was considered relevant at a scheme wide level and 14 policies were relevant to the route options.

Table 9.4 Summary of Aberdeenshire LDP 2017 Policies

Policy Category	LDP Policy Summary
Shaping Business Development	<p>The Business Development policies support the development of business and sustainable economic growth in all areas by taking account of the economic benefits of proposed development.</p> <p>The policies enable this by supporting new employment uses on land allocated (Policy B1), supporting appropriate development in town centres (Policy B2), supporting development of new tourist facilities or accommodation (Policy B3) and helping start-up businesses in the designated regeneration priority areas (Policy B4).</p>
Shaping Development in the Countryside	<p>These policies protect the rural environment and landscape by affording appropriate protection to the greenbelt (Policy R1), restricting development proposals in the countryside area in scale (Policy R2), and only allowing minerals development together with proposals for appropriate control, mitigation and monitoring (Policy R3).</p>
Shaping Homes and Housing	<p>The Shaping Homes and Housing policies provide for housing development which will contribute to Aberdeenshire being a successful sustainable place. This is achieved through supporting housing development on sites allocated for that purpose (Policy H1), ensuring 25% onsite 'Affordable Housing' provision (Policy H2), generally supporting special needs housing proposals (Policy H3), resisting development of permanent residential caravans (Policy H4), and supporting halting sites for gypsies and travellers on sites allocated for that purpose (Policy H5).</p>
Shaping Places – Layout, Siting and the Design of New Development	<p>These policies promote good design and placemaking through an overall approach, from the choice of site to its layout and detailed design, and covering the whole range of factors that contribute. This is facilitated by supporting major development which is in accordance with agreed masterplans/frameworks (Policy P1) and development on appropriate unallocated sites (Policy P3), by ensuring that adequate public space is provided in new developments (Policy P2), by refusing hazardous and potentially polluting developments (Policy P4), by supporting the provision of digital infrastructure (Policy P5), and by supporting the provision of new community infrastructure.</p>
Natural Heritage and Landscape	<p>The Natural Heritage and Landscape Policies protect Aberdeenshire's natural environment and landscape, and contribute to Aberdeenshire being a successful, sustainable, natural place. This is achieved by refusing development that may have an adverse effect on a nature conservation site or protected species (Policy E1), and by refusing development that may have an adverse effect on key natural landscape elements, historic features or the composition or quality of the landscape character (Policy E2).</p>

Policy Category	LDP Policy Summary
Historic Environment	These policies aim to protect and improve the historic environment and cultural areas, through encouraging the protection, maintenance, enhancement, appropriate active use and conservation of all listed buildings, archaeological sites and scheduled monuments (Policy HE1 and HE2) and encouraging the re-use of listed buildings which are at risk (Policy HE3).
Protecting Resources	The Protecting Natural Resources policies conserve natural resources, which is a major factor in sustainable development. This is achieved by refusing development that has a negative effect on important environmental resources (Policy PR1), by protecting sites for significant/important development (Policy PR2), and by supporting further waste management development on existing sites (Policy PR3).
Climate Change	The Climate Change policies aim to reduce energy use (Policy C1), conserve water, promote energy generation through renewables (Policy C2), sustain existing carbon stores (Policy C3) and deal with long term flood risks (Policy C4).
The Responsibilities of Developers	These policies aim to ensure that the infrastructure needed to ensure that new development functions well is delivered by providing on-site facilities to serve the reasonable expectations of occupants (Policy RD1) and by providing or improving off-site facilities (Policy RD2).

Local Development Plan Designated Sites

- 9.3.6 The LDP designated sites affected by the route options are derivative Aberdeenshire Council Settlement Statements. The Settlement Statements set out the land designations for each settlement or area in Aberdeenshire. Sites are designated for future development indicating the type of uses that would be acceptable, and where a current use is to be safeguarded or protected in the future.
- 9.3.7 Table 9.5 provides a summary of the types of designations within 500m of each route option listed by settlement or area. The full list of designations within 500m (baseline) of the route options is set out in Volume 4b, Appendix A9.2: LDP Designated Sites Baseline and Assessment and Volume 5, in Figures 9.1 to 9.11.

Table 9.5 Summary of Aberdeenshire LDP Designations by Settlement Area

Settlement Area	Types of LDP Designations
Inverurie & Port Elphinstone	Strategic reserve employment land
	Protected Areas-Landscaping
	Protected Areas-Green Network
	Protected Areas-Historic setting
	Opportunity Site-Employment land
	Opportunity Site-Mixed use
	Opportunity Site-Residential
	Green Network

Settlement Area	Types of LDP Designations
	Existing Employment Land
	Reserved Land-Park
	Reserved Land-Site access
Keithhall	Protected Areas-Landscape and setting
Kintore and Business Park	Transport Safeguard-transport interchange and Kintore railway station
	Protected Areas-Green Network
	Opportunity Site-Housing
	Green Network
	Existing Employment Land
Old Rayne	Opportunity Site-Mixed use
	Protected Areas-Open space and woodland
	Protected Areas-Playing field / amenity space
Whiteford	Protected Areas-Village setting

Planning Applications

9.3.8 Planning application data was provided by Aberdeenshire Council and was updated periodically over the assessment period and was sifted to exclude applications that are not relevant to this assessment as previously described. Table 9.6 provides a summary of types of planning application by geographical section of the scheme.

Table 9.6 Summary of Planning Application Types by Geographical Section

Summary of Planning Application Types	Geographical Section
Housing Major	Pitcaple to Kintore
Housing Local	East of Huntly to East of Colpy
	Colpy to Pitcaple
	Pitcaple to Kintore
Business and Industry Local	East of Huntly to East of Colpy
	Colpy to Pitcaple
	Pitcaple to Kintore
Other developments, consents and certificates	East of Huntly to East of Colpy
	Colpy to Pitcaple
	Pitcaple to Kintore

9.3.9 The planning applications considered as part of the assessment (baseline) are listed in Volume 4b, Appendix A9.3: Planning Applications Baseline and Assessment. The locations of applications potentially affected by route options are shown in Volume 5, Figures 9.1 to 9.11.

9.4 Impact Assessment

9.4.1 This section of the chapter provides an overview of the findings of the plans and policies assessment which was undertaken with the input of the wider DMRB Stage 2 environmental team.

Local Development Plan Policy Assessment

9.4.2 The assessment of the impacts of the route options on LDP policies relates solely to the Aberdeenshire LDP as no route options are located outwith the local authority area. There are 34 policies in the Aberdeenshire LDP 2017 which were identified as not relevant to the scheme, one which is relevant scheme-wide and should be assessed on a scheme-wide basis, and 16 which differ in relevance to the route options based on location and should be assessed accordingly. These are all listed in Volume 4b, Appendix A9.1 and matrices of the options' policy compliance are set out in Volume 4b, Appendix A9.1.

Policies Relevant Scheme Wide

9.4.3 One Aberdeenshire LDP policy was identified as being relevant at a scheme-wide level, namely Policy RD1. This policy states that Aberdeenshire Council 'will only allow development that provides adequate road, waste management, water or wastewater facilities, connections and treatment as appropriate'.

9.4.4 The level of design required to assess whether each route option complies with Policy RD1 has not yet been undertaken. As such, it remains uncertain whether the route options comply with the policy RD1 requirements. Further design of the Preferred Option will be undertaken during DMRB Stage 3.

Policies Relevant to Route Option – East of Huntly to Colpy (Cyan and Red Route Options)

Policy Compliance

9.4.5 Both the route options comply with the following LDP Policies:

- Policy R1 - Special rural areas;
- Policy HE2 - Protecting historic and cultural areas; and
- Policy PR3 - Waste areas.

9.4.6 None of the route options are located within the greenbelt or the coastal zone and as such both route options comply with Policy R1.

9.4.7 None of the route options are aligned through any Inventory Gardens and Designed Landscapes or Inventory Historic Battlefields and there are no Conservation Areas within the study area. The predicted impacts on the setting of Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields are considered minor or negligible (see Chapter 16, Cultural Heritage) and the impacts on the setting of these heritage assets is considered not to compromise the designation or overall integrity, character and setting of the designated area. As such both route options comply with Policy HE2.

9.4.8 None of the route options constitute inappropriate neighbouring development which would compromise waste handling operations at an existing waste management site, and as such both route options comply with Policy PR3.

9.4.9 Neither the Cyan or Red route options impact on land allocated or reserved for business or employment use. As such, both route options comply with Policy B1 which seeks to protect such land from development for alternative uses. Likewise, neither route option impacts on land allocated nor reserved for residential development and as such both route options comply with Policy H1.

9.4.10 Both the Cyan and Red route options comply with Policy PR2 which aims to protect important development sites as defined by the policy, as neither infringe on any such site.

Possible Policy Non-Compliance

9.4.11 Cyan and Red route options are considered to present a number of possible non-compliances with LDP policies. The definition of 'possible non-compliance' acknowledges that full consideration of policy performance is not possible at this stage pending design refinement, detailed environmental assessment, and confirmation of mitigation measures at DMRB Stage 3.

9.4.12 A qualitative assessment of impact magnitude has been undertaken for both the Cyan and Red route options, due to the detailed drainage design not being available at this stage of the project. This approach was verified by using the Highways Agency Water Risk Assessment Tool (HAWRAT) to demonstrate that any potentially significant effects on water quality from routine runoff are able to be mitigated with appropriate Sustainable Drainage Systems (SuDS). Whilst it is anticipated that mitigation will address this matter, until further detailed design of mitigation measures is undertaken there remains a potential non-compliance with Policy P4 concerning the potential for pollution, and PR1 with regards to protecting water quality and ancient woodland as important environmental resources.

9.4.13 Cyan and Red route options have the potential to significantly impact upon flood risk without mitigation and encroach on functional floodplains. Whilst it is anticipated that mitigation will address this matter, there remains a potential non-compliance with Policy C4 with regards to flood risk. The refinement of the Preferred Option and the design of mitigation will be developed during DMRB Stage 3.

9.4.14 Cyan and Red route options have potentially significant impacts on natural heritage and landscape through the scale, location and design impacts on key natural landscape elements, historic features or the composition or quality of the landscape character. As such there remains a potential non-compliance with Policy E2. The landscape assessment (see Chapter 17, Landscape) has identified landscape character areas across the wider landscape and has assessed the potential impacts on these areas. The overall effects at DMRB Stage 3 will depend on the design of the Preferred Option, including its vertical and horizontal alignment, design of key structures, and the mitigation measures developed during DMRB Stage 3.

9.4.15 Both the Cyan and Red route options are partially located within the Foudland Local Nature Conservation Site (LNCS). An assessment of the potential impacts on this site has not been undertaken to the requisite level of detail as part of DMRB Stage 2, and as such there remains a potential non-compliance with Policy E1 which seeks to protect nature conservation sites from development which would have adverse effects on the site.

9.4.16 The Red route option is predicted to have a moderate impact on regional heritage assets (see Chapter 16, Cultural Heritage). The route option therefore represents a potential non-compliance with Policy HE1. The route option has been designed to avoid direct impacts on nationally important sites, however, effects on the setting

of these sites and structures is still possible. Mitigation measures will be explored further and developed during DMRB Stage 3 and consultation with Historic Environment Scotland will continue to inform designs. Chapter 16, Cultural Heritage, sets out further information on the predicted effects of the route option on these assets.

Non-Compliance

- 9.4.17 The Cyan route option is predicted to have a major impact on the setting of Colpy Cottages Palisaded Enclosure crop mark site (see Chapter 16, Cultural Heritage). As such, the route option represents a non-compliance with Policy HE1. Mitigation measures will be explored further and developed during DMRB Stage 3 and consultation with Historic Environment Scotland will continue to inform the Preferred Option design. Chapter 16, Cultural Heritage, sets out further information on the predicted effects of the route option on these assets.

Uncertain Compliance

- 9.4.18 Policy C3 concerns the protection of carbon sinks and stores from disturbance or destruction, such as woodland and high-carbon peat rich soils. Compliance at this stage is uncertain for both route options due to the absence of sufficiently detailed data, as no ground investigation works have been undertaken during DMRB Stage 2. This subject matter will be assessed in further detail during DMRB Stage 3.
- 9.4.19 There are no core paths which would be impacted upon by either the Cyan or the Red route options. There may be opportunities to promote public access pending detailed assessment and design development at DMRB Stage 3. As such, it remains uncertain whether the Cyan and Red route options comply with Policy P2.

Policies Relevant to Route Options – Colpy to Pitcaple (Pink and Brown Route Options)

Policy Compliance

- 9.4.20 Pink and Brown route options comply with the following LDP Policies:
- Policy R1-Special rural areas;
 - Policy HE2-Protecting historic and cultural areas; and
 - Policy PR3-Waste areas.
- 9.4.21 Neither of the route options are located within the greenbelt or the coastal zone and as such both route options comply with Policy R1.
- 9.4.22 Neither of the route options run through any Inventory Gardens and Designed Landscapes or Inventory Historic Battlefields and there are no Conservation Areas within the study area. The predicted impacts on the setting of Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields are considered minor or negligible (see Chapter 16, Cultural Heritage) and the impacts on the setting of these heritage assets is considered not to compromise the designation or overall integrity, character and setting of the designated area. As such, both route options comply with Policy HE2.
- 9.4.23 Neither of the route options constitute inappropriate neighbouring development which would compromise waste handling operations at an existing waste management site and, as such, both route options comply with Policy PR3.

- 9.4.24 Neither the Pink nor Brown route options impact on land allocated or reserved for business or employment use. As such, both route options comply with Policy B1 which seeks to protect such land from development for alternative use. Likewise, neither route options impact on land allocated or reserved for residential development and, as such, both route options comply with Policy H1.
- 9.4.25 Both the Pink and Brown route options comply with Policy PR2 which aims to protect important development sites as defined by the policy, as neither infringe on any such site.
- Possible Policy Non-Compliance*
- 9.4.26 Both Pink and Brown route options are considered to present a number of possible non-compliances with LDP policies. The definition of 'possible non-compliance' acknowledges that full consideration of policy performance is not possible at this stage pending design refinement, detailed environmental assessment, and confirmation of mitigation measures.
- 9.4.27 A qualitative assessment of impact magnitude has been undertaken for both the Pink and Brown route options, due to the detailed drainage design not being available at this stage of the project. This approach was verified by using the HAWRAT to demonstrate that any potentially significant effects on water quality from routine runoff are able to be mitigated with appropriate SuDS. Whilst it is anticipated that mitigation will address this matter, until further design of mitigation measures is undertaken there remains a potential non-compliance with Policy P4 concerning the potential for pollution, and PR1 with regards to protecting water quality and ancient woodland as important environmental resources.
- 9.4.28 Pink and Brown route options have the potential to significantly impact upon flood risk without mitigation and encroach on functional floodplains. Whilst it is anticipated that mitigation will address this matter, there remains a potential non-compliance with Policy C4 with regards to flood risk. The refinement of the Preferred Option and the design of mitigation will be developed during DMRB Stage 3.
- 9.4.29 Pink and Brown route options have potentially significant impacts on natural heritage and landscape through the scale, location and design impacts on key natural landscape elements, historic features or the composition or quality of the landscape character. As such, there remains a potential non-compliance with Policy E2. The landscape assessment (see Chapter 17, Landscape) has identified landscape character areas across the wider landscape and has assessed the potential impacts on these areas. The overall effects at DMRB Stage 3 will depend on the design including its vertical and horizontal alignment, design of key structures, and the bespoke mitigation measures developed during DMRB Stage 3.
- 9.4.30 Both Pink and Brown route options are predicted to result in the severance of core paths and cycle routes, and as such represent potential non-compliance with Policy P2 which aims to protect existing and potential public access routes and promote walking or cycling as a means of transport. The design of mitigation such as Non-Motorised User (NMU) crossings and the realignment of NMU routes will be developed during DMRB Stage 3.
- 9.4.31 Both the Pink and Brown route options are predicted to have impacts on the setting of a number of Scheduled Monuments and the Brown route option in addition on a Non-Inventory Designed Landscapes (see Chapter 17, Landscape). The route options, therefore, represent a potential non-compliance with Policy HE1. The route options have been designed to avoid direct impacts on nationally important

sites, however, effects on the setting of these sites and structures is still possible. Mitigation measures will be explored further and developed during DMRB Stage 3 and consultation with Historic Environment Scotland will continue to inform designs. Chapter 16, Cultural Heritage, sets out further information on predicted effects of the route options on these assets.

Uncertain Compliance

- 9.4.32 Policy C3 concerns the protection of carbon sinks and stores from disturbance or destruction, such as woodland and high-carbon peat rich soils. Compliance at this stage is uncertain for both route options due to the absence of sufficiently detailed data as no ground investigation works have been undertaken during DMRB Stage 2. This subject matter will be assessed in further detail during DMRB Stage 3 (see Chapter 19, Geology, Soils, Contaminated Land and Groundwater).

Policies Relevant to Route Options – Pitcaple to Kintore (Violet and Orange Route Options)

Policy Compliance

- 9.4.33 Both the route options comply with the following LDP Policies:
- Policy R1-Special rural areas;
 - Policy HE2-Protecting historic and cultural areas; and
 - Policy PR3-Waste areas.
- 9.4.34 Neither of the route options are located within the greenbelt or the coastal zone and, as such, both options comply with Policy R1.
- 9.4.35 Neither of the route options run through any Inventory Gardens and Designed Landscapes or Inventory Historic Battlefields and there are no Conservation Areas within the study area. The predicted impacts on the setting of Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields are considered minor or negligible (see Chapter 16, Cultural Heritage) and the impacts on the setting of these heritage assets is 'considered not to compromise the designation or overall integrity, character and setting of the designated area'. As such, both route options comply with Policy HE2.
- 9.4.36 Neither of the route options constitute inappropriate neighbouring development which would compromise waste handling operations at an existing waste management site and, as such, both route options comply with Policy PR3.
- 9.4.37 The Orange route option complies with Policy PR2 which aims to protect important development sites as defined by the policy, as it does not infringe on any such site.

Possible Policy Non-Compliance

- 9.4.38 The Violet and Orange route options are considered to present a number of possible non-compliances with LDP policies. The definition of 'possible non-compliance' acknowledges that full consideration of policy performance is not possible at this stage pending design refinement, detailed environmental assessment, and confirmation of mitigation measures.
- 9.4.39 A qualitative assessment of impact magnitude has been undertaken for both the Violet and Orange route options, due to the detailed drainage design not being available at this stage of the project. This approach was verified by using the HAWRAT to demonstrate that any potentially significant effects on water quality

from routine runoff are able to be mitigated with appropriate SuDS. Whilst it is anticipated that mitigation will address this matter, until further design of mitigation measures is undertaken there remains a potential non-compliance with Policy P4 concerning the potential for pollution, and PR1 with regards to protecting water quality and ancient woodland as important environmental resources.

- 9.4.40 Both route options have the potential to significantly impact upon flood risk without mitigation and encroach on functional floodplains. Whilst it is anticipated that mitigation will address this matter, there remains a potential non-compliance with Policy C4 with regards to flood risk. The refinement of the Preferred Option and the design of mitigation will be developed during DMRB Stage 3.
- 9.4.41 Both route options have potentially significant impacts on natural heritage and landscape through the scale, location and design impacts on key natural landscape elements, historic features or the composition or quality of the landscape character. As such there remains a potential non-compliance with Policy E2. The landscape assessment (see Chapter 17, Landscape) has identified landscape character areas across the wider landscape and has assessed the potential impacts on these areas. The overall effects at DMRB Stage 3 will depend on the design including its vertical and horizontal alignment and design of key structures, and on the bespoke mitigation measures developed.
- 9.4.42 Both the Violet and the Orange route options are predicted to have minor impacts on LDP allocated housing sites by occupying a small proportion of the site (see Volume 5, Figures 9.7 to 9.11). As such both route options represent a potential non-compliance with Policy H1.
- 9.4.43 Both Violet and Orange route options are predicted to result in the severance of core paths and cycle routes, and as such represent potential non-compliance with Policy P2 which aims to protect existing and potential public access routes and promote walking or cycling as a means of transport. The design of mitigation such as NMU crossings and the realignment of NMU routes will be developed during DMRB Stage 3.
- 9.4.44 The Violet route option is predicted to have direct impacts on regional heritage assets and impacts on the setting of a number of Scheduled Monuments and Listed Buildings and Non-Inventory Designed Landscapes (see Chapter 16, Cultural Heritage). The Violet route option, therefore, represents a potential non-compliance with Policy HE1. The route options have been designed to avoid direct impacts on nationally important sites, however, effects on the setting of these sites is still possible. Mitigation measures will be explored further and developed during DMRB Stage 3 and consultation with Historic Environment Scotland will continue to inform designs. Chapter 16, Cultural Heritage, sets out further information on the predicted effects of the options on these assets.
- 9.4.45 The Violet route option is predicted to have a minor impact on land reserved for a transport interchange at Kintore. As such, this route option represents a potential non-compliance with Policy PR2 which aims to protect important development sites, including those associated with transport infrastructure.

Policy Non-Compliance

- 9.4.46 Both Violet and Orange route options (see Volume 5, Figures 9.7 to 9.11) are predicted to have a moderate impact on a designated opportunity site identified for employment use. As such, these route options are non-compliant with Policy B1 which seeks to protect land allocated for employment or business use from other types of development.

- 9.4.47 Both the Orange and Violet route options infringe upon the Pitscurry Moss LNCS and will likely result in an associated undermining of the biodiversity integrity of the site (see Chapter 18, Nature Conservation). As such, the route options are non-compliant with Policy E1 which seeks to avoid adverse impacts on nature conservation sites, protected species and wider biodiversity.
- 9.4.48 The Orange route option is assessed as having potential major impact on the settings of two scheduled monuments within 1km of the route option (Scheduled Monuments: Mains of Balquhain Stone Circle and St Apolinaris' Chapel and Burial Ground), along with a number of 'moderate' effects on the setting of other heritage assets (see Chapter 16, Cultural Heritage). As such, the Orange route option is non-compliant with Policy HE1. Mitigation measures will be explored further and developed during DMRB Stage 3, for the Preferred Option, and consultation with Historic Environment Scotland will continue to inform designs.

Uncertain Compliance

- 9.4.49 Policy C3 concerns the protection of carbon sinks and stores from disturbance or destruction, such as woodland and high-carbon peat rich soils. Compliance at this stage is uncertain for both route options due to the absence of sufficiently detailed data as no ground investigation works have been undertaken during Stage 2. This subject matter will be assessed in further detail during DMRB Stage 3 (see Chapter 19, Geology, Soils, Contaminated Land and Groundwater).

Local Development Plan Designated Site Assessments

- 9.4.50 The assessment of the impacts of the route options on LDP designated sites relates solely to the Aberdeenshire LDP as no route options are located outwith the local authority area. Areas of impact may change as a result of design development and some minor impacts have the potential to be designed out during DMRB Stage 3. The details of the impact assessment are set out in Volume 4b, Appendix A9.2.

East of Huntly to Colpy

- 9.4.51 Neither the Cyan nor Red route options are located within 500m any LDP designated sites and are not predicted to have any impacts on any designated sites.

Colpy to Pitcaple

- 9.4.52 Neither the Pink nor Brown route options are predicted to impact on any LDP designated sites (see Volume 5, Figures 9.3 to 9.6).

Pitcaple to Kintore

- 9.4.53 The Violet route option is predicted to have a minor impact upon six LDP designated sites (see Volume 5, Figures 9.7 to 9.9).
- 9.4.54 The Violet route option clips the edge, and occupies 1.2%, of site OP7 which is an LDP designated residential Opportunity Site, Uryside Phase 2 (see Volume 5, Figures 9.7 to 9.8). The Violet route option occupies 6.7% of site R1 Reserved Land for a northern link road and landscaping improvements to the north of Inverurie, and 0.7% of site BUS1 which is an existing employment site, and also occupies 6.7% of site R2 Reserved Land for a transport safeguard. The Violet route option occupies <0.1% of BUS9 site safeguarded for employment use.

- 9.4.55 The Violet route option also occupies 11% of site BUS2 Existing Employment Land safeguarded for employment uses and a transport interchange at Kintore, having a moderate impact.
- 9.4.56 The Orange route option is predicted to have a minor impact on nine LDP sites as per below (see Volume 5, Figures 9.9 to 9.11):
- Thainstone House Green Space with 7.3% of the site affected;
 - Inverurie Mill Green Space with 6.6% of the site affected;
 - OP4 housing opportunity site with 0.9% of the site affected;
 - BUS1 safeguarded employment site with 0.3% of the site affected;
 - BUS2 safeguarded for employment site with 0.4% of the site affected;
 - BUS10 safeguarded employment site with <0.1% of the site affected;
 - BUS5 safeguarded employment site with 0.6% of the site affected;
 - BUS7 safeguarded employment site with <0.1% of the site affected; and
 - BUS9 safeguarded employment site with 3.2% of the site affected.
- 9.4.57 The Orange route option is predicted to have a moderate impact on two sites. It is predicted to occupy 39.6% of site OP11, an employment Opportunity Site, and 19.7% of BUS 6, a safeguarded employment site. The route option is also predicted to have a major impact on one LDP site, occupying 54.3% of SR1 strategic reserve employment land.

Overall Impacts

- 9.4.58 For all route options, the impacts on designated sites are limited to the Pitcaple to Kintore Violet and Orange route options. The assessment findings are summarised in Table 9.8.

Planning Applications Assessment

- 9.4.59 The assessment of the impacts on planning applications solely concerns applications made to Aberdeenshire Council as no route options are located outwith the local authority area. Areas of impact may change as a result of design development and some minor impacts have the potential to be designed out during DMRB Stage 3. The details of the impact assessment are set out in Volume 4b, Appendix A9.3.

East of Huntly to Colpy

- 9.4.60 The Cyan route option is not predicted to have any impact on any planning application. Therefore it should be noted that there are no Figures to accompany this route option.
- 9.4.61 The Red route option is predicted to have a moderate impact on two application sites (see Volume 5, Figures 9.1 and 9.2). The Red route option will occupy 44.4% of a site granted permission for alterations and extensions to an existing architects' studio (Ref: APP/2016/1903). The Red route option will also occupy 27.5% of a site granted permission for the erection of a Class 10 non-residential institution (an eco-bothy) (Ref: APP/2017/1063).

Colpy to Pitcaple

- 9.4.62 The Pink route option is predicted to have a minor impact on four applications (see Volume 5, Figures 9.3 and 9.4), three of which concern the erection of a dwellinghouse, with 7% (ref: APP/20162621), 3% (Ref: APP/2017/1496) and 3.6% (Ref: APP/2018/1354) of the land affected respectively. The third concerns the 400kV Overhead Line reinforcement with less than 0.1% of the site affected (Ref: APP/2019/0506). One consented development concerning the erection of a dwellinghouse will be moderately impacted, with 21.6% of the site affected (Ref: APP/2018/0921).
- 9.4.63 The Brown route option is predicted to have a minor impact on two sites (see Volume 5, Figures 9.5 and 9.6). One of the predicted minor impacts affects a site granted permission for alterations, extension and change of use from office to dwellinghouse and would have 4.9% of the site affected (Ref: APP/2018/1507). The second concerns the 400kV Overhead Line reinforcement with 0.2% of the site affected (Ref: APP/2019/0506).
- 9.4.64 The Brown route option is predicted to have a moderate impact on a site that has a grant of planning permission for a single dwellinghouse, with 21.5% of the site affected (Ref: APP/2018/0921).

Pitcaple to Kintore

- 9.4.65 The Violet route option is predicted to have a minor impact on six application sites as follows (see Volume 5, Figures 9.7 and 9.8):
- a site approved for the formation of an access and car park with 0.1% of the site affected (Ref: APP/2018/0731);
 - a site concerning the reinforcement of 400kV Overhead Line with <0.1% of the site affected (Ref: APP/2019/0506);
 - a site approved for the erection of 125 dwellinghouses and associated infrastructure with 1.2% of the site affected (Ref: APP/2017/1381);
 - a site approved for the extension of an existing warehouse with 2.2% of the site affected (Ref: APP/2017/3217);
 - a site approved for a change of use from an area of hardstanding to a display area with 5.1% of the site affected (Ref: APP/2018/1644); and
 - a site granted permission for the erection of 40 dwellinghouses with 2% of the site affected (Ref: APP/2019/0232).
- 9.4.66 The Violet route option is predicted to have a moderate impact on three sites as follows:
- a site granted permission for the erection of a dwellinghouse, with 15.6% of the site being affected (Ref: APP/2019/1585);
 - a site approved for the erection of a dwellinghouse with 10.3% of the site affected (Ref: APP/2018/0308); and
 - a site granted permission for the installation of a testing rig with 14% of the site affected (Ref: APP/2019/0696).

9.4.67 The Orange route option is predicted to have a minor impact on four application sites (see Volume 5, Figures 9.10 to 9.11) as follows:

- a site granted permission for the continued operation of a Sunday market and associated carparking, with 6% of the site affected (Ref: APP/2017/2192);
- a site concerns the reinforcement of an 400kV overhead line, with 0.8% of the site affected (Ref: APP/2019/0506);
- a site concerning the formation of a private agricultural way, with 3% of the site affected (Ref: APP/2019/0257); and
- a site with permission in principle for the erection of a dwellinghouse, with 0.02% of the site affected (Ref: APP/2016/0244).

9.4.68 The Orange route option is predicted to have a moderate impact on a site with approval in principle for the erection of 737 dwellinghouses, business, industrial and educational facilities, with 13.3% of the site occupied (Ref: APP/2013/0267 & APP/2019/1489).

9.5 Route Option Comparison

9.5.1 This section sets out a summary of the key findings of the route options assessment based on the planning policies, land use planning allocations and planning applications assessments. The summaries are presented in Tables 9.7 to 9.10.

Summary of LDP Policy Assessment

9.5.2 This section provides in Table 9.7 a summary assessment by route option of the affected LDP policies.

Table 9.7 Summary of LDP Policy Assessment

Route Option	Complies	Potential Non-Compliance	Non-Compliance	Uncertain
East of Huntly to Colpy				
Cyan	6	5	1	3
Red	6	6	0	3
Colpy to Pitcaple				
Pink	6	6	0	3
Brown	6	6	0	3
Pitcaple to Kintore				
Violet	3	8	2	2
Orange	4	6	3	2

9.5.3 The East of Huntly to Colpy route options, Cyan and Red, are predicted to have similar impacts on LDP policies with the exception of policy HE1 which the Cyan route option does not comply with. The non-compliance and potential non-compliance with LDP policies have been identified subject to further consideration and potential mitigation at DMRB Stage 3.

- 9.5.4 The Colpy to Pitcapple route options, Pink and Brown, are predicted to have similar impacts on LDP policies. Neither route option has been identified as explicitly conflicting with any LDP policy, however, six potential non-compliances with LDP policies have been identified subject to further consideration and potential mitigation at DMRB Stage 3.
- 9.5.5 The Pitcapple to Kintore route options, Violet and Orange, differ in their compliance with LDP policies. Both the Orange and Violet route options infringe upon a LNCS and are non-compliant with Policy E1. The Orange route option will have a potentially significant impact on the settings of two scheduled monuments and is non-compliant with Policy HE1. The Orange route option is also predicted to have a moderate impact on a designated opportunity site identified for employment use and is non-compliant with Policy B1.

Summary of LDP Designated Sites Assessment

- 9.5.6 This section provides in Table 9.8 a summary assessment by route option of the affected LDP designated sites.

Table 9.8 Summary of LDP Designated Sites Assessment

Route Option	Minor Impact	Moderate Impact	Major Impact
East of Huntly to Colpy			
Cyan	0	0	0
Red	0	0	0
Colpy to Pitcapple			
Pink	0	0	0
Brown	0	0	0
Pitcapple to Kintore			
Violet	6	1	0
Orange	9	2	1

- 9.5.7 Overall, the predicted impacts of the route options on LDP designated sites are limited to the route options between Pitcapple and Kintore (see Volume 5, Figures 9.7 to 9.11). The Orange route option is predicted to have a major impact on the SR1 strategic reserve employment land site. In addition, there are predicted moderate impacts for the Orange route option on site OP11, employment land Opportunity Site, and on site BUS6, an employment Opportunity Site.

Summary of Planning Application Assessment

- 9.5.8 This section provides in Table 9.9 a summary assessment by route option of the affected planning applications.

Table 9.9 Summary of Planning Application Assessment

Route Option	Minor Impact	Moderate Impact	Major Impact
East of Huntly to Colpy			
Cyan	0	0	0
Red	0	4	0

Route Option	Minor Impact	Moderate Impact	Major Impact
Colpy to Pitcaple			
Pink	0	0	0
Brown	0	4	0
Pitcaple to Kintore			
Violet	7	3	0
Orange	5	2	0

- 9.5.9 Of the East of Huntly to Colpy route options, the Cyan route option has no predicted impacts identified and the Red route option has four moderate impacts (see Volume 5, Figure 9.1). The predicted moderate impacts identified concern approved applications for change of use to garden ground (Ref: APP/2020/0980), a change of use to a hair dressers (Ref: APP/2020/1072), the extension of an architect's studio (Ref: APP/2016/1903) and the erection of a Class 10 building (Ref: APP/2017/1063).
- 9.5.10 Of the Colpy to Pitcaple route options (see Volume 5, Figures 9.3 to 9.6), the Pink route options has four predicted minor impacts and one predicted moderate impact which concerns the development of a single dwellinghouse (Ref: APP/2018/092). The Brown route option has two predicted minor impacts and one predicted moderate impact which concerns the development of a single dwellinghouse (Ref: APP/2018/0921).
- 9.5.11 Of the Pitcaple to Kintore route options (see Volume 5, Figures 9.7 to 9.11), the Violet route option has seven predicted minor impacts and three predicted moderate impacts. The predicted moderate impacts relate the development of a single dwellinghouse (Ref: APP/2019/1585), the erection of a dwellinghouse (Ref: APP/2018/0308) and the erection of a testing rig (Ref: APP/2019/0696). The Orange route option is predicted to have a minor impact on five application sites and a moderate impact on two application site. The moderate impacts are of note as they relate to an application, approved in principle, for the erection of 737 dwellinghouses and business/industry/community facilities (Ref: APP/2013/0267 & APP/2019/1489) and an application approved for the erection of six business units (Ref: APP/2020/1034).

Overall Route Option Comparison

- 9.5.12 This section provides in Table 9.10 an overall comparison by route option of the compliance with LDP policies, the impact on LDP designated sites and impact on planning applications.

Table 9.10 Overall Route Option Comparison

Route Option	LDP Policies	LDP Designated Sites	Planning Applications
East of Huntly to Colpy			
Cyan	6 Complies 5 Potential non-compliance 1 Non-compliance 3 Uncertain	No impact	No impact
Red	6 Complies 6 Potential non-compliance 0 Non-compliance 3 Uncertain	No impact	4 moderate
Colpy to Pitcable			
Pink	6 Complies 6 Potential non-compliance 0 Non-compliance 3 Uncertain	No impact	4 minor 1 moderate
Brown	6 Complies 6 Potential non-compliance 0 Non-compliance 3 Uncertain	No impact	2 minor 1 moderate
Pitcable to Kintore			
Violet	3 Complies 8 Potential non-compliance 2 Non-compliance 2 Uncertain	6 minor 1 moderate	7 minor 3 moderate
Orange	4 Complies 6 Potential non-compliance 3 Non-compliance 2 Uncertain	9 minor 2 moderate 1 major	5 minor 2 moderate

9.6 Summary of Effects

East of Huntly to Colpy

- 9.6.1 There is little difference predicted between the Cyan and Red route options with regards to their predicted impacts on plans and policies. The Red route option is considered preferable, primarily as a result of the non-compliance of the Cyan route option with LDP policy HE1.

Colpy to Pitcaple

- 9.6.2 There is little difference between the Pink and Brown route options with regards to their predicted impacts on plans and policies (see Volume 5, Figures 9.3 to 9.6). There is also little difference between Pink and Brown route options with regards to their predicted impacts on planning applications, however, based on the predicted minor impacts the Brown route option is considered preferable.

Pitcaple to Kintore

- 9.6.3 The Violet route option is predicted to have a moderate impact on three planning application sites; however, these are not large scale developments and are not considered to be as difficult to overcome/mitigate as the predicted impacts on the LDP designated sites and the major 737 dwellinghouse development (see below). The Violet route option is also predicted to have a moderate impact on LDP allocated site BUS6 safeguarded employment land (see Volume 5, Figures 9.7 to 9.8).
- 9.6.4 The Orange route option is predicted to have a minor impact on nine LDP designated sites, a moderate impact on two and a major impact on one LDP designated site (see Volume 5, Figures 9.9 to 9.11). The Orange route option is predicted to occupy 39.6% of site OP11, an employment Opportunity Site, having a moderate impact and, in addition, has a moderate impact on BUS6 safeguarded employment land. The Orange route option is also predicted to occupy 54.3% of LDP site SR1 strategic reserve employment land and is assessed as having a major impact. The LDP impacts, and their scale, are largely responsible for the difference between the two route options in terms of policy non-compliance, with the Orange route option non-compliant with three LDP policies and the Violet route option non-compliant with two. The Orange route option will also have a moderate impact, occupying 13.3% of the site, on an application granted in principle for 737 dwellinghouses with associated business, industrial and community facilities (Ref: APP/2013/0267 & APP/2019/1489) and a moderate impact, occupying 13.9% of site, on an application granted for the erection of six business units (Ref: APP/2020/1034).
- 9.6.5 Based on the above assessment the Violet route option is considered preferable.

9.7 Scope of DMRB Stage 3 Assessment

- 9.7.1 The DMRB Stage 3 policies and plans assessment will, in greater detail, consider the performance of the Preferred Option. The Preferred Option will be subject to further design development against development plan policy. Further design development will enable the predicted land take impacts on LDP designated sites and planning application sites to be assessed in more detail.
- 9.7.2 The DMRB Stage 3 assessment will take into account the Aberdeenshire LDP (2021) and any proposed sites therein, as appropriate at the time of assessment.

- 9.7.3 The DMRB Stage 3 assessment will consider indirect effects on LDP designations and planning application sites that lie close to, but which are not directly affected by, the Preferred Option. This will be undertaken with reference to the detailed topic assessments for key environmental assessments.

10 Air Quality

10.1 Introduction

- 10.1.1 This chapter presents an assessment of the predicted air quality effects of the end-to-end options and identifies potential mitigation measures that may be required. Changes in concentrations of nitrogen dioxide (NO₂) and particulate matter with diameter less than 10 microns (PM₁₀) at sensitive receptor locations for each end-to-end option are considered with respect to relevant policy and legislation, and in the context of existing air quality throughout the study area. It should be noted that the manner in which this chapter is reported deviates slightly from other topics. This chapter considers end-to-end options as opposed to the individual route options. This is because the assessment is based on the traffic modelling which has been undertaken on an end-to-end option basis.
- 10.1.2 During the construction phase, temporary air quality impacts from the emission of dust may arise. Emissions during the construction phase may cause nuisance in the form of dust soiling, impact on human health and impact on any adjacent sensitive ecological receptors due to elevated concentrations of fine particulates released to air. It is anticipated that the impact of dust on sensitive receptors within the study area will not vary significantly between end-to-end options. As such, the assessment of dust emissions has been scoped out of this Design Manual for Roads and Bridges (DMRB) Stage 2 assessment.
- 10.1.3 The operational phase of the scheme has the potential to affect air quality as a result of:
- Changes in vehicular emissions and pollutant concentrations as a direct result of changes in the flow, speed and composition of traffic on the road network; and
 - Changes in road locations, layout and alignment, leading to changes in the distance between vehicular emission sources and sensitive receptors.
- 10.1.4 This air quality assessment focuses on local and regional impacts.
- Local Impacts: assessment of the impact on local air quality which is concerned principally with emissions of pollutants (NO₂ and PM₁₀) that are of concern to human health, vegetation and ecosystems, at a local level; and
 - Regional Impacts: assessment of total emissions of pollutants (NO₂ and PM₁₀) that may contribute to regional (transboundary) pollution, affecting human health, vegetation and ecosystems.
- 10.1.5 The following appendices are presented in Volume 4b of this report:
- Appendix A10.1: Air Quality Assessment Methodology;
 - Appendix A10.2: Air Quality Modelling Verification; and
 - Appendix A10.3: Air Quality Predicted Effects Supporting Assessment.
- 10.1.6 Figures relevant to the end-to-end options are:
- Volume 5, Figures 10.1 to 10.24: Air Quality Affected Road Network and Worst Case Receptors.

- 10.1.7 Predicted effects have been considered following the guidance contained in the DMRB (Volume 11, Section 3, Part 1, HA 207/07 Air Quality) referred to as DMRB HA 207/07 and relevant Interim Advice Notes (IANs):
- IAN 170/12 Updated air quality advice on the assessment of future NO_x and NO₂ projections for users of DMRB (Volume 11, Section 3, Part 1, HA 207/07 Air Quality) (referred to as IAN 170/12);
 - IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB (Volume 11, Section 3, Part 1 Air Quality) (referred to as IAN 174/13); and
 - IAN 175/13 Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB (Volume 11, Section 3, Part 1 Air Quality) (referred to as IAN 175/13).
- 10.1.8 Emission factors used in the assessment are based on the latest version of the Emissions Factor Toolkit (EFT v9.0)¹³ which has updated emissions for EURO 6/VI vehicles, which are predicted to make up most of the fleet in 2030 (the opening year).
- 10.1.9 As there are no Air Quality Management Areas (AQMAs) located throughout the study area, the IAN 185/15 'Assessment of link speeds and generation of vehicle data into speed-bands' is not relevant to this assessment and has not been considered further.

10.2 Approach to Assessment

Introduction

- 10.2.1 This section sets out the approach to the air quality assessment applied to all end-to-end options. Reference is made to key sources of information and the methodology for the assessment is presented.

Source of Information

- 10.2.2 The following information sources have been used to prepare this assessment:
- Scottish Background Maps¹⁴;
 - Aberdeenshire Annual Summary Report (2018 and 2019)¹⁵;
 - Outputs from A96 CRAM v1.4 Environmental Refined Core models (see Volume 3, Part 4, Traffic and Economic Assessment);
 - Department for Environment, Food and Rural Affairs (2018). (LAQM.TG(16))¹⁶;

¹³ Defra, *Emission Factor Toolkit*, 2019, available at: <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>,

¹⁴ Ricardo Energy and Environment, *Air Quality in Scotland*, available at: <http://www.scottishairquality.scot/data/mapping?view=data/>

¹⁵ Aberdeenshire Council, *Aberdeenshire Annual Summary Report*. 2018 & 2019, available at: <http://www.scottishairquality.scot/assets/documents/APR-1.pdf>

¹⁶ Defra, *Local Air Quality Management Technical Guidance 2016 (Feb, 2018 Update)*, 2018, available at: <https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>

- DMRB HA 207/07;
- IAN 174/13;
- IAN 170/12;
- IAN 175/13;
- Ordnance Survey AddressBase Plus (Dec 2019); and
- Land-Use Planning & Development Control: Planning for Air Quality (EPUK & IAQM, 2017)¹⁷.

Consultation

- 10.2.3 The Environmental Health Officer (EHO) at Aberdeenshire Council has been consulted and has requested to be kept informed of plans to implement a monitoring survey during the DMRB Stage 3 assessment.

Assessment Methodology

- 10.2.4 Operational air quality effects have been considered in accordance with the relevant guidance. The methodology applied to assess operational air quality impacts is presented in Volume 4b, Appendix A10.1: Air Quality Assessment Methodology.
- 10.2.5 The following steps have been completed to assist with identifying a Preferred Option, from an air quality perspective:
- A 'simple assessment' has been undertaken using Atmospheric Dispersion Modelling System (ADMS) Roads Extra, in accordance with guidance in DMRB HA207/07, LAQM.TG(16) and IAQM Guidance on Planning for Air Quality. This approach is considered appropriate to determine the magnitude of change and identify whether there are specific differences between the end-to-end options to the extent that a Preferred Option can be identified, from an air quality perspective. For example, will any of the end-to-end options lead to any exceedances of the Scottish Air Quality Objectives (SAQO) at sensitive receptor locations;
 - A 'simple assessment' approach has been adopted at Stage 2 using ADMS to calculate concentrations at specific receptor locations. This approach uses AADT 24-hour flows only, does not use period flows;
 - No exceedances of SAQO limit values were identified during the desk-based survey. Pollutant concentrations throughout the study area are generally low for NO₂ and PM₁₀ respectively (< 6 µg/m³, <12 µg/m³);
 - Background concentrations of NO₂, Nitrogen Oxides (NO_x) and PM₁₀ have been obtained from the Scottish Background Maps website. Baseline data has also been obtained from Aberdeenshire Council Local Air Quality Management (LAQM) Annual Summary Reports for 2018 and 2019;
 - No air quality monitoring surveys were carried out for this A96 Dualling East of Huntly to Aberdeen DMRB Stage 2 assessment. However, Aberdeenshire

¹⁷ Barrowcliffe and Moorcroft. *Land-Use Planning & Development Control: Planning for Air Quality*, 2017, available at: <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

Council carried out monitoring of NO₂ at three roadside locations during the 2017 calendar year. Data from these monitoring locations has been used to verify the model. It should be noted that there are limitations associated with this approach; diffusion tubes in town centre locations will be more representative of busy town centre conditions. Applying this verification factor to all modelled results may lead to under-predictions in rural areas. However, it should be noted that the DMRB Stage 2 air quality assessment is ultimately a comparative exercise, completed to identify whether there are significant differences between the end-to-end options. The limitations associated with this assessment are discussed in detail later in this chapter. The model verification working is shown in Volume 4b, Appendix A10.2: Air Quality Modelling Verification;

- Concentrations of NO_x, NO₂ and PM₁₀ from vehicular sources have been predicted at sensitive receptors for the opening year (2030) Do-Minimum and Do-Something scenarios for all end-to-end options;
- Modelled road concentrations of NO_x have been converted to NO₂ using the NO_x to NO₂ calculator (v7.1)¹⁸, using background concentrations from the Scottish Air Quality resource, with results compared to relevant SAQOs, and results compared to determine the changes each end-to-end option may have on local air quality and adjacent sensitive receptors;
- PM_{2.5} does not form part of the assessment since it is not required as part of DMRB and is a constituent part of PM₁₀. The predicted PM₁₀ concentrations remain below the relevant PM_{2.5} objective and any predicted changes would be smaller than those predicted for PM₁₀;
- ADMS has been used to predict the road traffic contributions of NO_x and PM₁₀ concentrations at specified receptors by combining the road source pollution concentrations with background data obtained from the Scottish Air Quality website (www.scottishairquality.co.uk);
- The significance of changes in local air quality has been determined as per the guidance detailed in IAN 174/13. Effects may be significant if the relevant SAQOs are exceeded in any modelled scenario. If exceedances are identified at affected receptors, the resulting level of significance is determined based on a series of variables such as the change in air quality, the number of people affected and the length of time that the change would occur for. In this case, there are no exceedances of any SAQOs for any of the end-to-end options. As such, a comparative assessment has been carried out reviewing the number of receptors adversely and beneficially impacted, and a comparison of the impact of each end-to-end option with respect to regional emissions of NO₂ and PM₁₀;
- Regional emissions of Nitrogen Oxides (NO_x), PM₁₀ and Carbon Dioxide (CO₂) have been calculated for the opening year (2030) Do-Something scenarios. The results for each end-to-end option are compared against each other, with total mass emissions presented in Table 10.13. There is no formalised approach for determining the significance of changes in regional emissions.

¹⁸ Department for Environment Food and Rural Affairs, *NO_x to NO₂ Calculator Version 7.1*, available at: <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>.

Results are presented to assist with the overall comparison of end-to-end options; and

- There are no Pollution Climate Mapping (PCM) links in the study area. As such, a compliance risk assessment of end-to-end options is not required.

Study Area

Local Assessment

- 10.2.6 The local air quality assessment involves estimating the change in pollutant concentrations at receptors resulting from the operation of the scheme. The study area for the local air quality assessment covers any chosen sensitive receptors (e.g. residential, educational and medical locations) within 200m of all roads (from the road centreline) that are expected to be affected by the scheme. There are no ecologically sensitive European or nationally statutory designated sites within 200m. The Affected Road Network (ARN) determined for the local air quality assessment is presented in Volume 5, Figures 10.1 to 10.24.
- 10.2.7 DMRB HA207/07 defines the ARN as roads where:
- The road alignment will change by 5m or more; or
 - Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more; or
 - Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
 - Daily average speed will change by 10kph or more; or
 - Peak hour speed will change by 20kph or more.
- 10.2.8 The affected roads identified for each of the end-to-end options meet one or more of the above criteria.
- 10.2.9 Professional judgement was used to select 'worst-case' receptors adjacent to the ARN where the greatest changes in concentration were expected to occur.
- 10.2.10 The ARN for each end-to-end option include the existing A96 and new dual carriageway (the scheme) and additional affected roads in the following end-to-end options:
- Cyan-Pink-Violet (C-P-V);
 - Cyan-Pink-Orange (C-P-O);
 - Cyan-Brown-Violet (C-Br-V);
 - Cyan-Brown-Orange (C-Br-O);
 - Red-Pink-Violet (R-P-V);
 - Red-Pink-Orange (R-P-O);
 - Red-Brown-Violet (R-Br-V); and
 - Red-Brown-Orange (R-Br-O).

Regional Assessment

- 10.2.11 The regional air quality assessment measures the change in overall emissions resulting from the scheme. This is required as emissions also have an impact on a regional, national and international scale. The regional assessment accounts for changes in emissions associated with the end-to-end options across the whole Corridor Road Assignment Model (CRAM) corridor which extends from Inverness to Aberdeen. Only a small element of the regional emissions estimate is attributable to the East of Huntly to Aberdeen scheme being considered. The absolute contribution of emissions for each end-to-end option are presented in Table 10.13 for comparison.
- 10.2.12 The criteria below (HA 207/07 Section 3.20) were used to determine the regional ARN:
- Change of more than 10% in AADT;
 - Change of more than 10% to the number of HDVs; or
 - Change in daily average speed of more than 20kph.
- 10.2.13 All roads that were identified as being part of the ARN for the local assessment were included in the regional assessment.

Sensitive Receptors

- 10.2.14 To assist in the determination of significance of effects on local air quality, AddressBase Plus data was used to identify receptors (e.g. residential, educational facilities and medical facilities) located within 200m of the affected road network.
- 10.2.15 The receptors modelled for each scenario were further refined and professional judgement was used to select 'worst-case' receptors adjacent to the ARN where the greatest changes in concentration were expected to occur.
- 10.2.16 Appendix A10.1: Air Quality Assessment Methodology in Volume 4b provides further details of the receptors selected for the assessment of each end-to-end option.
- 10.2.17 There are no ecological receptors (designated sites) within 200m of the ARN that may be affected by Nitrogen (N) deposition. As such, the assessment of N deposition on ecological receptors is not required and is not considered further in this assessment.

Assumptions and Limitations

New Guidance

- 10.2.18 An update to the Air Quality DMRB HA 207/07 (hereafter referred to as the 'Withdrawn Guidance') was released in November 2019 named 'DMRB – Sustainability & Environment Appraisal – LA 105 Air Quality (hereafter referred to as the 'New Guidance')'.
- 10.2.19 The DMRB Stage 2 environmental assessment for this scheme had commenced prior to the release of the New Guidance.
- 10.2.20 AmeyArup met with the Environment and Sustainability Branch representative of Transport Scotland to discuss the impact of using the New Guidance. Based on these discussions, AmeyArup has carried out the assessment presented in this chapter, according to the Withdrawn Guidance.

- 10.2.21 The main conclusions of the assessment to select a Preferred Option would not change if the New Guidance is implemented. This section explains the reasons why and outlines the key differences between the Withdrawn Guidance and New Guidance.
- 10.2.22 The New Guidance differentiates the assessment methodologies applied to the assessment, reporting and management of impacts of air quality on human health and biodiversity from the delivery of motorway and all-purpose trunk road projects.
- 10.2.23 The New Guidance sets out the requirements for assessing the potential risk of a scheme during construction, operation, and elements to consider in terms of UK PCM compliance risk assessment (e.g., local model 4m point validation).
- 10.2.24 The requirements for scoping, defining study areas, description of baseline, modelling, determining impact significance, and design and mitigation are also provided.
- 10.2.25 In addition, the New Guidance provides a workflow diagram, which gives guidance on determining the level of assessment required for any scheme, i.e., whether the assessment should be Simple or Detailed. This determination is based on factors such as the risk potential of the project and environmental sensitivity of the receiving environment.
- 10.2.26 Generally, the New Guidance provides a similar methodology as to how to identify, assess and determine significance of pollution impacts arising from the construction and operation of a road scheme, with additional information on requirements for PCM risk assessment, and modelling requirements (i.e. traffic data expectations, selection of sensitive receptors).
- 10.2.27 The New Guidance also introduces more flexibility to define the study area based on professional judgement of where impacts might occur, in line with advice provided in DMRB GG 101.

Effects of New Guidance

- 10.2.28 The method of determining significance of air quality impact is similar to that presented in the Withdrawn Guidance. However, more detail is provided, with worked examples shown.
- 10.2.29 Using the New Guidance would not change the final conclusions of the DMRB Stage 2 assessment of route options. Although the New Guidance introduces more assessment detail, the conclusion of the comparative exercise is presented within the chapter based on DMRB HA 207/07, i.e. no exceedances of air quality objectives have been identified throughout the study area and no route options have been identified which would result in significant air quality impact. This conclusion would not change if DMRB LA 105 were applied to the assessment.

Other Assumptions and Limitations

- 10.2.30 Air quality estimates are based on the most reasonable, robust and representative methodologies in accordance with best practice guidance. However, it should be noted that there are limitations associated with the DMRB Stage 2 assessment predictions. These include:
- Use of HA 207/7 and associated IANs, rather than updated DMRB LA 105 Air Quality guidance;
 - Lack of monitoring data;
 - Model verification using town centre diffusion tubes;

- Traffic data;
- Vehicle emission predictions and application of emission factors;
- Background air quality data; and
- Simplifications made during data pre-processing, modelling calculations or post processing data.

10.2.31 Further details on the modelling methodology is presented in Volume 4b, Appendix A10.1: Air Quality Assessment Methodology.

10.3 Baseline

Introduction

10.3.1 Baseline air quality data has been obtained from Aberdeenshire Council and Air Quality Scotland background maps. The baseline conditions presented throughout this section are relevant to all end-to-end options considered.

Local Authority Review and Assessment

10.3.2 Aberdeenshire Council published their most recent Annual Progress Report in 2018 which indicated that pollutant concentrations within the study area continue to be below the SAQOs. No AQMAs have been considered or designated throughout the study area.

Local Authority Monitoring

10.3.3 There are no automatic monitoring stations located within the study area.

10.3.4 Aberdeenshire Council undertakes diffusion tube monitoring at 17 locations within their area. Diffusion tubes monitor annual mean NO₂ concentrations. There is no monitoring data available for the other pollutants considered within this assessment. Table 10.1 presents the most recent monitored results at sites located within the study area. Recorded concentrations at all Aberdeenshire Council diffusion tube locations were all below the annual mean SAQO for NO₂ (40µg/m³) in assessment years 2016, 2017 and 2018.

Table 10.1 Aberdeenshire Diffusion Tube Data-NO₂

Site Name	Site Type	x	y	Dist. to Nearest Exposure (m)	Dist. to Kerbside (m)	NO ₂ Concentrations (µg/m ³)		
						2016	2017	2018
Inverurie 1	Roadside	377403	821584	2	1.5	31.5	27.7	26.4
Inverurie 2	Background	376646	821469	46	53	10.5	8.8	10.3
Inverurie MC	Roadside	377624	821295	0	1.5	31.0	24.3	24.0
Inverurie 21 High Street	Roadside	377602	821323	0	2.3	28.2	21.6	23.1
Oldmeldrum	Kerbside	380849	827226	2	0.6	NA	17.9	19.4
Westhill	Roadside	381837	806691	10	2.4	22.4	19.0	18.8

Source: Aberdeenshire Council

Note: Bias correction of 0.81 was applied to all raw diffusion tube data for 2018.

Background Pollutants

10.3.5 Background pollutant concentrations are spatially and temporarily variable throughout the UK. Annual mean background concentrations of NO_x, NO₂ and PM₁₀ were obtained from Air Quality Scotland background maps. The background maps provide yearly forecasts based on a 1km square grid across Scotland. Appendix A10.1: Air Quality Assessment Methodology in Volume 4b provides background concentrations for each grid square within the assessment. Table 10.2 and Table 10.3 present the minimum, maximum and average concentrations across the study area.

Table 10.2 Study Area Background Concentration Data for 2017

2017								
Maximum Concentration (µg/m ³)			Minimum Concentration (µg/m ³)			Average Concentration (µg/m ³)		
NO _x	NO ₂	PM ₁₀	NO _x	NO ₂	PM ₁₀	NO _x	NO ₂	PM ₁₀
8	6	12	4	3	7	5	4	10

Table 10.3 Study Area Background Concentration Data 2030

2030								
Maximum Concentration (µg/m ³)			Minimum Concentration (µg/m ³)			Average Concentration (µg/m ³)		
NO _x	NO ₂	PM ₁₀	NO _x	NO ₂	PM ₁₀	NO _x	NO ₂	PM ₁₀
6	5	12	3	2	7	3	3	10

10.3.6 Information on current background air quality has been taken from the Scottish Air Quality background maps base year of 2017. The 2017 backgrounds used for the assessment of the 2030 opening year results are shown in Volume 4b, Appendix A10.1: Air Quality Assessment Methodology.

Sensitive Receptors

10.3.7 The number of receptors susceptible to permanent air quality effects as a result of being within 200m of the scheme, according to the guidance in HA 207/07, are shown in Table 10.4 and broken down into residential, and community/commercial education or medical groupings.

Table 10.4 Sensitive Receptors within 200m of End-to-End Option ARN Centreline

Receptor Type	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
Residential	5904	7464	6020	7594	5911	7490	6029	7603
Educational/Medical	29	33	32	35	29	33	32	35
Total	5933	7497	6052	7629	5940	7523	6061	7638

10.3.8 The highest concentrations of receptors within the study area are found in Inverurie and Kintore.

10.3.9 Professional judgement was used to identify a selection of worst-case receptors, which are included in the modelling assessment and shown in Volume 5, Figures 10.1 to 10.24.

10.3.10 Worst-case receptors were identified using GIS and AddressBase Plus data. AddressBase Plus data does not include future receptors that may be introduced to the study area during future development.

Summary

10.3.11 There are no AQMAs located throughout the study area.

10.3.12 Aberdeenshire Council diffusion tube monitoring data and Scottish Air Quality background maps data indicate that annual mean concentrations of NO₂ and PM₁₀ are well below the annual SAOQs throughout the overall study area.

10.4 Potential Impacts

10.4.1 In order to compare the performance of each end-to-end option in terms of air quality, the change in concentrations of NO₂ and PM₁₀ has been estimated at each modelled receptor. Results from the Do-Something scenarios for each end-to-end option are compared with results at the same location from the Do-Minimum scenario. Findings include:

- Beneficial impacts at sensitive receptors located adjacent to roads where traffic is predicted to decrease;
- Adverse impacts at sensitive receptors located adjacent to new roads and adjacent to existing roads where traffic is predicted to increase; and
- Beneficial or adverse impacts on regional emissions as a result of overall changes predicted in traffic emissions throughout the study area.

10.4.2 The potential risk of route options causing a significant effect (i.e. exceedance of SAQO) at a sensitive receptor is low since background concentrations of NO₂ and PM₁₀ are low (i.e. air quality throughout the study area is generally very good) and the resulting potential of either the NO₂ or PM₁₀ limit values being exceeded is also low.

10.5 Mitigation

10.5.1 The findings of this air quality assessment indicate that significant adverse effects on local air quality from the options are not anticipated. No air quality specific mitigation measures have been designed into any end-to-end options at this stage. The requirement for mitigation will be reviewed again during DMRB Stage 3 and confirmed based on the outcome of the detailed air quality assessment.

10.6 Predicted Environmental Effects

10.6.1 This section presents the predicted environmental effects of the end-to-end options on air quality.

10.6.2 The predicted effects are presented in Tables 10.5 to 10.12. These tables capture the key findings of the assessment and provide a summary of the overall significance. A more detailed description of the results and full tables showing changes in pollutant concentrations at receptors are set out in Volume 4b, Appendix A10.3: Air Quality Predicted Effects Supporting Assessment.

Local Impact

- 10.6.3 The impact of each end-to-end option has been described in terms of the magnitude of change experienced at worst-case receptor locations (refer to Volume 5, Figures 10.1 to 10.24). These receptors were selected using professional judgement and are considered to experience the most significant changes in concentrations between the Do-Minimum and Do-Something scenarios, highlighting the change, both adverse and beneficial, in pollutant concentrations.
- 10.6.4 The predicted local air quality effects of all the end-to-end options are presented in Tables 10.5 to 10.12.

Cyan Pink Violet (C-P-V)

Table 10.5 Predicted Local Air Quality Effects – C-P-V Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on C-P-V Option is 13.3µg/m³ at R91 (Thainstone, north-west of Violet). The highest concentration of PM₁₀ estimated on C-P-V Option is 15.4µg/m³ at R91 (Thainstone, north-west of Violet).</p> <p>The highest increase in NO₂ concentration is 2.8µg/m³ at R173 (Mossfield on Violet). The largest reduction in NO₂ concentrations is estimated to be -10.6µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 0.7µg/m³ at R173 (Mossfield on Violet). The largest reduction in PM₁₀ concentrations is estimated to be -2.4µg/m³ at R1 (Thainstone, North Lodge).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Cyan Pink Orange (C-P-O)

Table 10.6 Predicted Local Air Quality Effects – C-P-O Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on C-P-O Option is 21.7µg/m³ at R91 (Thainstone, south-east of Orange). The highest concentration of PM₁₀ estimated on C-P-O Option is 17.7µg/m³ at R91 (Thainstone, south-east of Orange).</p> <p>The highest increase in NO₂ concentration is 5.4µg/m³ at R91 (Thainstone, south-east of Orange). The largest reduction in NO₂ concentrations is estimated to be -10.8µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 1.3µg/m³ at R168 (Burnside of Manar on Orange). The largest reduction in PM₁₀ concentrations is estimated to be -2.1µg/m³ at R145 (High Street, Inverurie).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Cyan Brown Violet (C-Br-V)

Table 10.7 Predicted Local Air Quality Effects – C-Br-V Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on C-Br-V Option is 13.5µg/m³ at R91 (Thainstone, south of Violet). The highest concentration of PM₁₀ estimated on C-Br-V Option is 15.8µg/m³ at R91 (Thainstone, south of Violet route option).</p> <p>The highest increase in NO₂ concentration is 2.4µg/m³ at R173 (Mossfield on Violet route option). The largest reduction in NO₂ concentrations is estimated to be -10.6µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 0.5µg/m³ at R173 (Mossfield on Violet route option). The largest reduction in PM₁₀ concentrations is estimated to be -2.3µg/m³ at R1 (Thainstone, North Lodge).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Cyan Brown Orange (C-Br-O)

Table 10.8 Predicted Local Air Quality Effects – C-Br-O Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on C-Br-O Option is 21.7µg/m³ at R91 (Thainstone, south-east of Orange). The highest concentration of PM₁₀ estimated on C-Br-O Option is 17.5µg/m³ at R91 (Thainstone, south-east of Orange).</p> <p>The highest increase in NO₂ concentration is 5.3µg/m³ at R91 (Thainstone, south-east of Orange). The largest reduction in NO₂ concentrations is estimated to be -10.7µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 1.2µg/m³ at R168 (Burnside of Manar on Orange). The largest reduction in PM₁₀ concentrations is estimated to be -2.1µg/m³ at R145 (High Street, Inverurie).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Red Pink Violet (R-P-V)

Table 10.9 Predicted Local Air Quality Effects – R-P-V Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on R-P-V Option is 13.3µg/m³ at R91 (Thainstone, north-west of Violet). The highest concentration of PM₁₀ estimated on R-P-V Option is 15.4µg/m³ at R91 (Thainstone, north-west of Violet).</p> <p>The highest increase in NO₂ concentration is 3.2µg/m³ at R158 (Midtown, north of Red). The largest reduction in NO₂ concentrations is estimated to be -10.6µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 0.9µg/m³ at R158 (Midtown, north of Red). The largest reduction in PM₁₀ concentrations is estimated to be -2.4µg/m³ at R1 (Thainstone, North Lodge).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Red Pink Orange (R-P-O)

Table 10.10 Predicted Local Air Quality Effects – R-P-O Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on R-P-O Option is 21.7µg/m³ at R91 (Thainstone, south-east of Orange). The highest concentration of PM₁₀ estimated on R-P-O Option is 17.7µg/m³ at R91 (Thainstone, south-east of Orange).</p> <p>The highest increase in NO₂ concentration is 5.3µg/m³ at R91 (Thainstone, south-east of Orange). The largest reduction in NO₂ concentrations is estimated to be - 10.8µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 1.3µg/m³ at R168 (Burnside of Manar on Orange route option). The largest reduction in PM₁₀ concentrations is estimated to be - 2.1µg/m³ at R145 (High Street, Inverurie).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Red Brown Violet (R-Br-V)

Table 10.11 Predicted Local Air Quality Effects – R-Br-V Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on R-Br-V Option is 13.5µg/m³ at R91 (Thainstone, north-west of Violet). The highest concentration of PM₁₀ estimated on R-Br-V Option is 15.8µg/m³ at R91 (Thainstone, north-west of Violet).</p> <p>The highest increase in NO₂ concentration is 2.7µg/m³ at R173 (Mossfield on Violet route option). The largest reduction in NO₂ concentrations is estimated to be -10.5µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 0.6µg/m³ at R173 (Mossfield on Violet route option). The largest reduction in PM₁₀ concentrations is estimated to be -2.3µg/m³ at R1 (Thainstone, North Lodge).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Red Brown Orange (R-Br-O)

Table 10.12 Predicted Local Air Quality Effects – R-Br-O Option

Sub-topic	Predicted Effects	Significance of Predicted Effects
Human Health	<p>The highest concentration of NO₂ estimated on R-Br-O Option is 21.7µg/m³ at R91 (Thainstone, south-east of Orange). The highest concentration of PM₁₀ estimated on R-Br-O Option is 17.6µg/m³ at R91 (Thainstone, south-east of Orange).</p> <p>The highest increase in NO₂ concentration is 5.4µg/m³ at R91 (Thainstone, south-east of Orange). The largest reduction in NO₂ concentrations is estimated to be - 10.7µg/m³ at R145 (High Street, Inverurie).</p> <p>The highest increase in PM₁₀ concentration is 1.2µg/m³ at R168 (Burnside of Manar on Orange route option). The largest reduction in PM₁₀ concentrations is estimated to be - 2.1µg/m³ at R145 (High Street, Inverurie).</p>	<p>Existing and predicted NO₂ and PM₁₀ concentrations at receptors are well below the respective SAQOs.</p> <p>Air quality at sensitive receptors is predicted to result in benefits at some locations and adverse impacts at others. There are no exceedances estimated at any receptor locations. As such, residual effects at all receptors are not significant.</p>

Regional Emissions

- 10.6.5 Total mass emissions from the regional impact assessment are presented in Volume 4b, Appendix A10.3: Air Quality Predicted Effects Supporting Assessment.
- 10.6.6 Details shown highlight the absolute change in tonnes per annum per pollutant between the Do-Minimum and Do-Something scenarios for each of the end-to-end options.

Table 10.13 Predicted Regional Emissions (2030)

Pollutant (t/annum)	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
NO _x	83	84	82	85	82	83	83	85
PM ₁₀	13	13	13	13	13	13	13	13
CO ₂	86,325	87,184	84,101	88,410	85,594	86,287	85,648	87,723

Table 10.14 Predicted Regional Emissions (2045)

Pollutant (t/annum)	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
NO _x	98	96	98	97	96	95	98	97
PM ₁₀	15	16	15	16	15	16	15	16
CO ₂	103,361	104,910	101,214	103,535	102,139	104,966	102,888	104,522

- 10.6.7 Tables 10.13 and 10.14 show that the increases in the regional impacts are similar in magnitude for each of the options for the opening year (2030) and future year (2045).
- 10.6.8 It should be noted that the Emissions Factor Toolkit (v9.0) calculator used to extrapolate regional emissions has limitations in that the highest model year emission factors can be applied is for 2030.
- 10.6.9 As such, improvements in vehicle emission factors between 2030 and 2045 will not be realised in this DMRB Stage 2 Scheme Assessment Report.
- 10.6.10 The results show that there are no significant differences for regional emissions between end-to-end options in either the opening year or the future year.

10.7 Cumulative Effects

- 10.7.1 The traffic data used to inform the air quality assessment are derived from a transport model covering the A96 Dualling Programme between Inverness and Aberdeen. The projected opening year of the scheme (2030) in both the Do-Minimum and the Do-Something scenarios has taken account of future changes in land use and development areas, including projected population change and economic growth. The Do-Something assumes full dualling of the A96 throughout the Inverness to Aberdeen corridor. As these projections have already been taken into account in the prediction of the future traffic flows, which informed this air quality assessment, cumulative effects on air quality are not considered in more detail during DMRB Stage 2.
- 10.7.2 Predicted air quality effects indicate that no residual significant effects are predicted on air quality and, as such, no significant cumulative effects from any of the end-to-end options are predicted.

10.8 Summary of Effects

- 10.8.1 This section sets out a summary of the key findings of the end-to-end options assessment based on the predicted residual effects. Summaries are presented in Tables 10.15 to 10.22 with a commentary provided under each table.
- 10.8.2 The overall impact of pollution resulting from changes in traffic flow should not be considered at individual receptor locations. The impact of each end-to-end option should be considered across all receptors with focus on the overall benefit or disbenefit introduced.
- 10.8.3 With respect to PM₁₀, the impact at a small number of individual receptor locations (e.g. R91) show that concentrations are close to the annual mean SAQO (18µg/m³). However, it should be noted that the average contribution of PM₁₀ at all receptor locations is approximately 3% (0.3µg/m³) of the average background concentration (10.1µg/m³) throughout the study area.

Table 10.15 Summary of Predicted Environmental Effects –C-P-V Option

Predicted Residual Effects for C-P-V Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

C-P-V Option Summary

- 10.8.4 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for the C-P-V Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.5 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new dual carriageway. Receptors located within 200m of the end-to-end option are predicted to experience a minor deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.
- 10.8.6 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.7 Overall there are no significant air quality effects predicted for the C-P-V Option.

Table 10.16 Summary of Predicted Environmental Effects – C-P-O Option

Predicted Residual Effects for C-P-O Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

C-P-O Option Summary

- 10.8.8 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for the C-P-O Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.9 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.
- 10.8.10 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.11 Overall there are no significant air quality effects predicted for C-P-O Option.

Table 10.17 Summary of Predicted Environmental Effects – C-Br-V Option

Predicted Residual Effects for C-Br-V Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

C-Br-V Option Summary

- 10.8.12 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for the C-Br-V Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.13 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.
- 10.8.14 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.15 Overall there are no significant air quality effects predicted for C-Br-V Option.

Table 10.18 Summary of Predicted Environmental Effects – C-Br-O Option

Predicted Residual Effects for C-Br-O Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

C-Br-O Option Summary

- 10.8.16 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs for the protection of human health. There are no predicted significant effects throughout the study area for C-Br-O Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.17 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows would decrease as traffic moves onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.
- 10.8.18 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.19 Overall there are no significant air quality effects predicted for C-Br-O Option.

Table 10.19 Summary of Predicted Environmental Effects – R-P-V Option

Predicted Residual Effects for R-P-V Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

R-P-V Option Summary

- 10.8.20 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for R-P-V Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.21 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will be not significant.
- 10.8.22 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.

10.8.23 Overall there are no significant air quality effects predicted for R-P-V Option.

Table 10.20 Summary of Predicted Environmental Effects – R-P-O Option

Predicted Residual Effects for R-P-O Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

R-P-O Option Summary

10.8.24 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for R-P-O Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.

10.8.25 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.

10.8.26 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.

10.8.27 Overall there are no significant air quality effects predicted for R-P-O Option.

Table 10.21 Summary of Predicted Environmental Effects – R-Br-V Option

Predicted Residual Effects for R-Br-V Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

R-Br-V Option Summary

10.8.28 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for R-Br-V Option. All predicted changes in local air quality at the sensitive receptors included in the assessment.

10.8.29 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the end-to-end option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.

- 10.8.30 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.31 Overall there are no significant air quality effects predicted for R-Br-V Option.

Table 10.22 Summary of Predicted Environmental Effects – R-Br-O Option

Predicted Residual Effects for R-Br-O Option
Existing and predicted NO ₂ and PM ₁₀ concentrations at local sensitive human receptors are low and well below the SAQOs for the protection of human health.
The predicted residual effect on local air quality will not be significant.

R-Br-O Option Summary

- 10.8.32 All pollutant concentrations in the local air quality assessment are predicted to be well below the SAQOs with respect to the protection of human health. There are no predicted significant effects throughout the study area for R-Br-O Option. There are some non-significant predicted changes in local air quality at the sensitive receptors included in the assessment.
- 10.8.33 Receptors located along the existing A96 and within Inverurie centre will experience improvements in local air quality as traffic flows decrease with traffic moving onto the new road. Receptors located within 200m of the end-to-end option are predicted to experience a deterioration in air quality as the option introduces additional emissions from passing traffic. The impact on receptors located within 200m of the end-to-end option will not be significant.
- 10.8.34 The regional assessment shows emissions of NO_x, PM₁₀ and CO₂ in line with the magnitude of emissions contributed by all other end-to-end options.
- 10.8.35 Overall there are no significant air quality effects predicted for R-Br-O Option.

Summary

- 10.8.36 None of the end-to-end options assessed present any significant air quality impacts throughout the study area. The differences between the magnitude of change for each end-to-end option is small, the regional emissions for each end-to-end option are comparable, and the number of receptors within 200m of the ARN is also similar.
- 10.8.37 When comparing results between the Cyan and Red route options, Pink and Brown route options, and Violet and Orange route options, there are no substantial differentiators between the Cyan and Red route options or the Pink and Brown route options. When comparing the Violet and Orange route options, the Violet route option performs better based on the analysis carried out to date. End-to-end options that contain the Violet route option have significantly less receptors located within 200m of the ARN. However, this is likely as a result of end-to-end options that contain the Violet route option having a smaller ARN.
- 10.8.38 While the tables above show that end-to-end options including the Orange route option may result in a higher number of receptors experiencing an improvement in pollution, this is likely influenced by the higher number of receptors located within 200m of end-to-end options that include the Orange route option.

- 10.8.39 Considering the similarities between each end-to-end option, the limitations associated with the DMRB Stage 2 assessment, and the conclusion that there are no significant environmental impacts associated with any end-to-end option, the air quality assessment concludes that there is no Preferred Option.

10.9 Scope of DMRB Stage 3 Assessment

- 10.9.1 The air quality impact of the Preferred Option will be assessed in accordance with the New Guidance during DMRB Stage 3.
- 10.9.2 In accordance with DMRB LA 105 and IAQM Guidance on the assessment of dust from demolition and construction (2014), a qualitative risk assessment of potential dust effects during construction will be undertaken for the Preferred Option following further design development and a review of likely dust generating activities. An exercise to further identify sensitive receptors within 350 metres of these activities will also be completed.
- 10.9.3 Relevant mitigation measures to minimise the air quality impact of construction activities will be set out in the EIA Report and included within commitments for any Construction Environmental Management Plan (CEMP) and/or Dust Management Plan (DMP).
- 10.9.4 In line with updated guidance LA105, if construction activities are programmed to last less than two years in any one location it is unlikely that the construction activities would constitute a significant air quality effect or impinge on the UK's reported ability to comply with the Air Quality Directive given the short term duration of the construction activities as opposed to the long term operation of the project.
- 10.9.5 Once further details of the proposed construction programme are published, the requirement for further air quality assessment will be reviewed, with proposed approach to assessment outlined in the Stage 3 Scoping Report.
- 10.9.6 The operational impacts associated with predicted traffic flows for the Preferred Option will be determined as a result of the DMRB Stage 3 Detailed Air Quality Assessment.
- 10.9.7 The Stage 3 Air Quality Assessment will build on the detailed design information available, using updated traffic data based on the detailed design of the preferred route, noting that this is a major infrastructure development which transects low - to medium (e.g. Huntly, Inverurie) risk receiving environment. As such, in order to ensure a robust human health impact assessment a detailed assessment will be completed as part of the DMRB Stage 3 Air Quality Assessment.
- 10.9.8 It is proposed to implement an NO₂ monitoring survey at approximately 30 locations to be confirmed when the Preferred Option is determined. The implementation of an NO₂ monitoring survey will enable the dispersion model to be verified throughout the study area.

11 Noise and Vibration

11.1 Introduction

11.1.1 This chapter describes the noise and vibration assessment conducted for the scheme. It should be noted that the manner in which this chapter is reported is similar to Chapter 10, Air Quality. Both chapters consider end-to-end options as opposed to the individual route options since both assessments are based on traffic modelling which has been undertaken on an end-to-end option basis. The following sections describe the baseline noise climate, assessment methodology, results and conclusions for a 'Detailed' assessment of the scheme according to the Design Manual for Roads and Bridges (DMRB) (HD 213/11¹⁹). Potential noise effects have been considered for the operation of the end-to-end options. Outline mitigation measures are also discussed.

11.1.2 The following figures (see Volume 5) relate to this chapter:

- Figures 11.1 to 11.24: Noise Assessment Study Area and Calculation Area for all end-to-end options; and
- Figures 11.25 to 11.48: Future Year Noise Change Contours for all end-to-end options.

11.1.3 The following appendices relating to this chapter are presented in Volume 4b:

- Appendix A11.1: Glossary of Acoustic Terminology; and
- Appendix A11.2: DMRB Noise Reporting Tables.

Policy Context

The Planning Advice Noise PAN1/2011

11.1.4 The Planning Advice Note (PAN1/2011) for Scotland 'Planning and Noise'²⁰ provides advice to control the adverse effect of noise (and vibration). It promotes appropriate locations of development and mitigation methods to ensure quality of life is not unreasonably affected whilst supporting sustainable economic growth.

11.1.5 PAN1/2011 states the following may be relevant when considering noise in relation to a development proposal:

- Type of development and likelihood of significant noise impact;
- Sensitivity of location;
- Existing noise level and likely change in noise levels;
- Character (tonal, impulsivity, etc.), duration, frequency of any repetition and time of day of noise that is likely to be generated; and
- Absolute level and possible dose-response relationships e.g. health effects if robust data are available.

¹⁹ Highways Agency, 2011, *Design Manual for Roads and Bridges, HD 213/11*.

²⁰ The Scottish Government, 2011, *Planning Advice Note – Planning and Noise*.

The Technical Advice Note

- 11.1.6 The Technical Advice Note: Assessment of Noise (TAN)²¹ which supplements PAN 1/2011, aims to assist in the technical evaluation and in assessing the significance of noise impact to ensure that the quality of life is not unreasonably affected and that new developments continue to support sustainable economic growth in Scotland.
- 11.1.7 The TAN provides a framework for assessing the noise impact(s) that could potentially arise when either:
- A noise source is planned to be developed or an existing noise source is to be further developed (noise generating development); or
 - A noise sensitive development is planned, or an existing noise source is to be further developed (noise sensitive development).
- 11.1.8 The TAN also advises an assessment procedure to identify all noise sensitive receptors which are likely to be adversely affected by the development and to classify their level of sensitivity. In addition, the assessment procedure requires the magnitude of impact and level of significance at noise sensitive receptors to be determined.

Scotland's Third National Planning Framework

- 11.1.9 Scotland's Third National Planning Framework²² (NPF3) sets out a long-term vision for development and investment across Scotland over the next 20-30 years, and states that planning makes Scotland a successful, sustainable place which supports sustainable economic growth and regeneration, and the creation of well-designed places.
- 11.1.10 The noise and vibration assessment presented in this chapter takes into account NPF3, in particular, in Section 2 of the document where it refers to 'A successful, sustainable place'. Under the spatial priorities for change, under heading 2.16, it states that reducing the impact of the car on city and town centres will make a significant contribution to realising their potential as sustainable places to live, by addressing noise pollution and improving public realm.

Aberdeen City and Shire Strategic Development Plan

- 11.1.11 The Aberdeen City and Shire Strategic Development Plan²³ is a regional plan that sets out the direction for the future development of the North East, recognising the importance of improving links and connections, adding to the quality of life and providing the opportunities for high-quality sustainable growth.
- 11.1.12 The plan identifies the issue of noise pollution and congestion associated with road transport, and the need to develop sustainable solutions.

²¹ The Scottish Government, 2011, *Technical Advice Note – Assessment of Noise*.

²² The Scottish Government, *Scotland's Third National Planning Framework*, available at: <https://www.gov.scot/publications/national-planning-framework-3/>

²³ Aberdeen City and Shire Sustainable Development Plan, Aberdeen City and Shire. Accessible via <http://www.aberdeencityandshire-sdpa.gov.uk/>

Aberdeenshire Local Development Plan

- 11.1.13 The Aberdeenshire Local Development Plan (LDP) 2017²⁴ directs decision-making on all land-use planning issues and planning applications in Aberdeenshire. The LDP sets out the policies to be used by the council to assess planning applications up to 2026.
- 11.1.14 The objectives of the LDP include the promotion of sustainable mixed communities with the highest standards of design, to protect and improve assets and resources and to promote the creation of green networks within and between settlements.

11.2 Approach to Assessment

Introduction

- 11.2.1 The assessment has been undertaken in accordance with the 'Detailed' assessment within DMRB HD 213/11, supplemented with the Technical Advice Note (TAN)²¹ that supports the Scottish Government's Planning Advice Note (PAN1/2011)²⁰.

Sources of Information

- 11.2.2 The following sources of information have been used to inform this assessment:
- Ordnance Survey (OS) Terrain Contours;
 - OS MasterMap Topographic Area (including buildings, structures and ground features);
 - OS Address Base Plus data;
 - Outputs from A96 CRAM v1.4 Environmental Refined Core models (see Volume 3, Part 4, Traffic and Economic Assessment);
 - Information from the LDP;
 - OS MasterMap tiles;
 - Public Rights of Way and Core Paths; and
 - Scheme drawings.

Consultation

- 11.2.3 AmeyArup met with Environmental Health Officers of Aberdeenshire Council and Aberdeen City Council in May 2019. AmeyArup set out the proposed approach methodology for DMRB Stage 2. No concerns were raised with respect to particular sensitivity of any types or groups of receptors. AmeyArup confirmed that further liaison will be undertaken as required and at commencement of the DMRB Stage 3 process.
- 11.2.4 AmeyArup met with the Environment and Sustainability Branch representative of Transport Scotland to discuss the recently released DMRB – Sustainability &

²⁴ Aberdeenshire Council, *The Aberdeenshire Local Development Plan 2017*, available at: <https://www.aberdeenshire.gov.uk/planning/plans-and-policies/aberdeenshire-local-development-plan-2017/>

Environment Appraisal – LA 111 Noise and Vibration²⁵. Based on these discussions, AmeyArup has carried out the assessment presented in this report, according to the DMRB HD 213/11 version.

- 11.2.5 It should be noted that the recently released DMRB GG101²⁶ (under the 'Implementation' section), makes provision for schemes that are in progress during the transition from HD213/11 to LA 111.

Assessment Methodology

Study Area

- 11.2.6 The study areas for this noise assessment, as shown in Volume 5, Figure 11.1 to Figure 11.24 were determined in accordance with DMRB HD 213/11 according to the following steps:
- Identify the start and end points of the physical works associated with the road project;
 - Identify the existing routes that are being bypassed or improved, and any proposed new routes, between the start and end points;
 - Define a boundary one kilometre from the carriageway edge of the routes identified in (b);
 - Define a boundary 600m from the carriageway edge around each of the routes identified in (b) above and also 600m from any other affected routes within the boundary defined in (c) above. The total area within these 600m boundaries is termed the 'calculation area'. An affected route is where there is the possibility of a change of 1dBL_{A10,18h} or more in the short-term or 3dBL_{A10,18h} or more in the long-term;
 - Identify any affected routes beyond the boundary defined in (c); and
 - Define a boundary 50m from the carriageway edge of the routes identified in (e) above.
- 11.2.7 The calculation area is the area for which detailed quantitative calculations are made.
- 11.2.8 It is acknowledged in DMRB HD 213/11 that a reduced study area may be necessary dependent on the extent of the traffic model.
- 11.2.9 Changes to the noise levels within the study areas of other schemes of the A96 Dualling Programme will be considered within the assessments of those schemes. Receptors adjacent to affected roads in areas outside the study area but adjacent to the East of Huntly to Aberdeen section will be considered within DMRB Stage 3.

²⁵ *Design Manual for Roads and Bridges - Sustainability & Environment Appraisal LA111 Noise and Vibration (formerly HD 213/11, IAN 185/15), Revision 0, November 2019.*

²⁶ *Design Manual for Roads and Bridges – General Principles and Scheme Governance. General Information. GG101 Introduction to the Design Manual for Roads and Bridges (formerly GD 01/15) Revision 0, June 2018.*

Approach to Identification of Baseline Conditions

- 11.2.10 Noise or vibration sensitive locations have been identified for inclusion in the assessment (see Table 11.1). Baseline noise surveys have not been carried out as part of this assessment. Baseline noise surveying will be completed as part of the DMRB Stage 3 assessment.
- 11.2.11 The future baseline noise conditions for the operational traffic assessment have been determined by the Calculation of Road Traffic Noise²⁷ (CRTN) prediction model for a forecast traffic scenario immediately prior to construction. This has provided a detailed coverage of results across the entire calculation area.
- 11.2.12 DMRB states that this is the preferred approach for establishing baseline noise conditions, which are then directly comparable with the noise levels predicted in the same way for future assessment years.

Methodology for Determining Operational Impacts

- 11.2.13 Geographical Information Systems (GIS) have been used to construct a topographically accurate 3-dimensional noise model of the calculation area for each end-to-end option. The model includes terrain data, buildings and other structures that might screen or reflect noise, ground cover types and roads.
- 11.2.14 For each road in the model, data on traffic flow, speed, proportion of heavy goods vehicles (HGVs) and road surface type were obtained for inclusion into the model. Noise level calculations according to CRTN were carried out using proprietary noise modelling software. Traffic noise levels were calculated across a grid of receptor positions over the calculation area, and contours of noise level exposure were established to allow contour maps to be compiled for different scenarios.
- 11.2.15 For receptors with a façade, the assessment has included calculations of noise changes on the building façades facing the scheme. For outdoor receptors that are not buildings and are located in open space e.g. Public Rights of Way (PRoW) a free-field²⁸ value is used for the assessment. This is considered appropriate to allow comparison of different end-to-end options.
- 11.2.16 The traffic data used in the model were those forecast under the 'Do-Something' and 'Do-Minimum' scenarios both in the baseline year²⁹ (2030) and those in the future assessment year, i.e. the year of maximum projected traffic flow within 15 years of opening – in this case, the future year (2045). The traffic data were included in the noise model to produce predictions for the following scenarios:
- 'Do-Minimum' (without the Scheme) in the baseline year (2030);
 - 'Do-Something' (with the Scheme) in the baseline year (2030);
 - 'Do-Minimum' (without the Scheme) in the future assessment year (2045); and
 - 'Do-Something' (with the Scheme) in the future assessment year (2045).

²⁷ Department of Transport Welsh Office, 1988, *Calculation of Road Traffic Noise*.

²⁸ Free-field a sound pressure level away from reflective surfaces other than the ground. This is contrary to façade level which is a sound pressure level 1m in front of a façade.

²⁹ HD 213/11 Para 3.8 notes that: 'For an assessment of permanent noise and vibration impacts, the baseline year is taken as the opening year of the road project.'

- 11.2.17 The DMRB Detailed Assessment considers the following scenarios:
- Do-Minimum scenario in the 2030 baseline year, against the Do-Minimum scenario in the future year 2045;
 - Do-Minimum scenario in the 2030 baseline year, against the Do-Something scenario in the baseline year 2030; and
 - Do-Minimum scenario in the 2030 baseline year, against the Do-Something scenario in the future year 2045.
- 11.2.18 The study area and DMRB calculation area are defined in Paragraphs 11.2.6 and 11.2.7 respectively.
- 11.2.19 The prediction model was used to calculate noise levels at single receptors within the calculation area, at an appropriate height above local ground level, as described in DMRB. The contour maps are calculated at a height of 4m. The model calculates the $L_{A10,18h}$ index in accordance with CRTN methodology, as required by DMRB, for each of the three traffic modelling scenarios listed above.
- 11.2.20 The $L_{A10,18h}$ daytime is calculated as a façade level, except for outdoor spaces e.g. PRoW, for which a $L_{A10,18h}$ free-field level is calculated.
- 11.2.21 The $L_{A10,18h}$ index represents the arithmetic mean of all the hourly values of L_{A10} during the period between the hours of 06:00 and 24:00. The CRTN procedure is based upon empirical data with a slightly positive wind vector component blowing downwind from source to receptor. The CRTN prediction, therefore, assumes an adverse wind component to represent a typical worst-case scenario. The additional advice given in HD 213/11 has been adopted regarding CRTN procedures. These include revisions to vehicle classification, traffic data and corrections due to road surface.
- 11.2.22 As part of the procedure for a Detailed Assessment, the DMRB requires that the magnitude of the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the assessed roads. The magnitude scale is described in more detail in Paragraph 11.2.31.

Night-time Noise

- 11.2.23 The DMRB Detailed Assessment describes a procedure to consider night-time noise associated with the assessed roads. The L_{night} descriptor is used to represent the noise level at residential receptors between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report 'Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping'³⁰ was used for predicting L_{night} noise levels. Method 3 uses daily traffic flow data converting predicted daytime noise levels ($L_{A10,18h}$) to night-time noise levels. This method is appropriate as there is nothing considered to be unusual in the proportionate traffic flow volumes for the assessed roads between daytime and night-time.
- 11.2.24 The assessment of impact magnitude for night-time noise follows the same method as that for daytime. Additionally, the assessment of impacts during the night is based upon the change in noise levels only at the sensitive receptors which are predicted to exceed 55dB during the night in any scenario.

³⁰ Abbott, PG & Nelson PM, 2002, PR/SE/451/02, *Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping.*

Approach to Assessment of Effects – All Sources and Receptors

11.2.25 The method for identifying significant effects of noise and vibration from the operation of the assessed roads draws on best practice from other infrastructure projects and is aligned with the DMRB and with reference to the guidance in the Scottish Government's noise policy.

11.2.26 Table 11.1 shows the level of sensitivity associated with examples of noise sensitive receptors as defined in TAN.

Table 11.1 Level of Sensitivity and Associated Example Noise Sensitive Receptors as Defined in the Technical Advice Note: Technical Advice Note (TAN)

Sensitivity	Description	Receptor Type
High	Receptors where people or operations are particularly susceptible to noise	Residential (including private gardens where appropriate), theatres, auditoria, studios, schools, hospitals, places of worship, residential care homes, conference facilities, quiet outdoor areas used for recreation.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices, bars, cafes, restaurants, sports grounds (where spectator noise is not a normal part of the event (e.g. tennis, golf, bowls))
Low	Receptors where distraction or disturbance from noise is minimal	Factories and working environments with existing high noise levels, sports grounds when spectator noise is a normal part of the event, night clubs

11.2.27 DMRB HD 213/11 defines examples of noise and vibration sensitive receptors as residential receptors, hospitals, schools, community facilities, designated areas and PRoW.

11.2.28 The assessment approach considers a range of receptors and effects on the following types of receptor:

- Residential receptors;
- Non-residential noise sensitive receptors;
- Candidate Noise Management Areas; and
- Future development³¹.

11.2.29 For the purposes of this assessment, residential receptors are considered to be of high sensitivity.

³¹ Information on future developments based on information provided by Aberdeenshire Council.

Operational Noise Assessment Criteria

11.2.30 Assessment criteria have been established that consider the requirements of:

- Government policy set out in TAN and PAN 1/2011;
- DMRB HD 213/11;
- Relevant regulations, guidance and standards; and
- Best practice as set by previous relevant projects including other schemes as part of the A96 Dualling project.

11.2.31 DMRB HD 213/11 provides a basis for evaluating the magnitude of impact and effect caused by noise change both in the short-term and long-term. These can be seen in Table 11.2 and Table 11.3 respectively. For the purposes of this assessment, this methodology has been applied for residential and non-residential receptors.

Table 11.2 Classification of Magnitude of Noise Impact in the Short-term under DMRB

Noise Change (dB(A))	Magnitude of Impact in the Short-term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 11.3 Classification of Magnitude of Noise Impact in the Long-term under DMRB

Noise Change (dB(A))	Magnitude of Impact in the Long-term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

11.2.32 This assessment has considered changes in noise levels in the short and the long-term. A minor impact (1dB or greater in the short-term, or 3dB or greater in the long term) is taken as an indicator of a potential significant effect.

11.2.33 Whilst DMRB HD 213/11 does not advocate the use of absolute noise levels as a means of assessing noise impact or effects on receptors, the Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment³² notes that relying solely on noise change may not always be appropriate.

³² Institute of Environmental Management and Assessment, 2014, *Guidelines for Environmental Noise Impact Assessment*.

- 11.2.34 The determination of significance of effects will be undertaken in future stages when a Preferred Option is selected.

Assumptions and Limitations

New Guidance

- 11.2.35 An update to the Noise and Vibration DMRB HD 213/11 (hereafter referred to as the 'Withdrawn Guidance') has been released in November 2019 and further updated in May 2020 entitled 'DMRB – Sustainability & Environment Appraisal – LA 111 Noise and Vibration (hereafter referred to as the 'New Guidance')'.
- 11.2.36 The A96 Dualling East of Huntly to Aberdeen Stage 2 Scheme Assessment Report had commenced prior to the release of the New Guidance. . It is noted in the GG101 that the LA 111 standard should be implemented except where the project reaches a stage in which the use of the new (or revised) DMRB document would result in significant additional expense or delay.
- 11.2.37 AmeyArup met with the Environment and Sustainability Branch representative of Transport Scotland to discuss the impact of using the New Guidance. Based on these discussions, AmeyArup has carried out the assessment presented in this chapter, according to the Withdrawn Guidance.
- 11.2.38 If the assessment was undertaken using the moderate and major noise change bands (which are those identified by LA 111 as significant effects), the results of the Preferred Route Option from a noise perspective would have been the same. The main conclusions of the assessment to select a Preferred Option, therefore, would not change if the New Guidance is implemented. The following Paragraphs 11.2.39 to 11.2.49 explain the reasons why and outline the key differences between the Withdrawn Guidance and New Guidance.
- 11.2.39 The New Guidance clearly differentiates the assessment methodologies for construction noise, construction vibration and operational noise. These assessment methodologies are structured by scoping, defining study areas, description of baseline, determining significance and design & mitigation. It is noted that construction noise assessment was scoped out at this optioneering stage of the project.
- 11.2.40 The New Guidance states that the level of detail is to be proportionate to the quality of input information available, which is somewhat different to the distinct levels of assessment: scope, simple and detail assessment level of the Withdrawn Guidance.
- 11.2.41 Generally, the New Guidance provides a more detailed methodology as to how to identify, assess and determine significance of noise and vibration effects arising from the construction and operation of a road scheme. The New Guidance also introduces more flexibility to define the study area based on stakeholder expectations of where impacts might occur. DMRB GG 101 also states that qualified professionals are expected to apply their own skill and judgement when making decisions involving the information that the DMRB contains.

Effects of the New Guidance

- 11.2.42 The New Guidance clearly differentiates the assessment methodologies for construction noise, construction vibration and operational noise. These assessment methodologies are structured by scoping, defining study areas, description of baseline, determining significance and design & mitigation. It is noted

that construction noise assessment was scoped out at this optioneering stage of the project.

- 11.2.43 The New Guidance states that the level of detail is to be proportionate to the quality of input information available, which is somewhat different to the distinct levels of assessment: scope, simple and detail assessment level of the Withdrawn Guidance.
- 11.2.44 Generally, the New Guidance provides a more detailed methodology as to how to identify, assess and determine significance of noise and vibration effects arising from the construction and operation of a road scheme. The New Guidance also introduces more flexibility to define the study area based on stakeholder expectations of where impacts might occur. DMRB GG 101 also states that qualified professionals are expected to apply their own skill and judgement when making decisions involving the information that the DMRB contains.
- 11.2.45 The noise and vibration potential effects of the Preferred Option will be assessed in accordance with the New Guidance for DMRB Stage 3.
- 11.2.46 The New Guidance provides information about how to assess impacts for construction and operation of the scheme.
- 11.2.47 The construction noise assessment will be undertaken to identify potential significant effects at sensitive receptors following the New Guidance which refers to BS5228³³ methodologies. The New Guidance will also be used to identify likely significant effects for the operational noise assessment.
- 11.2.48 The construction and operational assessment will be supplemented by the information obtained from the environmental sound level survey.
- 11.2.49 The New Guidance also provides more information regarding mitigation measures and states that these are to be identified and costs of installation and maintenance determined. Potential sustainable mitigation measures, including potential qualification for Noise Insulation (Scotland) Regulations, will be assessed for both construction and operation of the Preferred Option.

Other Assumptions and Limitations

- 11.2.50 The effects of noise from the operation of the assessed roads have been assessed based on traffic modelling and 3D mapping information for the road network and surrounding terrain. Other developments may affect the predicted traffic using the scheme and these have, as far as possible, been included within the traffic data on the basis of the assumed dates for committed developments to be operational.
- 11.2.51 The assessment does not identify individual properties potentially eligible for noise insulation.
- 11.2.52 The baseline assessment is based solely on modelled predictions which have not been supplemented with noise survey data. It is noted that modelled predictions are the preferred method as defined in DMRB HD 213/11.
- 11.2.53 The assessment has not included a detailed appraisal of potential noise mitigation measures.
- 11.2.54 Construction noise and vibration is excluded from this comparative exercise due to the amount of information available at this stage.

³³ British Standards Institution, 2014, *BS 5228 Parts 1 and 2, 2009+A1:2014, Code of practice for noise and vibration control on construction and open sites.*

- 11.2.55 The generation of 'speed-bands' in accordance with IAN 185/15 has not been undertaken, although this does not affect the comparison of the noise impacts of the assessed roads.
- 11.2.56 For the purposes of this comparative assessment, it has been assumed that all existing roads have a Hot Rolled Asphalt Surface Course and all new roads are assumed to have a low noise surface.
- 11.2.57 There would be regular planned maintenance work along the new roads. Although this has not been assessed quantitatively, given the infrequent, irregular and short duration of works likely to cause appreciable noise or vibration, maintenance work is considered unlikely to generate significant noise or vibration effects.
- 11.2.58 For the purposes of this comparative study of the end-to-end options, the noise modelling is considered adequate to quantify the noise exposure and associated impacts across the calculation area.
- 11.2.59 Other transportation noise sources such as railway or aircraft noise have not been included in this assessment.

11.3 Baseline

- 11.3.1 Baseline information is extracted from a combination of desktop studies and the prediction of road traffic noise using the traffic flows of the baseline 2030 year.
- 11.3.2 The desktop study includes the investigation of the site using aerial imagery in GIS and the information given in this section of the report.
- 11.3.3 The receptors which are assessed, include residential receptors, hospitals, schools and educational buildings, among others.
- 11.3.4 The calculation area contains approximately 10,000 residential receptors and approximately 120 non-residential receptors. The calculation areas can be seen on Figures 11.1 to 11.24 (Volume 5) Noise Assessment Study Area and Calculation Area for all end-to-end options. For the majority of the calculation area, existing noise levels are considered to be dominated by road traffic noise from the existing A96 and immediate road network.
- 11.3.5 The following description of the baseline study area is based upon the alignment of the existing A96 and the end-to-end options.

Existing

East of Huntly to Colpy

- 11.3.6 The existing A96 between East of Huntly and Colpy is single carriageway. Climbing lanes are present between East of Huntly and Bainshole, serving traffic in both directions of travel.
- 11.3.7 The study area extends into the east part of the town of Huntly which includes a mix of dwellings and non-residential buildings.
- 11.3.8 To the east of Huntly, the existing A96 is surrounded by agricultural land, farms and isolated dwellings. The road continues through Bainshole where there are farms and isolated/small groups of dwellings. As the road passes through Skares, there are further isolated dwellings. Between Skares and Kirkton of Culsalmond lies Morgan McVeighs restaurant and isolated/small groups of dwellings. In Kirkton of Culsalmond, there is a community centre (Culsalmond Community Education Centre) and a dwelling. At Colpy, there is a small community of dwellings.

Colpy to Drimmies

- 11.3.9 Between Colpy and Drimmies, the existing A96 is single carriageway.
- 11.3.10 Between Colpy and Old Rayne, there are isolated/small groups of dwellings, a cattery, Kellockbank (a café and shop), and a farm. At Pitmachie, there is a small group of dwellings, offices and other non-residential buildings. At Old Rayne, there is a community of dwellings and a school (Old Rayne Primary School). Between Old Rayne and Pitcaple, there are isolated/small groups of dwellings and the Woods of Logie. At Pitcaple, there is a small community of dwellings and some non-residential properties. To the north of Pitcaple and the existing A96, there is a community of dwellings at Whiteford. Between Pitcaple and Drimmies, there are isolated/small groups of dwellings.

Drimmies to Port Elphinstone Roundabout

- 11.3.11 Between Drimmies and Port Elphinstone roundabout, the existing A96 is single carriageway. There are two roundabouts, one at Inverurie (Blackhall roundabout) and at Port Elphinstone (Inverurie roundabout).
- 11.3.12 Between Drimmies and Port Elphinstone roundabout, there is the town of Inverurie with a large community of dwellings and non-residential properties. Between Inverurie and Port Elphinstone, the existing A96 passes over the River Don. At Port Elphinstone, there is a medium sized community of residential properties and non-residential properties.
- 11.3.13 There is one Candidate Noise Management Area (CNMA) in this section of the existing A96 corridor (see Paragraph 11.4.59), located south of Port Elphinstone on the B993 road³⁴.

Port Elphinstone Roundabout to Gauchhill Junction

- 11.3.14 To the east of Port Elphinstone roundabout, the existing A96 is a dual carriageway. There is also a roundabout at Thainstone.
- 11.3.15 Between Port Elphinstone and Gauchhill Junction, there is a mix of residential dwellings and non-residential properties along the existing A96. The town of Kintore, with a large community of dwellings and non-residential properties, is located near to Gauchhill Junction.

Proposed

East of Huntly to Colpy

Cyan Route Option

- 11.3.16 To the east of Huntly, the Cyan route option broadly follows the existing A96 deviating across farmland to the west at West Adamston, to the south of Hillhead and then passing across the existing A96 at Broom Hill before returning south until the area of Skares where the Cyan route option runs to the north of the existing A96. The Cyan route option continues around the Hill of Skares before crossing the existing A96 around Waulkmill continuing south on the western side of Colpy.
- 11.3.17 The closest sensitive receptors located near the Cyan route option are small scattered communities along the route option such as the communities in

³⁴ Round Three of the Candidate Noise Management Areas. Reported on 18 January 2019, available at: <https://noise.environment.gov.scot/pdf/RoundThree/Transportation/Transportation%20CNMA%20Road.pdf>

Thomastown, Hillhead, Bainshole, Glens of Foudland, Skares, Kirkton of Culsalmond and Colpy.

Red Route Option

- 11.3.18 The Red route option follows the same alignment as the Cyan route option from the east of Huntly, as described in Paragraph 11.3.16, following the existing A96 up to West Adamston. It then passes to west of the existing A96 through farmland at Ramstone Hill, passing between Cot Hill and Saddle Hill, before continuing to the south of Clinkstone, north of Newton and then south of Bog, Mid Bog and East Bog.
- 11.3.19 The Red route option continues on the southern slope of the Hill of Skares, north of Jericho, to the west of Colpy.
- 11.3.20 The closest sensitive receptors located near the Red route option are small scattered communities and farmhouses along the route option such as communities in Thomastown, Hillhead, Bainshole, Glens of Foudland, Skares, Kirkton of Culsalmond and Colpy.

Colpy to Pitcaple

Pink Route Option

- 11.3.21 The Pink route option runs from the east of Colpy across farmland and the existing A96 until it crosses the A96 to the south of Mains of Williamston. The route option then crosses Lawrence Road between Glenniston Croft and Saint Cloud continuing south across farmland before crossing Lawrence Road and over Bonnyton Burn to the south of Mill of Bonnyton.
- 11.3.22 The Pink route option passes Old Rayne community and continues over farmland passing to the north of Newton of Lewesk, south of East Law, north of Gallows Hill, south of Woodend before crossing the Burn of Durno.
- 11.3.23 The closest sensitive receptors located near the Pink route option are small communities along the route such as communities in Bonnyton and Durno. There are other residential receptors in the vicinity of Pitmachie, Westhall, Pitcaple and Whiteford which are located adjacent to the existing A96.

Brown Route Option

- 11.3.24 The Brown route option runs from the south of Colpy and the existing A96 passing to the west of Little Lediken, south of Mill of Newton and north of East Lediken. The Brown route option continues to the west of the existing A96 over The Shevock watercourse and west of Pitmachie continuing south-east crossing the existing A96 north of Carden Farm and Moor of Carden before crossing the River Urie.
- 11.3.25 The Brown route option continues across farmland to the north of Old Logie Cottages, south of Logie Durno Farm and east on the southern side of Gallows Hill running to the north of Bridgend before crossing the Burn of Durno to the south of Woodend.
- 11.3.26 The closest sensitive receptors located near the Brown route option are scattered farmhouses, small/medium communities with non-residential receptors including a school and village hall along the route. Some of the communities include Pitmachie, Westhall, Durno and Whiteford. The residential receptors in Pitmachie, Westhall, Pitcaple and Whiteford are located adjacent to the existing A96.

Pitcaple to Kintore

Violet Route Option

- 11.3.27 The Violet route option runs eastwards from the Burn of Durno across farmland passing between Mossfield and Mackstead then south of Broadward before turning south and crossing the B9001 continuing west of Hillhead of Lethenty. This route option, beyond the eastern side of the Inverurie community, continues south crossing Ides Burn before heading south-east crossing Lochter Burn passing to the south of Hillcrest, Hillbrae and along the southern slope of Hill of Selbie.
- 11.3.28 The Violet route option continues south of Ordiefauld crossing the B993 at Eastfield then passes between Isaacstown and Ashlea Grange and then east of Altons.
- 11.3.29 The Violet route option continues south across farmland passing between Hogholm and Heatherwick over Densy Burn before turning south-east. The route option then crosses the River Don and railway line before joining the existing A96 to the north of Tavelty Farm, north of the larger community of Kintore.
- 11.3.30 The closest sensitive receptors located near the Violet route option are scattered dwellings, farmhouses and small/medium sized communities along the route option such as communities in Balhalgardy and Hillbrae. There is a relatively large number of residential and non-residential receptors in the town of Inverurie and Kintore. These receptors are located adjacent to the affected roads associated with the Violet route option.

Orange Route Option

- 11.3.31 The Orange route option runs eastwards from the Burn of Durno then turns south passing east of Mill Wood and west of Legatesden Farm then crosses the River Urie, the existing A96 and Aberdeen to Inverness railway line.
- 11.3.32 The Orange route option continues south, running to the west of the existing A96 and west of Milton of Inveramsay, Mill of Inveramsay and Drimmies Cottages before continuing over farmland to the west of Dilly Hill passing between Alton and Dubston to the west of the larger Inverurie community.
- 11.3.33 The Orange route option continues south-east of Newseat then crosses the River Don at Roquharold Hill before passing around the northern slope of Shaw Hill, south of Crichie and north-east of Thainstone House before joining the existing A96.
- 11.3.34 The closest sensitive receptors located near the Orange route option are small communities along the route option. There are a large number of residential and non-residential receptors to the west of Inverurie and Port Elphinstone. These residential and non-residential receptors to the west of Inverurie and Kintore are located adjacent to affected roads which connect to the Orange route option.

11.4 Assessment

- 11.4.1 This section presents the findings of the assessment of the noise and vibration effects of the various options. There are two potential route options in each geographical section, combining to make eight potential end-to-end options. The assessment is undertaken as follows:

- East of Huntly to Colpy: Cyan route option compared to Red route option;
- Colpy to Pitcaple: Pink route option compared to Brown route option; and

- Pitcapple to Kintore: Violet route option compared to Orange route option.
- 11.4.2 The comparison between each route option has been undertaken using the eight end-to-end options, which are presented below:
- Cyan-Pink-Violet (C-P-V);
 - Cyan-Pink-Orange (C-P-O);
 - Cyan-Brown-Violet (C-Br-V);
 - Cyan-Brown-Orange (C-Br-O);
 - Red-Pink-Violet (R-P-V);
 - Red-Pink-Orange (R-P-O);
 - Red-Brown-Violet (R-Br-V); and
 - Red-Brown-Orange (R-Br-O);
- 11.4.3 The following figures (see Volume 5) comply with the DMRB methodology and support the assessment:
- Figures 11.1 to 11.24: Noise Assessment Study Area and Calculation Area for all end-to-end options; and
 - Figures 11.25 to 11.48: Future Year Noise Change Contours for all end-to-end options, which are the contour maps resulting from the long-term assessment.
- 11.4.4 Additionally, the following tables are also presented in Volume 4b, Appendix A11.2 for each of the route options and each of the end-to-end options assessed for both residential and non-residential receptors:
- Appendix A11.2: For the Do-Something 2030 compared to Do-Minimum 2030 scenario in the daytime short-term, refer to Table 1.1, Table 1.10 and Table 1.19;
 - Appendix A11.2: For the Do-Something 2045 compared to Do-Minimum 2030 scenario in the daytime long-term, refer to Table 1.3, Table 1.12 and Table 1.21;
 - Appendix A11.2: For the Do-Minimum 2045 compared to Do-Minimum 2030 in the daytime long-term, refer to Table 1.5, Table 1.14 and Table 1.23;
 - Appendix A11.2: For the Do-Something 2045 compared to Do-Minimum 2030 scenario in the night-time long-term, refer to Table 1.7, Table 1.16 and Table 1.25; and
 - Appendix A11.2 For the Nuisance tables of the Do-Something 2045 compared to Do-Minimum 2030, refer to Table 1.9, Table 1.18 and Table 1.27 Nuisance.
- 11.4.5 To allow a direct comparison between each of the route options, the main findings of the assessment are summarised in Tables 11.4 to 11.9, which shows the number of dwellings falling within the three highest DMRB impact category bands (minor, moderate and major). The summary tables therefore present the receptors predicted to be most impacted, either positively or negatively.

- 11.4.6 Consideration is given to the daytime results in the short and long-term for residential and non-residential receptors. Consideration is also given to the results during the night-time in the long-term for residential receptors. Nuisance impacts upon residential receptors are reported as per DMRB. Future receptors are also considered.
- 11.4.7 This summary should be read in conjunction with the tables in Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b).

East of Huntly to Colpy

Residential Receptors

Daytime

- 11.4.8 Table 11.4 presents the total numbers of receptors in the daytime experiencing minor adverse impacts in either the short or long-term, and the total number of receptors experiencing a moderate or major adverse noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b). The table gives the total number of residential receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.4 Summary of Adverse Daytime Noise Impacts at Residential Receptors – East of Huntly to Colpy

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor adverse noise increase	13	18	19	20	17	19	14	17
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) adverse noise increase	10	11	8	8	27	26	29	28

- 11.4.9 The results indicate that there are more adverse impacts at the receptors affected by the end-to-end options containing the Red route option than for those end-to-end options containing the Cyan route option. This is particularly true for the moderate and major increase bands. For the minor increase bands, the results are generally similar.
- 11.4.10 All the receptors identified in Table 11.4 have a potential adverse significant effect.
- 11.4.11 Table 11.5 presents the total numbers of receptors in the daytime experiencing minor beneficial impact in either the short or long-term, and the total number of receptors experiencing a moderate or major beneficial noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b). The table gives the total number of residential receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.5 Summary of Beneficial Noise Daytime Impacts at Residential Receptors - East of Huntly to Colpy

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Bf-V	C-Bf-O	R-P-V	R-P-O	R-Bf-V	R-Bf-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor beneficial noise decrease	25	18	19	24	10	12	19	17
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) beneficial noise decrease	33	40	34	34	46	44	36	39

11.4.12 Table 11.5 indicates all the end-to-end options have generally comparable results. The end-to-end options containing the Cyan route option have a slightly higher number of residential receptors experiencing a noise decrease across all category bands, although it is noted the difference is small.

Night-time

11.4.13 For the results of the long term night-time assessment (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b), the predicted noise increases for all the end-to-end options result in negligible change at residential receptors when comparing Do-Minimum 2030 to Do-Something 2045. In terms of noise decreases, the results of all the end-to-end options are comparable.

11.4.14 For the comparison of Do-Minimum 2030 against Do-Minimum 2045 in the night-time, the results show that there are no increases or decreases for any of the end-to-end options as all receptors fall into the negligible category band.

11.4.15 It is noted that only the receptors predicted to experience levels higher than 55dB are used in the assessment of the night-time.

Do-Minimum Comparison

11.4.16 The comparison between the Do-Minimum 2030 and the Do-Minimum 2045 (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) during the daytime indicates that there are no substantial increases or decreases for any of the end-to-end options.

Non-residential Receptors

11.4.17 The short and long-term adverse impacts assessed at the identified non-residential receptors, result in negligible changes for all end-to-end options (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b).

11.4.18 With regards to noise decreases, all end-to-end options have the potential to give rise to beneficial impacts upon a community hall near Rothmaise West and upon a PRoW in Colpy.

Nuisance

- 11.4.19 The table of nuisance (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) indicates that for the comparison between the Do-Minimum 2030 and the Do-Minimum 2045, most of the changes fall into the '<10% nuisance band'.
- 11.4.20 In the long-term assessment for the Do-Minimum 2030 compared to Do-Something 2045, the end-to-end options containing the Red route option appear to have slightly more increase in nuisance level for the 10<20%, 20<30%, 30<40% and >40% bands. For the decrease in nuisance level, the results of all end-to-end options are similar and there is no clear differentiator.

Future Developments

- 11.4.21 There are a number of future receptors³⁵ within LDP future development proposals with the potential to be affected by the assessed roads. The future receptors include LDP opportunity sites, protected reserve land as well as planning applications for residential dwellings and education facilities.
- 11.4.22 All the end-to-end options containing either Red route option or Cyan route option, have the potential to give rise to impacts upon the same number of future development allocations within the LDP, as they are all within the same calculation areas. Therefore, the impact upon the future receptors is not a differentiator. The end-to-end options containing the Red route option run closer to a planned school in Overton, Bainshole (Huntly) and may, therefore, have more potential to give rise to adverse impacts than the end-to-end options containing the Cyan route option.

Summary: East of Huntly to Colpy

- 11.4.23 The results of the noise assessment for the East of Huntly to Colpy geographical section show that the end-to-end options containing the Cyan route option generally perform better than those end-to-end options with a Red route option.
- 11.4.24 For residential receptors, there are more predicted adverse impacts for the end-to-end options containing the Red route option, and also there are more predicted beneficial impacts for the end-to-end options with the Cyan route option.
- 11.4.25 There are also more residential receptors with an increase in nuisance level caused by the end-to-end options containing the Red route option than those with the Cyan route option.
- 11.4.26 The noise assessment in the East of Huntly to Colpy geographical section has reported the potential significant effects upon the receptors presented in Table 11.4 and Table 11.5.

Colpy to Pitcaple

Residential Receptors

Daytime

- 11.4.27 Table 11.6 presents the total numbers of receptors in the daytime experiencing minor adverse impacts in either the short or long-term, and the total number of receptors experiencing a moderate or major adverse noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b. The table gives the total number of residential

³⁵ Future receptors are those which do not currently exist but are identified within an LDP.

receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.6 Summary of Adverse Daytime Noise Impacts at Residential Receptors – Colpy to Pitcaple

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor adverse noise increase	28	35	148	143	32	38	157	141
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) adverse noise increase	84	108	62	113	85	108	71	119

11.4.28 Table 11.6 shows that overall, the predicted adverse impacts are larger for the end-to-end options containing the Brown route option than for those end-to-end options containing the Pink route option. The difference in the number of receptors subject to adverse impacts across all the end-to-end options in Table 11.6, is partly due to the difference in their calculation areas. These have been calculated in line with DMRB as described in Paragraph 11.2.7.

11.4.29 All the receptors identified in Table 11.6 have a potential adverse significant effect.

11.4.30 Table 11.7 presents the total numbers of receptors in the daytime experiencing a minor beneficial impact in either the short or long-term, and the total number of receptors experiencing a moderate or major beneficial noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b. The table gives the total number of residential receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.7 Summary of Beneficial Daytime Noise Impacts at Residential Receptors – Colpy to Pitcaple

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor noise decrease	95	80	36	83	93	82	33	81
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) beneficial noise decrease	119	149	43	68	120	157	42	68

11.4.31 Table 11.7 shows that the end-to-end options containing the Pink route option have substantially more beneficial impacts, than the end-to-end options containing the Brown route option. This is true for the moderate and major bands. For the minor bands, the results are closer for certain end-to-end options.

Night-time

11.4.32 The results for the long term night-time assessment of Do-Minimum 2030 and Do-Something 2045 (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b), show the noise increase results are negligible for all the end-to-end options. The noise decreases caused by the end-to-end options containing the Brown route option appear to be larger than those containing the Pink route option.

11.4.33 For the comparison of Do-Minimum 2030 against Do-Minimum 2045 in the night-time, the results show that there are no increases or decreases for any of the end-to-end options as all receptors fall into the negligible category band.

11.4.34 It is noted that only the receptors predicted to experience levels higher than 55dB are used in the assessment of the night-time.

Do-Minimum Comparison

11.4.35 The comparison between the Do-Minimum 2030 and the Do-Minimum 2045 during the daytime (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) indicates that there are no substantial increases or decreases for any of the assessed end-to-end options.

Non-residential Receptors

11.4.36 For non-residential receptors, in both the short and long-term there are more adverse impacts caused by the end-to-end options containing the Brown route option and slightly more beneficial impacts caused by the end-to-end options containing the Pink route option (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b).

11.4.37 In the short-term, the non-residential receptors adversely affected by the end-to-end options containing the Brown route option include community facilities, children's nurseries, two primary schools, a hotel and various PRoW. In the long-term, the adversely affected receptors include community facilities, a children's nursery and various PRoW.

11.4.38 The non-residential receptors beneficially affected by the end-to-end options containing the Brown route option in both short and long-term are one PRoW and a mausoleum.

11.4.39 For the end-to-end options containing the Pink route option, there are potential adverse impacts in the short-term upon a hotel, a primary school, a community facility and various PRoW. In the long term, the adverse impacts are identified at a community facility and PRoW only.

11.4.40 The end-to-end options containing the Pink route option have the potential to give rise to beneficial impacts upon PRoW, a community hall and a mausoleum. In the long-term the beneficial impacts are identified upon a PRoW and a mausoleum.

11.4.41 The results of comparing the Do-Minimum 2030 and Do-Minimum 2045 for non-residential receptors are negligible (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b).

Nuisance

- 11.4.42 The table of nuisance impacts (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) indicates that for the comparison between the Do-Minimum 2030 and the Do-Minimum 2045, most of the increase in nuisance level occur in the <10% band for all end-to-end options.
- 11.4.43 For the Do-Minimum 2030 comparison against Do-Something 2045 (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b), the results show that the end-to-end options containing the Brown route option have substantially more residential receptors falling into the 20-30% increase than the end-to-end options containing the Pink route option. The end-to-end options containing the Pink route option have more residential receptors falling into the >40% increase band than the end-to-end options containing the Brown route option. Overall, the end-to-end options containing the Brown route option have more increases in nuisance impact.
- 11.4.44 In consideration of a decrease in nuisance level, the end-to-end options containing the Pink route option have considerably larger numbers falling into the <10% than the end-to-end options containing the Brown route option. For the other nuisance bands, the results for both route options are similar.

Future Developments

- 11.4.45 There are a number of future receptors³⁵ with the potential to be affected by the end-to-end options containing the Brown route option and the Pink route option. These receptors would be located in future land uses identified for development in the LDP, including opportunity sites, protected reserve land (to conserve amenities) as well as planning applications for dwellings and education facilities.
- 11.4.46 The total number of potentially affected receptors within the LDP by the end-to-end options containing the Brown route option or the Pink route option is similar. The only differentiator is that end-to-end options containing the Pink route option affect slightly more planning applications that include residential dwellings and one more protected reserve land development. This is considered a marginal difference.

Summary: Colpy to Pitcaple

- 11.4.47 The results of the assessment for the Colpy to Pitcaple geographical section show that the end-to-end options with a Pink route option generally perform better than those with a Brown route option.
- 11.4.48 For residential and non-residential receptors, there are more predicted adverse impacts for the end-to-end options with the Brown route option and more predicted beneficial impacts for the end-to-end options with the Pink route option. Moreover, there are more residential receptors with an increase in nuisance level caused by the end-to-end options with the Brown route option. There are also more residential receptors with a decrease in nuisance level caused by the end-to-end options containing the Pink route option than those with the Brown route option.
- 11.4.49 The noise assessment of the Colpy to Pitcaple geographical section has reported the potential significant effects upon the receptors presented in Table 11.6 and Table 11.7.

Pitcaple to Kintore

Residential Receptors

Daytime

11.4.50 Table 11.8 presents the total numbers of receptors in the daytime experiencing minor adverse impacts in either the short or long-term, and the total number of receptors experiencing a moderate or major adverse noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b. The table gives the total number of residential receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.8 Summary of Adverse Daytime Noise Impacts at Residential Receptors – Pitcaple to Kintore

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Bf-V	C-Bf-O	R-P-V	R-P-O	R-Bf-V	R-Bf-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor adverse noise increase	193	358	178	207	209	391	178	316
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) adverse noise increase	485	96	447	88	489	96	449	90

11.4.51 Table 11.8 shows that the end-to-end options containing the Violet route option have more impacts at the moderate and major bands than the end-to-end options containing the Orange route option. For the minor bands the end-to-end options containing the Orange route option have more adverse impacts upon residential receptors than those containing the Violet route option. The results indicate that the end-to-end options containing the Violet route option have overall more noise increases than those containing the Orange route option.

11.4.52 All the receptors identified in Table 11.6 have a potential adverse significant effect.

11.4.53 Table 11.9 below presents the total numbers of receptors in the daytime experiencing a minor beneficial impact in either the short or long-term, and the total number of receptors experiencing a moderate or major beneficial noise impact in either the short or long-term. For further details refer to Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b. The table gives the total number of residential receptors potentially affected by the route option shown by bold letter for each of the end-to-end options.

Table 11.9 Summary of Beneficial Daytime Noise Impacts at Residential Receptors - Pitcaple to Kintore

Residential Receptors Subject to:	End-to-end Options							
	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
A short-term (≥ 1 dB) or long-term (≥ 3 dB) minor beneficial noise decrease	2852	3586	979	3779	2598	3550	991	3764
A short-term moderate (≥ 3 dB) or major (≥ 5 dB) or long-term moderate (≥ 5 dB) or major (≥ 10 dB) beneficial noise decrease	154	608	43	636	217	604	43	633

11.4.54 Table 11.9 shows that overall, the end-to-end options containing the Orange route option have more noise decreases at residential receptors than those end-to-end options containing the Violet route option.

Night-time

11.4.55 For the results of the long-term Do-Minimum 2030 against Do-Something 2045 night-time assessment (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b), the end-to-end options containing the Orange route option have more potential adverse impacts than the end-to-end options containing the Violet route option. In terms of potential decreases, the end-to-end options containing the Orange route option have more beneficial impacts than those with a Violet route option in the minor beneficial bands. For the other bands, the results of both route options are similar.

11.4.56 For the comparison of Do-Minimum 2030 against Do-Minimum 2045 in the night-time, the results show that there are no increases or decreases for any of the end-to-end options as all receptors fall into the negligible category band.

11.4.57 It is noted that only the receptors predicted to experience levels higher than 55dB are used in the assessment of the night-time.

Do-Minimum

11.4.58 The comparison between the Do-Minimum 2030 and the Do-Minimum 2045 during the daytime (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) indicates that there are no increases or decreases of noise for any of the assessed routes.

Candidate Noise Management Areas

11.4.59 The Scottish Government Round Three strategic noise mapping³⁶ of Candidate Noise Management Areas (CNMAs) identifies one CNMA south of Port

³⁶ Scotland's noise part of Scotland's environment. Candidate Action planning – Round Three, available at: <https://noise.environment.gov.scot/pdf/RoundThree/Transportation/Transportation%20CNMA%20Road.pdf>

Elphinstone (with ID 11336) on the B993 road. This is the only CNMA in the entire scheme. There are a number of residential properties alongside this road. There is no prescribed methodology to assess CNMAs in DMRB. However, it is considered appropriate to assess the impacts at the CNMA, with an arithmetic average of the predicted change in noise level ($L_{A10,18h}$) for all the receptors that fall within the CNMA. The assessment is undertaken for the long-term during the daytime.

11.4.60 Table 11.10 gives the average change in noise level by the route option shown by bold letter for each of the end-to-end options.

Table 11.10 Summary of Noise Impacts at CNMAs - Pitcaple to Kintore

CNMA Reference	Arithmetic Average Change in Noise Levels dB (Do-Something 2045 – Do-Minimum 2030) at Representative Assessment Locations							
	C-P-V	C-P-O	C-Br-V	C-Br-O	R-P-V	R-P-O	R-Br-V	R-Br-O
ID 113 – B993	0.2	0.2	0.3	0.2	0.1	0.2	0.4	0.2

11.4.61 For the end-to-end options containing the Orange route option, the average change in noise level is 0.2dB. For the end-to-end options containing the Violet route option, the average change in noise ranges between 0.1dB and 0.4dB.

11.4.62 It can be seen in Table 11.10 that all end-to-end options would give a change of less than 0.4dB which falls into the ‘negligible’ band of the DMRB criteria of Table 11.3. No adverse impacts are therefore identified upon the assessed CNMA.

11.4.63 It is noted that this is a CNMA rather than a formally declared Noise Management Area (NMA). There are various input variables used in the decision making process to declare a formal NMA from a CNMA which are detailed in the ‘Technical Guidance for CNMA to NMA’³⁷. The Scottish Government has not assessed the CNMA further at the time of writing.

Non-residential Receptors

11.4.64 For non-residential receptors, the end-to-end options containing the Orange route option are predicted to have more adverse noise impacts than the end-to-end options containing the Violet route option (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b). The end-to-end options containing the Orange route option are predicted to have more beneficial impacts than the Violet route option.

11.4.65 In the short-term, the end-to-end options containing the Orange route option have the potential to adversely affect several non-residential receptors including a church hall in Kintore, a hotel, various community facilities and various PRow. In the long-term, the predicted adverse impacts on non-residential receptors include a hotel, community facilities and a number of PRow.

11.4.66 The end-to-end options, containing the Violet route option, have the potential to adversely affect fewer non-residential receptors than the end-to-end options containing Orange route option. In the short-term, a sports centre, a social club,

³⁷ The Scottish Government, *Technical Guidance: CNMA to NMA*, available at: https://noise.environment.gov.scot/pdf/TechnicalGuidance/Technical_Guidance_CNMA2NMA.pdf

community facilities and various PRoW would be affected. In the long-term, the adversely affected receptors are a sports centre and PRoW.

- 11.4.67 The end-to-end options containing the Orange route option are predicted to have more beneficial impacts on several non-residential receptors than the Violet route options. In the short-term, the end-to-end options containing Orange route option are predicted to have beneficial impacts on receptors including nurseries, hospitals and medical facilities, hospice, churches, hotel, animal medical treatment centre, sports centre, social club, educational facilities, community facilities and a number of PRoW around Inverurie. In the long-term, beneficial impacts on nurseries and PRoW are identified.
- 11.4.68 The end-to-end options containing the Violet route option are predicted to have beneficial impacts in the short-term on nurseries, golf facilities, hospital and medical facilities, hotels, educational facilities, community facilities and PRoW. For the long-term, no beneficial impacts have been identified for the end-to-end options containing the Violet route option.

Nuisance

- 11.4.69 The table of nuisance impacts (see Appendix A11.2: DMRB Noise Reporting Tables, Volume 4b) indicates that for the comparison between the Do-Minimum 2030 and the Do-Minimum 2045, all the predicted changes are within the <10% band.
- 11.4.70 For the analysis of the Do-Minimum 2030 against the Do-Something 2045, the results show that the end-to-end options containing the Violet route option have more increases in the <10%, the 30>40% and >40% bands. For the bands 10<20% and 20<30% the end-to-end options containing the Orange route option have greater numbers of receptors than those containing the Violet route option. In general, the end-to-end options containing the Violet route option have more increases in nuisance level than those containing the Orange route option.
- 11.4.71 In consideration of a decrease in nuisance level, the end-to-end options containing the Orange route option have substantially more decreases in nuisance level than the end-to-end options containing the Violet route option.

Future Developments

- 11.4.72 There are several future receptors in the Pitcaple to Kintore area with the potential to be affected by the end-to-end options containing the Orange route option and the Violet route option. These are the LDP land use allocations which include opportunity sites, protected reserve land (to conserve amenities), green spaces, as well as planning applications for residential receptors, education and health facilities.
- 11.4.73 The total number of potentially affected LDP land use allocations by the end-to-end options containing the Orange route option or the Violet route option is similar. Most of the LDP land use allocations are within Inverurie and Port Elphinstone. The end-to-end options containing the Orange route option run closer to the southern LDP land use site allocations whereas the end-to-end options with Violet route option run closer to the northern LDP land use site allocations. The end-to-end options that include the Orange route option are relatively close to a number of LDP land use site allocations around Daviot, including protected reserve land, opportunity sites and small residential developments.
- 11.4.74 The end-to-end options containing the Orange route option run closer to one of the largest LDP land use allocations to the south of Inverurie, which is an opportunity

sites for Housing, Community Facilities and School - Masterplan Approved (reference APP/2013/0267). There are two relatively large LDP land use allocations for green space at Thainstone House and Inverurie Mill, which are likely to be more adversely affected by the end-to-end options containing the Orange route option than those containing the Violet route option.

- 11.4.75 There are a number of LDP land use site allocations to the south-west of Inverurie, that are closer to the end-to-end options containing the Orange route option, which include protected reserve land (to enable the relocation of St Andrews Special School), as well as a relatively large planning application for committed housing site (reference APP/2011/2682). There are also a few scattered individual sites with planning applications associated with relatively small residential dwellings.
- 11.4.76 For the end-to-end options containing the Violet route option, there are a number of LDP land use site allocations to the north of Inverurie with the potential of being adversely affected. These LDP allocated land use sites are not within the calculation area of the end-to-end options containing the Orange route option. These sites include various committed housing sites (including references APP/2009/2542, APP/2009/2542, APP/2010/3002, APP/2017/1367), opportunity sites for housing (including APP/2008/4145), protected land for a Uryside Park and points of access to Uryside. There are also a number of LDP land use site allocations around Daviot including opportunity sites and small residential developments.
- 11.4.77 In Kintore, there are a number of relatively large LDP land use site allocated areas associated with residential dwellings and green spaces with the potential to be adversely affected. In Kintore, however, all the end-to-end options have the same alignment and therefore, the potential impacts in this area are unlikely to be a differentiator.
- 11.4.78 In conclusion, giving consideration to future developments, the end-to-end options containing the Orange route option have a similar number of potentially adversely affected LDP allocated land use sites as the end-to-end options containing the Violet route option. Although there are several large LDP allocated land use sites to the south of Inverurie closer to the Orange route option, there are also a number of large LDP allocated land use sites to the north that are closer to the Violet route option. These LDP land use allocated sites are comparable in size, and hence there is no clear distinction as to which route option performs better. A detailed assessment of the potential impacts upon all these future receptors, including how much area of the LDP land use allocation is likely to experience significant effects, will be undertaken during DMRB Stage 3, once a Preferred Option has been selected.

Summary: Pitcaple to Kintore

- 11.4.79 The results of the assessment for the Pitcaple to Kintore geographical section show that the end-to-end options containing the Orange route option generally perform better than those with a Violet route option.
- 11.4.80 For residential receptors, there are more predicted adverse impacts from the end-to-end options containing Violet route option than those containing the Orange route option. There are also substantially more predicted beneficial impacts from the end-to-end options containing the Orange route option than those with the Violet route option.
- 11.4.81 For non-residential receptors, there are more predicted beneficial impacts caused by the end-to-end options containing the Orange route option. There are more residential receptors with an increase in nuisance level caused by the end-to-end

options containing the Violet route option than those containing the Orange route option.

- 11.4.82 The assessment has reported the potential significant effects upon the receptors presented in Tables 11.8 to 11.10.

11.5 Mitigation

- 11.5.1 The magnitude of noise increases, and the number of residential receptors and non-residential receptors adversely affected by the assessed roads would be minimised by noise mitigation integrated into the engineering design at DMRB Stage 3. PAN1/2011 promotes the principles of good acoustic design and a sensitive approach to the location of new development. As stated in the document, it promotes the appropriate location for new potentially noisy development, and the need for a pragmatic approach to the location of new development within the vicinity of existing noise generating uses. This is to ensure that the quality of life is not unreasonably affected, and that new development continues to support sustainable economic growth.
- 11.5.2 To avoid likely significant adverse effects from the Preferred Option, noise mitigation (where sustainable) such as low noise surfacing or screening would be incorporated.
- 11.5.3 To ensure mitigation is practicable and sustainable, the provision of mitigation would be subject to the following tests:
- Stakeholder engagement and consultation responses;
 - Engineering practicability;
 - Consideration of noise benefit compared to cost of the mitigation; and
 - Other environmental effects potentially caused by the mitigation (for example, landscape or visual effects).
- 11.5.4 As significant effects often relate to disruption to residents indoors e.g. sleep disturbance, mitigation such as noise insulation at affected receptors³⁸ can be used to avoid the likely significant effect. However, this requires that mitigation within the scheme (e.g. noise barriers) has first been applied as far as is sustainable.

11.6 Cumulative Effects

- 11.6.1 The effects of the LDP land use allocations upon traffic flows within the calculation areas have been taken into account in the traffic assessment and the effect on LDP land use allocations is, therefore, reflected in this assessment.
- 11.6.2 The cumulative effect of other transportation sources such as railway or aircraft noise, has not been taken into account as it does not constitute a differentiator for the DMRB Stage 2 assessment.

³⁸ HMSO, 1975, *The Noise Insulation (Scotland) Regulations*.

11.7 Summary of Effects

East of Huntly to Colpy

- 11.7.1 Taking account of the assessments presented in Tables 11.4 and 11.5 and Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b), the end-to-end options containing the Cyan route option are predicted to perform better than the end-to-end options containing the Red route option.
- 11.7.2 For residential receptors, there are more predicted adverse impacts from the end-to-end options with a Red route option. In addition, there are more predicted beneficial impacts from the end-to-end options containing the Cyan route option.
- 11.7.3 There are also more residential receptors with an increase in nuisance level caused by the end-to-end options containing the Red route option than those with the Cyan route option.
- 11.7.4 Therefore, from a noise perspective, the Cyan route option is preferred.

Colpy to Pitcaple

- 11.7.5 Taking account of the assessments presented in Tables 11.6 and 11.7 and Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b), the end-to-end options containing the Pink route option are predicted to perform better than the end-to-end options containing the Brown route option.
- 11.7.6 For residential and non-residential receptors, there are more predicted adverse impacts from the end-to-end options with the Brown route option. There are also more predicted beneficial impacts from the end-to-end options containing the Pink route option. Moreover, there are more residential receptors with an increase in nuisance level caused by the end-to-end options containing the Brown route option. There are also more residential receptors with a decrease in nuisance level caused by the end-to-end options containing the Pink route option than those with the Brown route option.
- 11.7.7 Therefore, from a noise perspective, the Pink route option is preferred.

Pitcaple to Kintore

- 11.7.8 Taking account of the assessments presented in Tables 11.8 and 11.9 and Appendix A11.2: DMRB Noise Reporting Tables (Volume 4b), the end-to-end options containing the Orange route option are predicted to perform better than the end-to-end options containing the Violet route option.
- 11.7.9 For residential receptors, there are more predicted adverse impacts from the end-to-end options with a Violet route option than those with an Orange route option. There are also substantially more predicted beneficial impacts from the end-to-end options containing the Orange route option than those with the Violet route option.
- 11.7.10 For non-residential receptors, there are more predicted beneficial impacts caused by the end-to-end options with an Orange route option. There are more residential receptors with an increase in nuisance level caused by the end-to-end options with containing the Violet route option than those with the Orange route option.
- 11.7.11 Therefore, from a noise perspective, the Orange route option is preferred.

11.8 Scope of DMRB Stage 3 Assessment

- 11.8.1 An assessment of the effects of noise and vibration will be undertaken during DMRB Stage 3 in accordance with the New Guidance, DMRB (Sustainability & Environment Appraisal – LA 111 Noise and Vibration²⁵).
- 11.8.2 Baseline sound level surveying will be undertaken at representative noise sensitive locations in the vicinity of the existing and Preferred Option.
- 11.8.3 Construction impacts will be assessed following the guidance within DMRB LA 111 and in BS5228³⁹, using the information obtained from the baseline noise survey.
- 11.8.4 The potential cumulative effect of other transportation noise sources such as rail and aircraft, will be considered during DMRB Stage 3 after the Preferred Option is selected and more information becomes available including the baseline noise survey data. The detailed assessment of the overall impact of proposed scheme combined with existing non-road traffic sources will be developed as part of the DMRB Stage 3
- 11.8.5 Potential sustainable mitigation measures, including potential qualification for Noise Insulation (Scotland) Regulations⁴⁰, will be assessed for both construction and operation of the Preferred Option.
- 11.8.6 Aberdeenshire Council will be consulted on the selection of baseline surveying locations, as well as the approach and the methodologies for the assessment.

³⁹ British Standards Institution, 2014, *BS 5228 Parts 1 and 2, 2009+A1:2014, Code of practice for noise and vibration control on construction and open sites.*

⁴⁰ The Noise Insulation (Scotland) Regulations 1975, HMSO, define the scenarios under which dwellings are eligible for noise insulation to control internal noise levels when it has not been possible to control external noise within defined criteria.

12 People and Communities

12.1 Introduction

- 12.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the predicted effects on People and Communities. The assessment has been undertaken in accordance with DMRB (Interim Advice Note (IAN) 125/15, Environmental Assessment Update) which recommends that the following parts of the DMRB Guidance are combined into a single assessment on 'People and Communities':
- DMRB (Volume 11, Section 3, Part 6, Land Use), which comprises assessments of private property, loss of land used by the community, effects on development land, effects on agricultural land and waterway restoration projects;
 - DMRB (Volume 11, Section 3, Part 8, Pedestrians, Cyclists, Equestrians and Community Effects), which comprises assessments of changes in journey length, changes in amenity, community severance, new severance and relief from existing severance; and
 - DMRB (Volume 11, Section 3, Part 9, Vehicle Travellers), which comprises assessments of views from the road and driver stress.
- 12.1.2 In this chapter, in accordance with DMRB (Volume 11, Section 3, Part 6, Land Use) the impacts are assessed in terms of effects on land use and focusses on the loss of private and community land only. This includes consideration of community land that may be lost, along with residential and commercial buildings that may be demolished, or have land taken from them. Potential mitigation to prevent, reduce or compensate for adverse effects on private and community land is also identified in this chapter.
- 12.1.3 In accordance with DMRB (Volume 11, Section 3, Part 8, Pedestrians, Cyclists, Equestrians and Community Effects) community impacts are determined in terms of severance from community land and facilities, therefore any potentially affected community land and facilities are included. This also extends to include an assessment on severance between local community areas.
- 12.1.4 Due to the rural nature of the study area, severance impacts resulting from the route options on all travellers include those travelling on foot, by bicycle or by horse (Non-Motorised Users (NMUs)) as well as those travelling by motorised vehicle (Vehicle Travellers).
- 12.1.5 With regards DMRB (Volume 11, Section 3, Part 9, Vehicle Travellers) the effects on vehicle travellers, in relation to driver stress, have been scoped out of this assessment as it is considered each route option provides a similar benefit. Vehicle Travellers are, therefore, not considered further in this assessment.
- 12.1.6 Waterway restoration projects, as described in DMRB (Volume 11, Section 3, Part 6, Land Use), are not considered in this assessment due to the absence of any navigable canals or waterways within the study area, but this does not preclude recreation activities for example kayaking.
- 12.1.7 The assessment of impacts of the route options on the likely effects on health is presented in Chapter 22, Human Health. The assessment of impacts on development land (including planning application sites) is presented in Chapter 9, Policies and Plans, and the assessment of impacts on agriculture, forestry and

sporting interests is presented in Chapter 13, Agriculture, Forestry and Sporting Interests, both included in this report.

12.1.8 This assessment therefore covers the effects of the route options on:

- NMUs – walkers, cyclists and equestrians;
- Private Property;
- Community Land and Facilities; and,
- Community Severance.

12.1.9 This chapter is supported by the following figures (Volume 5) and appendices (Volume 4b):

- Figures 12.1 to 12.13: People and Communities Assessment;
- Appendix A12.1: People and Communities Assessment Methodology;
- Appendix A12.2: NMU Assessment Tables; and
- Appendix A12.3: Community Land and Facilities Assessment Tables.

Policy context

Nestrans Active Travel Action Plan (AcTrAP) 2014-2035

12.1.10 The AcTrAP was published with the aim of “encouraging increased levels of active travel across the region”. This action plan contains a long term vision for active travel in the north east.

12.1.11 A key aim of the action plan is to support the development of a strategic travel network of active travel routes linking Aberdeen City and the main towns in Aberdeenshire and seek to develop this as an attractive network of links which can be promoted and prioritised over the period of AcTrAP.

12.1.12 The Plan identifies a number of benefits of increasing levels of active travel and reducing the proportion of private car journeys. Increasing active travel can make significant contributions to health, local environment, global environment, economic benefits, reducing social exclusion and improving safety.

Inverurie Integrated Travel Town Masterplan (ITT) – Supporting Sustainable and Active Travel – June 2018

12.1.13 The ITT aspires to “achieve a modal change whereby 40% of all local journeys under 5km are made by bike or foot” which reflects the Government commitments set out in the Cycling Action Plan for Scotland and the National Walking Strategy. It is hoped to be achieved by providing the proper infrastructure at the key locations and ensuring that residents are fully aware of the sustainable and active travel options that will be open to them with a result of having fewer single occupancy car journeys being made

12.1.14 The aim of the ITT is “to develop these transport opportunities fully, by understanding the issues and barriers and overcoming these with support and initiatives identified and developed with the local community at the heart”. The objectives contained in the ITT are to help the Council meet sustainability objectives, supporting the priorities set out in the Council Plan 2017-2022 and have a positive influence on the environment and the country’s health.

12.2 Approach to Assessment

Introduction

- 12.2.1 The assessment follows the guidance outlined in Section 12.1.
- 12.2.2 At this stage in the design and assessment process, the likely nature, location and scale of the construction activities (e.g. location of construction compounds) is not known. The predicted effects reported in this chapter therefore focus on the permanent effects of the route options.

Sources of Information

- 12.2.3 Baseline conditions were collated from information gathered during site visits and through desk-based review.
- 12.2.4 Site visits were conducted in April, May and September 2018, to verify features identified during the desk-based review within the study area, and to establish any additional features.
- 12.2.5 A desk-based review was carried out to gather additional baseline data using:
- Available/modelled traffic data;
 - Address-based data (used to identify residential, commercial and industrial property);
 - Other road network information;
 - Ordnance Survey (OS) maps;
 - Google and Bing maps;
 - Aberdeenshire Council's interactive map identified core paths⁴¹ and school catchment areas⁴²;
 - Aberdeenshire Council's Open Space Strategy Audit⁴³; and
 - Scottish Canals⁴⁴ website and Inland Waterways Association⁴⁵ website identified waterways.

Consultation

- 12.2.6 Consultation to inform the understanding of baseline conditions was undertaken with several organisations as set out in Chapter 8, Table 8.3. Consultation consisted of an initial information request on the location of, and any other information on, NMU routes and community land/facilities within the study area and a record of consultations has been made. In some circumstances, consultation responses were followed up with meetings to gain more information.
- 12.2.7 ScotWays⁴⁶ was consulted to obtain Public Rights of Way data.

⁴¹ <https://www.aberdeenshire.gov.uk/paths-and-outdoor-access/core-paths-plan/core-paths-plan-maps/>

⁴² <https://www.aberdeenshire.gov.uk/schools/school-info/admissions/school-zones/>

⁴³ <https://www.aberdeenshire.gov.uk/leisure-sport-and-culture/parks-and-open-spaces/open-space-strategy-audit/>

⁴⁴ <https://www.scottishcanals.co.uk/destinations/>

⁴⁵ <https://www.waterways.org.uk/waterways/discover-the-waterways>

⁴⁶ ScotWays - Scottish Rights of Way & Access Society, <https://www.scotways.com/>

12.2.8 A summary of the main topics highlighted during discussions with Aberdeenshire Council, Aberdeen City Council and Nestrans⁴⁷ is set out below:

- Aberdeenshire Council highlighted that provision for NMUs is a key issue and that key settlements within Aberdeenshire need to be linked;
- Having safe alternative options for NMUs that avoid use of the dual carriageway is an important aspect of the scheme and NMU facilities will be incorporated into the design of grade separated junctions and side road crossings;
- There are a significant number of public transport service providers used for school transport, with the highest proportion of children's bus services located in the Oldmeldrum area. Related data on this can be provided by Aberdeenshire Council;
- Public Transport facilities will be positioned appropriately relative to NMU facilities, and locations providing a safe means of set down and pick-up will be sought as design development becomes more detailed; and
- Aberdeen City Council and Nestrans indicated that Active Travel measures are being promoted in the area with some work already underway between Dyce and Blackburn. Plans are ongoing to implement measures between Kintore and Thainstone, and Kintore and Blackburn.

12.2.9 A meeting with Grampian Cycle Partnership, Aberdeenshire Council Elected Member for Ward 12 East Garioch and Nestrans discussed the following topics related to Stage 2:

- Consideration of all levels of NMUs and not just experienced cyclists and walkers is a requirement, and provision of high quality NMU facilities should be the vision for this scheme;
- Consideration should be given to link into the existing cycling network, including those between Inverurie and Kintore Business Park, as well as a link being formed between Kintore and Kemnay to encourage pupils to travel by this mode to Kemnay Academy;
- Consideration should be given to providing segregated NMU facilities along the corridor with the location of these to be developed as the scheme progresses. Additionally, it was noted that the de-trunked sections of the A96 may offer opportunities for NMU routes; and
- The increasing use in electric cycles will make some commuting distances achievable and there will also be increased tourism benefits based on providing good cycle network links to the rail stations.

12.2.10 Aberdeenshire Council have also provided information in relation to:

- Proposals for a shared cycle path between Kintore and Blackburn;
- Accident information on the surrounding Local Authority (LA) roads;
- Traffic information on the surrounding LA roads;

⁴⁷ Nestrans - Transport Partnership for Aberdeen City and Shire, <https://www.nestrans.org.uk/>

- Transport Assessments for developments in the area;
- Inverurie and Kintore local Paramics traffic models;
- Updates to the Local Development Plan; and
- Updates to the Passenger Transport Strategy including aspirations to provide mini interchange hubs on the main routes, which would provide dedicated interchange opportunities with walking, cycling and/or private transport. This initiative will provide access to public transport for rural communities which are not directly served by bus services.

12.2.11 The information obtained from consultation has been used to:

- Help understand the existing environmental site conditions within the study area;
- Help to establish key environmental issues and identify potential impacts to be considered in the assessments;
- Inform the scope of the assessments and reporting; and
- Inform the design and the development of mitigation.

NMU Assessment

Assessment Methodology

- 12.2.12 The NMU assessment identifies the key routes used by NMUs and assesses the effects of the route options on users regardless of the purpose of the journey.
- 12.2.13 In line with DMRB, the key points to consider when assessing NMUs are the identification of existing routes used by pedestrians and other NMUs and an estimation of their numbers or types of NMUs using a route.
- 12.2.14 This assessment considers key NMU routes to be those which are identified as Core Paths, Aspirational Core Paths, Public Rights of Way (PRoW), National Cycle Network (NCN) and existing local routes. Refer to Volume 1, Part 1, Chapter 2, Existing Conditions for more details. The assessment considers all users of the paths, irrespective of the purpose of their journey (e.g. commuting, recreation, etc.), and considers all paths to be of equal importance regardless of user type, or levels of usage.
- 12.2.15 For further information on the assessment methodology for the NMU assessment see Volume 4b, Appendix A12.1: People and Communities Assessment Methodology.

Impact Assessment

- 12.2.16 The assessment of the effects of the route options on NMUs considers changes in journey length and times, and changes in the amenity value of NMU journeys.
- 12.2.17 Amenity is defined according to the DMRB (Volume 11 Section 3, Part 8) as ‘the relative pleasantness of the journey’ and is the extent to which NMUs are exposed to traffic, noise and dirt as well as feelings of fear derived from footpath width, distance from traffic and the existence of barriers/fences. The assessment of amenity considers the visual effects assessment (Chapter 15, Visual Effects) but does not double-count impacts since other factors are considered to determine the overall amenity impact. This chapter does not include an assessment of the

subsequent health impacts as a result of changes in amenity and community severance. This is presented within the human health assessment (Chapter 22, Human Health) which considers the likely effects of the route options on health outcomes at population level in Aberdeenshire.

- 12.2.18 The assessment of change in the amenity of journeys has been based on professional judgement taking account of information on predicted changes in traffic flows on roads in proximity to, or crossed by, NMU routes. It also takes account of the extent to which new road infrastructure affects the pleasantness of routes currently unaffected e.g. from new crossings.
- 12.2.19 A change in journey length occurs where there are direct impacts on NMU routes, where disruption to a path is predicted to result in a diversion, or where an NMU's ability to use a path in its current form is affected. The assessment of the effects on users of NMU routes includes an analysis of traffic flows to determine changes to the number of vehicles using the road network (both local and trunk), and if this deters or encourages NMUs to use routes.
- 12.2.20 Potential impacts on users of NMU routes are set out in Tables 12.5 to 12.10 of this chapter.
- 12.2.21 Further information on the criteria used in the assessment of impacts on NMUs is set out in Volume 4b, Appendix A12.1: People and Communities Assessment Methodology.

Private Property Assessment

Assessment Methodology

- 12.2.22 Within DMRB (Volume 11, Section 3, Part 6, Land Use), private land refers to residential, commercial and industrial properties which are at risk of demolition or the curtilage of the properties are susceptible to land take as a consequence of the route options. Collectively, residential, commercial, industrial and other properties are referred to as private property within this assessment. The impacts of the route options on private property are established by quantifying the number of private properties affected and the associated land take. It also considers any changes in access to/from affected properties, as a result of changes to the road network⁴⁸.
- 12.2.23 For further information on the assessment methodology for Private Property see Volume 4b, Appendix A12.1: People and Communities Assessment Methodology.

Impact Assessment

- 12.2.24 DMRB (Volume 11, Section 3, Part 6, Land Use) does not include guidance for describing the sensitivity of private and community assets or methods for assessing the magnitude of impact. However to be consistent the assessment closely aligns with that used within the A96 Dualling Hardmuir to Fochabers DMRB Stage 2 Scheme Assessment Report.
- 12.2.25 The assessment of effects on private property assesses any direct impacts predicted from the demolition, land take or changes to access as a consequence of the route options.
- 12.2.26 The assessment of effects also considers where alternative access to private property could potentially lead to a change in journey length.

⁴⁸ Where agricultural businesses and associated land and infrastructure is affected this is considered within Chapter 13, Agriculture, Forestry and Sporting Interests.

- 12.2.27 For this assessment, private properties are allocated to one category based on their primary land use. For example, where agricultural land and associated infrastructure is affected this is considered within Chapter 13, Agriculture, Forestry and Sporting Interests, and where a community facility is potentially impacted, this is assessed under the Community Land and Facilities assessment in this chapter.
- 12.2.28 The sensitivity and magnitude criteria for assessing impacts on private properties, as well as the significance of effects, are set out in Volume 4b, Appendix A12.1: People and Communities Assessment Methodology.

Community Land and Facilities

Assessment Methodology

- 12.2.29 The assessment of the effects on community land and facilities considers direct impacts to, amenity of, and the change in accessibility of the public from facilities and services that they use (e.g. schools, churches, community centres, and essential shops and eateries which act as a focal point within a community rather than specific commercial premises/retail centres) as well as considering the location, status and importance of any land used by the public that could be lost. Community land includes town or village greens, public parks or other land used for recreation. Consideration has also been given to the accessibility of community land and facilities.
- 12.2.30 'New' severance in the context of the community land and facilities assessment is defined as the severance of users from facilities resulting from the 'physical barrier effect' of the new road proposals and any associated amenity or perceived effects and from changes to journeys which are required in order to cross or make detours around the new infrastructure. The assessment has considered impacts to access, amenity and land take to determine the significance of effect.
- 12.2.31 Further information on the assessment methodology and the criteria used for the assessment of direct and indirect impacts to land and facilities used by the community as a result of permanent change in land use from the route options is set out in Volume 4b, Appendix A12.1: People and Communities Assessment Methodology.

Impact Assessment

- 12.2.32 The assessment considers how the route options affect access to and the amenity of community land and facilities, and outdoor access areas (i.e. relief from, or the creation of severance to community land and facilities) as well as assessing any land take from these areas.
- 12.2.33 According to the DMRB (Volume 11 Section 3, Part 6) where land is taken from common land or open space for a road scheme 'it will generally be necessary to provide exchange land'. Where exchange land is required the impacts arising from that land take will be included in this assessment.
- 12.2.34 The assessment of changes to access to outdoor areas for NMUs focusses on any changes to journeys undertaken for purposes including recreation and education from one place to another. A qualitative description has been completed taking account of changes in journey length and the amenity of journeys.
- 12.2.35 To assess the changes in journey lengths and implications for community severance, it is necessary to identify the key journeys that are likely to be affected by the scheme. It is assumed that people will use the nearest available facility and

that journeys to facilities outside of towns and villages are most likely to be undertaken by vehicle.

- 12.2.36 The sensitivity and magnitude criteria for assessing impacts on community land and facilities are set out in Volume 4b, Appendix A12.1: People and Communities, Assessment Methodology. The impact on community land and facilities is categorised as significant (Major or Moderate) or not significant (Minor or Negligible).

Community Severance

Assessment Methodology

- 12.2.37 The assessment of community severance on key community connectivity considers the level of severance between local community areas as a result of the route options. These key communities are towns, villages and hamlets.
- 12.2.38 The assessment of community severance considers the degree of severance experienced by local communities (such as Inverurie, Kintore, Old Rayne, etc.) as a result of the permanent development of, and traffic using, the route options.

Impact Assessment

- 12.2.39 The assessment considers how the route options affect community connectivity and considers the connectivity within and between local communities. The criteria for the assessment of community connectivity has been developed using professional judgement based on a review of guidance contained within DMRB (Volume 11, Section 3, Part 8, Pedestrians, Cyclists, Equestrians and Community Effects).
- 12.2.40 In assessing new community severance, consideration has been given to known routes used by vulnerable groups. All communities are considered high value receptors, since at this stage, there is only limited knowledge of travel patterns between communities.
- 12.2.41 'New' severance is the severance of communities from the 'physical barrier effect' of the new road proposals and any associated amenity or perceived effects and from changes to journeys between communities. 'Existing' severance is defined as the severance of communities from their local facilities, by the presence of the existing road network (and traffic using it).
- 12.2.42 In assessing relief from existing severance, consideration is given to the reduction in traffic flows within the settlements in the vicinity of the route options.
- 12.2.43 The sensitivity and magnitude criteria for assessing impacts on community severance have been set out in Volume 4b, Appendix A12.1: People and Communities Assessment Methodology. The impact of community severance has been categorised as significant (Major or Moderate) or not significant (Minor or Negligible).

Assumptions and Limitations

New Guidance

- 12.2.44 An update to the People and Communities assessment methodology was released in January 2020, now referred to as LA 112 Population and Human Health (hereafter referred to as the 'New Guidance'). During the time that the environmental assessment was being undertaken, the New Guidance was released. This guidance followed a structure outlined in the previous published

DMRB guidance, (hereafter referred to as the 'Withdrawn Guidance'). Following discussions with Transport Scotland, it has been agreed that the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there would be no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.

- 12.2.45 The following Paragraphs 12.2.46 to 12.4.61 outline the key differences between the Withdrawn Guidance and New Guidance and describe how this chapter meets the objectives of the New Guidance. Private accesses and accommodation works have not been detailed at this stage. Any assumptions made to inform the assessment process are based on experience from other Scottish trunk road schemes. Further access and accommodation works will be developed during DMRB Stage 3.
- 12.2.46 The New Guidance is titled Population and Human Health, rather than People and Communities, and the definition of this is given as follows:
- Population: 'All individuals located in a particular location (this can be local, regional or at a national scale)'; and
 - Human Health: 'A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.'
- 12.2.47 The scope of the New Guidance still includes the assessment of land-use and accessibility and has specific significance criteria supporting a quantitative assessment and reporting of significance as it did within the Withdrawn Guidance, therefore, there is little change to that aspect of the assessment. However, an assessment of vehicle travellers is no longer required.
- 12.2.48 The material difference between the Withdrawn Guidance and the New Guidance is the introduction of a qualitative assessment on human health, and Human Health is included as Chapter 22 of this report. The New Guidance has set out new methodology to establish the potential effects on the health of the population as a result of a project. This change in guidance highlights the health of the population as a key factor within EIA which aligns with the 2017 changes in the Environmental Impact Assessment (EIA) Regulations. The amendments made within the EIA Regulations clarifies that 'population and human health' factors should be included within the list of environmental topics considered by EIA. With this change, consultation will also need to include public health professionals.
- 12.2.49 The New Guidance also includes the assessment of impacts on agricultural holdings. Chapter 13, Agriculture, Forestry and Sporting Interests provides further details regarding the Withdrawn Guidance and New Guidance in relation to this.

Effects of the New Guidance

- 12.2.50 Rather than identifying an explicitly three stage assessment, the New Guidance advocates a reporting process, differentiating between two elements; screening and scoping, and assessment. The conclusion of the screening and scoping phase is the production of a report answering a set of scoping questions, based on a baseline scenario underpinned by desk study, and incorporating an evaluation of the potential significant effects on population and human health. This leads into an assessment phase underpinned by detailed surveys to inform the final assessment and design. This DMRB Stage 2 Scheme Assessment Report fits well into this new process at the scoping reporting stage. It reports any potential significant effects

and outlines what surveys and further work need to be carried out to inform design and mitigation and to deliver the detailed assessment report.

- 12.2.51 New baseline data is required as part of the human health assessment. Health data required will include health profiles of the communities within the study area. Baseline data gathered for land-use and accessibility will largely stay the same.
- 12.2.52 The New Guidance requires IEMA's Source-Pathway-Receptor model to establish the plausibility of health impacts to be followed and provides assessment tables to establish health outcomes and risk.
- 12.2.53 Apart from the Human Health assessment, the New Guidance requires a similar assessment of resource value as the Withdrawn Guidance. The main variance noted is where amenity is assessed as part of the assessment for walkers, cyclists and horse riders (WCH) formerly known as NMUs. Under this assessment, amenity is defined according to the Withdrawn Guidance as 'the relative pleasantness of the journey' and is the extent to which NMUs are exposed to traffic, noise and dirt as well as feelings of fear derived from footpath width, distance from traffic and the existence of barriers/fences. Amenity under the New Guidance falls within the human health assessment through the environmental conditions of landscape amenity.
- 12.2.54 The significance of effect shall be derived by combining the assigned value (sensitivity) of receptors with the magnitude of change arising from a project, in accordance with LA 104, and in some circumstances significance of impact will be established using information from the literature, baseline assessment and professional judgement. This was the case during the assessment using the Withdrawn Guidance, therefore, there is no change to the assessment of significance.
- 12.2.55 The purpose of the DMRB Stage 2 Scheme Assessment Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance. At subsequent reporting stages the Preferred Option will be assessed using the New Guidance significance matrix.
- 12.2.56 Once the scheme progresses to the DMRB Stage 3 Reporting phase and onto an assessment of the Preferred Option, the New Guidance does diverge slightly from the Withdrawn Guidance.
- 12.2.57 As part of the DMRB Stage 3 assessment following the New Guidance, consultation with stakeholders will be required to allow for comments on the Preferred Option. Those identified and contacted at DMRB Stage 2 will go largely unchanged and these groups will be contacted again, however, with the introduction of the assessment on human health, additional parties will require to be consulted, for example, public health professionals.
- 12.2.58 The New Guidance identifies a mitigation hierarchy to be implemented during design and assessment; avoidance and prevention, reduction and remediation. This will be followed with ongoing engagement between the design engineers and the environmental team. This engagement with designers and stakeholders will increase the effectiveness of design and mitigation measures.
- 12.2.59 WCH design, assessment and provision shall be in accordance with GG 142 Walking, cycling and horse-riding assessment and review⁴⁹.

⁴⁹ GG142 - Walking, cycling and horse-riding assessment and review

- 12.2.60 GG 142 also highlights enhancement opportunities as an integral part of project life cycle which should be identified through the population and human health assessment process. LA 112 details that mitigation for population and health are likely to comprise measures that are integral to the project design or have been implemented to reduce effects associated with other environmental factors. Monitoring of designed mitigation is also cited as a key element to be considered but must not duplicate with other environmental topics and should be discussed with the Overseeing Organisation.
- 12.2.61 Overall, despite some differences between the New and Withdrawn Guidance there would be no material change to the DMRB Stage 2 People and Communities Assessment outcome resulting from the New Guidance.

Other Assumptions and Limitations

- 12.2.62 The estimation of land take from each land holding is approximate and is based on the footprint of the route options. The estimation of land take includes a minimum three metre maintenance strip, since this is typically required on all Transport Scotland trunk road schemes to enable maintenance of earthwork slopes, fencing etc, however, at this stage of development, it does not include any additional land required for construction or any land take required for compensatory landscape planting or other possible mitigation measures. This approach is applied consistently across each route option therefore the land take comparison is equitable between options.
- 12.2.63 Baseline information for private property and community facility land take has been determined using the data available at the time of the assessment. Not all land ownership details are known at this stage. Land take will be considered in more detail at DMRB Stage 3.
- 12.2.64 The potential impacts on future business viability have not been assessed at this stage. Business viability will be considered in more detail at DMRB Stage 3 where consultation with landowners can be carried out to fully assess the impacts of the Preferred Option.
- 12.2.65 No detailed consultation has been undertaken with business owners or landowners at this stage.
- 12.2.66 The assessment of access to outdoor facilities via the NMU routes identified in the study area only considers those areas in the immediate vicinity of the study area (as defined in Section 12.3).
- 12.2.67 The effects of the route options relating to active quarrying sites is set out in Chapter 19, Geology, Soils, Contaminated Land and Groundwater. These have, therefore, not been considered further within the People and Communities assessment.
- 12.2.68 The effects of the route options on public utilities have been considered in Volume 1, Part 2, Engineering Assessment. No assessment of potential impacts to utility equipment is provided in this chapter.

12.3 Baseline

Defining the Study Area

- 12.3.1 The relevant DMRB chapters do not set out specific guidelines on defining a study area. For the assessment of direct effects on private properties (residential and commercial) and community land and facilities, the study area for this assessment

is defined by those areas which may be subject to land take, demolition or to a change in access from the scheme.

12.3.2 The study area for the assessment on community land and facilities is defined as 500m from the outermost edge of all the route options including the maintenance strip. The assessment of community severance, in some instances, may extend beyond this to allow for consideration of the potential impacts of severance on communities which extend beyond the study area.

12.3.3 The assessment of NMUs is based on a review of existing infrastructure, the location of community land and facilities in the area and the main routes likely to be used by travellers to reach them. Essentially, the study area is defined by the sphere of influence of any community facility in the area which intersects with the scheme but can also include existing NMU routes outside of the 500m buffer where they may be affected.

Study Area Context

12.3.4 The study area (500m buffer) encompasses and lies adjacent to many local communities. The key communities relative to this study are Huntly, Inverurie, Port Elphinstone and Kintore, all of which are located along the existing A96, and Oldmeldrum located to the north of the study area. Smaller settlements include, but are not limited to Inch, Old Rayne, Colpy, Daviot, Durno, Pitcaple and Whiteford.

12.3.5 The main residential, commercial and industrial areas are located within the larger settlements. Most community land and facilities are located within these settlements, however, due to the rural nature of the study area, both private property and community land and facilities such as community halls, primary schools, play parks and places of worship are also found in rural settings.

12.3.6 The baseline NMU network consists of:

- Public Rights of Way (PRoW);
- Core Paths, including Aspirational Core Paths;
- Existing local routes (including National Forest Recreation Routes); and
- National Cycle Network (NCN) Routes.

12.3.7 The baseline NMU network in the study area is shown in Volume 5, Figure 12.1 to 12.13.

East of Huntly to Colpy

12.3.8 The town of Huntly lies to the west of the study area and provides a wide range of community land and facilities to the surrounding area. The communities of Culsalmond and Colpy are located at the eastern extents of this section of the study area.

12.3.9 A summary of the baseline NMU routes, private properties, community land and facilities within the study area and surrounding the route options between East of Huntly and Colpy is provided in Table 12.1.

Table 12.1 Baseline Summary - Cyan and Red Route Options

Receptor Type	Cyan Route Option	Red Route Option
NMU Routes		
Public Rights of Way	N/A	N/A
Core Paths, including Aspirational Core Paths	N/A	N/A
Existing local routes	<ul style="list-style-type: none"> Huntly to Greenmyres community path Scotston Loop 	<ul style="list-style-type: none"> Huntly to Greenmyres community path Scotston Loop
National Cycle Network	N/A	N/A
Private Properties (High sensitivity receptors within the exception of the curtilage of properties, or any derelict/disused properties)		
Private Properties (Approximate number within 500m)	90	85
Community Land & Facilities		
Community land and Facilities	<ul style="list-style-type: none"> Culsalmond Community Education Centre (includes playing fields) Morgan McVeighs (Restaurant) Culsalmond Parish Church Religious Grounds Private burial site, Hill of Foudland 	<ul style="list-style-type: none"> Culsalmond Community Education Centre (includes playing fields) Culsalmond Parish Church Religious Grounds Private burial site, Hill of Foudland
Schools	<p>Two secondary school catchment areas:</p> <ul style="list-style-type: none"> The Gordon Schools Inverurie Academy <p>Two primary school catchment areas:</p> <ul style="list-style-type: none"> Drumblade School Insch School 	<p>Two secondary school catchment areas:</p> <ul style="list-style-type: none"> The Gordon Schools Inverurie Academy <p>Two primary school catchment areas:</p> <ul style="list-style-type: none"> Drumblade School Insch School

Colpy to Pitcaple

- 12.3.10 The settlements of Pitmachie, Old Rayne, Whiteford, Durno and Pitcaple are located within this study area.
- 12.3.11 A summary of the baseline NMU routes, private properties, community land and facilities within the study area and surrounding the route options between Colpy and Pitcaple, is provided in Table 12.2.

Table 12.2 Baseline Summary - Pink and Brown Route Option

Receptor Type	Pink Route Option	Brown Route Option
NMU Routes		
Public Rights of Way	N/A	N/A
Core Paths	<ul style="list-style-type: none"> • L3R - Old Rayne Village link to 415.02 • 415.02 - Jenny's Trees via Urie Riverside • 404.01P - Logie Woods to Durno - Proposed Link • 404.01 - Logie Woods to Durno 	<ul style="list-style-type: none"> • 404.02 – Whiteford to Old Rayne (Logie Road) • L6R - Whiteford to Old Rayne (Logie Road) 404.02c. • 415.01 - Burnside Path Old Rayne • L3R - Old Rayne Village link to 415.02 • 415.02 - Jenny's Trees via Urie Riverside • 404.01 - Logie Woods to Durno
Existing local routes	<ul style="list-style-type: none"> • GA3 - Oldmeldrum to Old Rayne • GA1 – Inch to Oyne via Archaeolink 	<ul style="list-style-type: none"> • GA1 - Inch to Oyne via Archaeolink • GA3 - Oldmeldrum to Old Rayne
National Cycle Network	N/A	N/A
Private Properties (High sensitivity receptors with the exception of the curtilage of properties, or any derelict/disused properties)		
Private Properties (approximate number within 500m)	105	210

Receptor Type	Pink Route Option	Brown Route Option
Community Land & Facilities		
Community Land and Facilities	<ul style="list-style-type: none"> • Kellockbank Country Emporium and Coffee Shop • Durno and Logie Woodland area • Logie Durno Village Hall • Logie Durno Play Park • Logie Durno Playing Fields • Loch Inch Fishery • • • • • 	<ul style="list-style-type: none"> • St Lawrence Hall, Old Rayne • Old Rayne Play Park (Lawrence Road) • Old Rayne Playing Fields (Lawrence Road) • Logie Durno Village Hall • Logie Durno Play Park • Logie Durno Playing Fields • Old Logie Burial Ground – North of Logie House • Kellockbank Country Emporium and Coffee Shop • Durno and Logie Woodland area • River Urie • Loch Inch Fishery • Strathorn Farm Stables
Schools	<p>Three secondary school catchment areas:</p> <ul style="list-style-type: none"> • The Gordon Schools • Inverurie Academy • Meldrum Academy <p>Three primary school catchment areas:</p> <ul style="list-style-type: none"> • Inch School • Old Rayne School • Logie Durno School <p>One school within 500m:</p> <ul style="list-style-type: none"> • Logie Durno School 	<p>Three secondary school catchment areas:</p> <ul style="list-style-type: none"> • The Gordon Schools • Inverurie Academy • Meldrum Academy <p>Four primary school catchment areas:</p> <ul style="list-style-type: none"> • Inch School • Old Rayne School • Oyne School • Logie Durno School <p>Two schools within 500m:</p> <ul style="list-style-type: none"> • Old Rayne School • Logie Durno School

Pitcaple to Kintore

12.3.12 Inverurie and Port Elphinstone are the main communities that lie to the south of this study area.

12.3.13 A summary of the baseline NMU routes, private properties, community land and facilities within the study area between Pitcaple and Kintore is provided in Table 12.3.

Table 12.3 Baseline summary - Violet and Orange Route Option

Receptor Type	Violet Route Option	Orange Route Option
NMU Routes		
Public Rights of Way	<ul style="list-style-type: none"> GG53 – West of Hillhead Lethenty to the B9001. GG55 – leading west from Old Kemnay Road, running parallel to the River Don towards Woodend Burn Unrecorded path passing from the B993 to Kemnay Road, Inverurie 	<ul style="list-style-type: none"> GG52 – leading south from Mill of Pitcaple to the existing A96, east of Pitcaple Castle GG55 – leading west from Old Kemnay Road, running parallel to the River Don towards Woodend Burn Unrecorded path passing from the B993 to Kemnay Road, Inverurie

Receptor Type	Violet Route Option	Orange Route Option
Core Paths, including Aspirational Core Paths	<ul style="list-style-type: none"> 408.11P - Howford Bridge Link Meldrum Meg Way - Proposed Link 408.06 – Inverurie to Kintore Cycle path 410.01 – Castle Farm to Gauchhill Plantation 408.06R – Inverurie to Kintore Cycle Path Road Links 410.05 – Gauchhill Circular (roadside path) 410.04 – Gauchhill Woodland Circular 408.04 – Inverurie to Aquhorthies 408.09 – Souterford Road to The Bass 309.04P – Oldmeldrum: Village link to Lochter – Proposed Link 309.05 – Oldmeldrum: Roadside Cycle Path 	<ul style="list-style-type: none"> 408.04R - Inverurie to East Aquhorthies 408.04a Road Link 408.04 – Inverurie to Aquhorthies 408.06 - Inverurie to Kintore Cycle Path 408.06R – Inverurie to Kintore Cycle Path Road Links 408.05P – Old Kemnay Road (Kemnay - Inverurie) – proposed link 408.07 – Inverurie to Dillyhill 408.12 – Davah Hill Loop (Development condition) 408.08 – Druidsfield Circular (South Heritage Walk) 408.09 – Souterford Road to The Bass 309.04P – Oldmeldrum: Village link to Lochter – Proposed Link 309.05 – Oldmeldrum: Roadside Cycle Path 408.11P – Howford Bridge Link Meldrum Meg Way – Proposed Link
Existing local routes	<ul style="list-style-type: none"> GA3 – Oldmeldrum to Old Rayne GA2 – The Great Inverurie Bike Ride A96 Inverurie to Kintore: Foot/Cycleway 	<ul style="list-style-type: none"> GA3 – Oldmeldrum to Old Rayne GA2 – The Great Inverurie Bike Ride Pitcaple Wood National Forest Recreation Route A96 Inverurie to Kintore: Foot/Cycleway
National Cycle Network	N/A	N/A
Private Properties (High sensitivity receptors with the exception of the curtilage of properties, or any derelict/disused properties)		
Private Properties (approximate number within 500m)	1700	855

Receptor Type	Violet Route Option	Orange Route Option
Community Land & Facilities		
Community Land and Facilities	<ul style="list-style-type: none"> • The Cabin Equestrian Centre, near Keith Hall • Hogholm Stables • Overdon Care Home • Kintore Cemetery • Mill Wood • Keith Hall Public Hall • Masonic Hall • Crown Park • Provost Laurence Court • Kintore Fire Station • Kintore Medical Centre • Kintore Scout Hall • The Bothy • Kintore Play Park • Kintore Playing Fields • Clydesdale Bank, Thainstone Agricultural Centre • Thainstone Agricultural Centre • Porterhouse Restaurant and Coffee Shop, Thainstone • Ceann Turr Café and Shop • Airlie House • Kintore Library • Kintore Family Centre • Kintore Co-op • Fyfe House (Girl Guides) 	<ul style="list-style-type: none"> • Buzzard Café, Pitcaple • Pitcaple Wood • Clydesdale Bank, Thainstone Agricultural Centre • Thainstone Agricultural Centre • Porterhouse Restaurant and Coffee Shop, Thainstone. • Kemnay Woods - Roquharold Hill and surrounding woodland (woodland walks) • Mill Wood • Newseat walks and trails • Crichtiebank Business Centre Wood • River Don • Pitcaple Environmental Project • Convenience Store, Elphinstone Road • Ladeside Gardens Recycling Facility • Port Elphinstone Play Park • Port Elphinstone Playing Fields • Druids Toddler play park • Druids Playing Fields • Port Elphinstone Cemetery • Kintore Cemetery • Overdon Care Home • Kirkdale Nursery, Garden Centre

Receptor Type	Violet Route Option	Orange Route Option
Schools	<p>Three secondary school catchment areas:</p> <ul style="list-style-type: none"> Meldrum Academy Inverurie Academy Kemnay Academy and Community Learning Centre <p>Five primary school catchment areas:</p> <ul style="list-style-type: none"> Logie Durno School Daviot School Inverurie Market Place School Keith Hall School Kintore School <p>One school within 500m:</p> <ul style="list-style-type: none"> Kintore School 	<p>Three secondary school catchment areas:</p> <ul style="list-style-type: none"> Meldrum Academy Inverurie Academy Kemnay Academy and Community Learning Centre <p>Eight primary school catchment areas:</p> <ul style="list-style-type: none"> Logie Durno School Daviot School Inverurie Market Place School Chapel of Garioch School Strathburn School Kellands School Port Elphinstone School Kintore School <p>One school within 500m:</p> <ul style="list-style-type: none"> Port Elphinstone School

12.4 Potential Impacts

- 12.4.1 This section presents the assessment of potential impacts for the six route options. The magnitude of impacts has been considered in combination with the sensitivity of the affected receptor to determine the potential for significant impacts. The potential impacts are presented in Table 12.4. An impact of moderate or greater significance is considered to be potentially significant impact. Impacts shown in the tables which are not anticipated to be potentially significant have not been assessed or reported further in this chapter.
- 12.4.2 Potential impacts are described without mitigation, and therefore represent a worst-case scenario. Mitigation measures are considered in Section 12.5 Mitigation. Detailed mitigation to reduce impacts and effects will be developed for the Preferred Option during the DMRB Stage 3 assessment.
- 12.4.3 No potential impacts have been identified in relation to the loss of all or part of common land or open space. Where land take is required consideration would normally be given to the provision of exchange land. However, as no land take from these specific community land areas or facilities is required the provision of exchange land is not considered further in this assessment.

Table 12.4 Potential Impacts on People and Communities

Potential Impact (Taking Account of Sensitivity of Receptors)	Adverse/ Beneficial	Magnitude	Potentially Significant?	Relevant Route Options
NMU Assessment				
<ul style="list-style-type: none"> Direct impacts to NMU routes leading to a diversion for users of less than 250m 	Adverse	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
<ul style="list-style-type: none"> Direct impacts to NMU routes leading to a diversion for users of more than 250m 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> A barely noticeable change to the amenity or perceived safety of an NMU route 	Adverse	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
<ul style="list-style-type: none"> Noticeable or considerable change to the amenity or perceived safety of an NMU route (including safety resulting from changes in traffic flows) which significantly alters the experience of the user, or deters existing users from using the route 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> A minor improvement to the amenity or perceived safety of NMU routes, or reductions in traffic flows of less than 30% 	Beneficial	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
<ul style="list-style-type: none"> Noticeable or considerable improvements to the amenity or perceived safety of an NMU route; or Provision of a new grade separated crossing leading to an enhancement of the NMU network; or Reductions in traffic flows to below 8,000 Average Annual Daily Traffic (AADT) or by more than 30% resulting in perceived fewer intimidating conditions for users 	Beneficial	Moderate to Major	✓	ALL

Potential Impact (Taking Account of Sensitivity of Receptors)	Adverse/ Beneficial	Magnitude	Potentially Significant?	Relevant Route Options
Private Properties Assessment				
<ul style="list-style-type: none"> Demolition of a private property, loss of more than 10% of the landholding (including property curtilage), or a major severance of a landholding 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> Alterations to the access to a private property resulting in an increase in vehicle distance travelled for access of over 1,000m 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> Partial severance or a loss of less than 10% of a landholding 	Adverse	Negligible to Minor	✓	ALL
<ul style="list-style-type: none"> Alterations to the access to a private property resulting in an increase in vehicle distance travelled for access of less than 1,000m 	Adverse	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
Community Land and Facilities Assessment				
<ul style="list-style-type: none"> Total loss of community land or facility, loss of more than 10% of the land/facility, or a major separation of an area of community land 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> Partial separation or a loss of community land/facilities of less than 10% 	Adverse	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
<ul style="list-style-type: none"> Change to the amenity of community land/facilities which significantly alters the experience of the user Journey distance would be increased by >0.15km for pedestrians (vulnerable groups), >0.25km pedestrians (non-vulnerable groups), >1km for cyclists and/or >3km for vehicles 	Adverse	Moderate to Major	✓	ALL

Potential Impact (Taking Account of Sensitivity of Receptors)	Adverse/ Beneficial	Magnitude	Potentially Significant?	Relevant Route Options
<ul style="list-style-type: none"> Current journey pattern to/from community land/facilities are maintained but there may be some hindrance to movement including the requirement to use of a new underpass/overbridge <p>Journey distance to community land/facilities would be increased by <0.15km for pedestrians (vulnerable groups), <0.25km pedestrians (non-vulnerable groups), <1km for cyclists and/or <3km for vehicles</p>	Adverse	Negligible to Minor	✓ - High value receptors ✗ - all other receptors	ALL
Community Severance Assessment				
<ul style="list-style-type: none"> Journey distance between/within communities would be increased by >0.15km for pedestrians (vulnerable groups), >0.25km for pedestrians (non-vulnerable groups), >1km for cyclists and/or >3km for vehicles 	Adverse	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> Current journey pattern within a community is maintained but there may be some hindrance to movement for communities including the requirement to use of a new underpass/overbridge Journey distance would be increased by <0.15km for pedestrians (vulnerable groups), <0.25km for pedestrians (non-vulnerable groups), <1km for cyclists and/or <3km for vehicles 	Adverse	Negligible to Minor	✓ - High value receptors	ALL
<ul style="list-style-type: none"> Traffic levels are reduced by >30% in urban areas or where the existing road substantially bisects a village or small town, or by >75% in rural areas 	Beneficial	Moderate to Major	✓	ALL
<ul style="list-style-type: none"> Traffic levels are reduced by <30% in urban areas or where the existing road substantially bisects a village or small town, or by <75% in rural areas 	Beneficial	Negligible to Minor	✓ - High value receptors	ALL

12.5 Mitigation

- 12.5.1 At this stage designs are not developed to include detailed mitigation measures. This section provides potential mitigation taking consideration of best practice, legislation and guidance. Further detailed mitigation measures for the Preferred Option will be developed during DMRB Stage 3.
- 12.5.2 The route options have not been developed at this stage to consider specific provisions for NMUs. The design has however considered alternative access routes where the route option would sever an existing access and where no reasonable local alternative exists.
- 12.5.3 The following mitigation measures for the People and Communities assessment (MPC1 – MPC4) have been assumed in this assessment:
- MPC1: Where NMU routes are directly impacted, diversions or re-routing of existing paths will be implemented to maintain the connectivity of the path network. To inform the assessment the most likely path diversions have been assumed in some locations where a clear connection could be made without the requirement for significant additional land take;
 - MPC2: Surfacing of any new paths to be provided will consider the existing type of user and the design will be developed taking account of need;
 - MPC3: Where vehicle access to private properties and community land and facilities is permanently impacted, reinstatement or an alternative access will be provided; and
 - MPC4: Where land take is required from private properties or community land and facilities, consideration will be given to amending earthwork slopes to reduce/remove the land take requirements where possible.
- 12.5.4 Where no specific mitigation has been developed at this stage, this is identified in Tables 12.5 to 12.10 with a 'N/A' entry in the table column for assumed mitigation. Further design development will be undertaken during DMRB Stage 3 to develop specific mitigation measures.

12.6 Predicted Environmental Effects

- 12.6.1 This section presents the key predicted environmental effects of the route options. Predicted effects have been assessed prior to mitigation and the residual effects then evaluated following assumed mitigation (see Section 12.5). Where significant residual effects (i.e. major or moderate significance) are presented in Tables 12.5 to 12.10, the text is set out in bold.
- The predicted effects for the Cyan and Red route options are summarised in Tables 12.5 and Table 12.6 respectively;
 - The predicted effects for the Pink and Brown route options are summarised in Tables 12.7 and Table 12.8 respectively; and
 - The predicted effects for the Violet and Orange route options are summarised in Tables 12.9 and Table 12.10 respectively.
- 12.6.2 These tables capture the key findings of the assessment and more detailed supporting assessments are set out in Volume 4b, Appendix A12.2: NMU

Assessment Tables and Appendix A12.3: Community Land and Facilities Assessment Tables.

12.6.3 The assessment tables should be read in conjunction with Volume 5, Figures 12.1 to 12.13 which show the following:

- NMU routes;
- Private properties directly affected and those whose access is significantly affected; and
- Significantly affected areas of community land and facilities.

Table 12.5 Predicted Effects – East of Huntly to Colpy (Cyan Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
<p>NMU Assessment</p>	<p>Users of two NMU routes (High sensitivity) are predicted to experience a significant adverse effect to amenity as a result of adverse change in the existing views, air quality, noise levels and/or traffic flows</p> <ul style="list-style-type: none"> Existing local route (Huntly to Greenmyres community path) – The Cyan route option is expected to result in considerable adverse changes to the amenity of this NMU route. The current route is in a tranquil setting and the route option may lead to an alteration in the character of the eastern section of this route. Existing local route (Scotston Loop) – The current NMU route is in a tranquil setting and the Cyan route option may lead to an alteration in the character of the eastern section of this route. 	<p>Major to moderate adverse</p>	<p>N/A</p>	<p>Major adverse residual effects due to changes in amenity to Huntly to Greenmyres community path).</p> <p>Moderate adverse residual effects due to changes in amenity to Scotston Loop</p>
<p>Private Properties Assessment</p>	<p>Land take</p> <p>There would be total loss of an outbuilding structure in a field adjacent to the existing A96/U82S junction which would require demolition due to earthworks. This appears to be an unoccupied building (low sensitivity).</p> <p>Minor land take required from Bardstreen/Ritchies Garage and from a land parcel plot on Jericho Road near Colpy.</p>	<p>Minor to moderate adverse</p>	<p>MPC4</p>	<p>Minor to Moderate adverse residual effects predicted due to demolition of the outbuilding.</p> <p>Minor adverse residual effects predicted to Bardstreen/Ritchies Garage and the Jericho Road parcel plot due to less than 10% land loss.</p>
	<p>Access to Private Property</p> <p>Access to all properties have been maintained. There are no significant effects predicted. Changes to some private accesses and alterations to the local road network are predicted to have minor effects on access to twelve private properties.</p>	<p>Minor adverse</p>	<p>MPC3</p>	<p>Minor adverse residual effects predicted due to partial severance</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Community Land and Facilities	<p>Land take, access and amenity</p> <p>Predicted significant effects on the amenity of and the journey to Culsalmond Community Education Centre and Morgan M^cVeighs Restaurant.</p> <p>Small loss of land associated with the curtilage of Culsalmond Community Education Centre where earthworks at Colpy Junction have encroached onto the land are predicted to have minor effects. No demolition is required.</p>	Minor to moderate adverse	MPC4, MPC2	<p>Land take from Culsalmond Community Education Centre will result in minor residual effects however</p> <p>Moderate adverse effects are anticipated due to changes in amenity of Culsalmond Community Education Centre and Morgan M^cVeighs Restaurant.</p>
Relief from Existing Severance	<p>Significant reduction in traffic flows on the existing A96 between East of Huntly and Colpy and on the A920 between Colpy and Oldmeldrum predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities, and between local communities.</p>	Major beneficial	N/A	<p>Major beneficial effects predicted for severance between East of Huntly and Colpy and Colpy and Oldmeldrum due to a reduction in traffic.</p>

Table 12.6 Predicted Effects – East of Huntly to Colpy (Red Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
<p>NMU Assessment</p>	<p>Users of two NMU routes (High sensitivity) are predicted to experience a significant adverse effect to amenity as a result of adverse change in the existing views, air quality, noise levels and/or traffic flows.</p> <ul style="list-style-type: none"> Existing local route (Huntly to Greenmyres community path) – The Cyan route option is expected to result in considerable adverse changes to the amenity of this NMU route. The current route is in a tranquil setting and the route option may lead to an alteration in the character of the eastern section of this route. Existing local route (Scotston Loop) – The current NMU route is in a tranquil setting and the Cyan route option may lead to an alteration in the character of the eastern section of this route. 	<p>Moderate to Major adverse</p>	<p>N/A</p>	<p>Major adverse residual effects due to changes in amenity to Huntly to Greenmyres community path).</p> <p>Moderate adverse residual effects due to changes in amenity to Scotston Loop.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Private Properties Assessment	<p>Land take</p> <p>Predicted significant effects resulting from a private burial site on the Hill of Foudland being directly affected by the route option.</p> <p>There would be total loss of an outbuilding structure in a field which would require demolition due to earthworks. This appears to be an unoccupied building (low sensitivity).</p> <p>Between 10% and 50% loss of land required from the private property Midtown due to earthworks.</p> <p>Minor land take required from Bardstreen/Ritchies Garage and from a land parcel plot on Jericho Road near Colpy.</p>	Moderate to Major adverse	MPC4	<p>Major adverse residual effects are predicted as a result of the direct effects on the private burial site.</p> <p>Moderate adverse residual effects predicted due to demolition of the outbuilding and land loss of Midtown.</p> <p>Minor adverse residual effects predicted to Bardstreen/Ritchies Garage and the Jericho Road parcel plot due to less than 10% land loss.</p>
	<p>Access to Private Properties</p> <p>Property access has been stopped up at the private property Glennieston which is predicted to have significant changes in access to the property.</p> <p>Access to a further eight properties have been maintained with minor changes to some private accesses and alterations to the local road network. No significant effects predicted</p>	Major adverse	MPC3	Minor adverse residual effects predicted.

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Community Land and Facilities	<p>Land take, access and amenity</p> <p>Predicted significant effects on the amenity of and the journey to Culsalmond Community Education Centre.</p> <p>Small loss of land associated with the curtilage of Culsalmond Community Education Centre where earthworks at Colpy Junction has encroached onto the land are predicted to have minor effects. No demolition is required.</p>	Minor to Moderate adverse	MPC4	<p>Land take from Culsalmond Community Education Centre will result in minor residual effects however Moderate adverse residual effects are anticipated due to changes in amenity of Culsalmond Community Education Centre.</p>
Relief from Existing Severance	<p>Significant reduction in traffic flows on the existing A96 between East of Huntly and Colpy and on the A920 between Colpy and Oldmeldrum predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities, and between local communities.</p>	Major beneficial	N/A	<p>Major beneficial effects predicted for severance between East of Huntly and Colpy and Colpy and Oldmeldrum due to a reduction in traffic.</p>

Table 12.7 Predicted Effects – Colpy to Pitcaple (Pink Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
NMU Assessment	<p>Users of two NMU routes (High sensitivity) are predicted to experience a significant adverse effect to amenity or perceived safety of journeys due to change in existing views and/or traffic flows:</p> <ul style="list-style-type: none"> • Core Path (L3R) – The new A96 may cause hinderance as the highway design indicates that the side road is to be an overbridge where it traverses the Pink route option. There will be a noticeable change in existing views due to the overbridge for the new A96. • Core Path (415.02) – The new A96 may cause hinderance as the highway design indicates that the Lewesk access road is to be an underbridge where it traverses the Pink route option. There will be a noticeable change in existing views due to the overbridge for the new A96. 	Moderate adverse	MPC2	Moderate adverse residual effect on NMUs due to reduction in amenity of routes
	<p>Users of one NMU route (High sensitivity) are predicted to experience a significant adverse effect to journeys due to considerable adverse changes in amenity and journey distance:</p> <ul style="list-style-type: none"> • Core Path (404.01) - Route requires diversion. Potential journey distance increase for pedestrians of approximately 900m. NMUs would be required to walk along the side road between Durno and Pitcaple then along Lourin Close. The current core path is a countryside off road route and connects other core paths to create an extended network. 	Major adverse	MPC1 and MPC2	Major adverse residual effects due to complete severance of core paths and the required significant diversions of this route with the amenity of the route significantly affected resulting in a likely reorganisation of habits by users

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Relief from Existing Severance	<p>The B992 Auchleven to Fisherford will see an increase in traffic flows from Inch to Kellockbank due to traffic routing to the Kellockbank (Pink) Junction.</p> <p>There will be, however, a significant reduction in traffic flows on the existing A96 between Colpy and Pitcaple predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities, and between local communities.</p>	Moderate beneficial	N/A	Moderate beneficial effects predicted for severance between Colpy and Pitcaple due to a significant reduction in traffic on the existing A96.

Table 12.8 Predicted Effects – Colpy to Pitcaple (Brown Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
NMU Assessment	<p>Users of two NMU routes (High sensitivity) predicted to experience a significant adverse effect to journeys due to considerable adverse changes in amenity and journey distance:</p> <ul style="list-style-type: none"> Core Path (404.02) – NMU route will require diversion. Potential journey distance increase for pedestrians of approximately 900m. The current core path is a countryside off road route and will require diversions or features to navigate around. This route also connects other core paths to create an extended network. Core Path (404.01) – NMU route will require diversion. Potential journey distance increase for pedestrians of approximately 900m. The current core path is a countryside off road route and will require diversions or features to navigate around. This route also connects other core paths to create an extended network through the local communities of Whiteford, Durno and Old Rayne. 	Major adverse	MPC1, MPC2	Major adverse residual effects due to the substantial diversion of core paths and considerable changes in amenity.

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
	<p>Users of two NMU routes (High sensitivity) are predicted to experience a significant adverse effect to journeys due to noticeable adverse changes to existing views:</p> <ul style="list-style-type: none"> Existing local route (GA1) - Path would be cut short by approximately 800m and would be diverted back onto the existing route resulting in loss of path provision at this point. The path will also experience a reduction of traffic flows along the minor road (U61S) however the changes will result in a noticeable adverse change in existing views. Existing local route (GA3) - Existing route (Lourin Close-side road U84C) will be realigned slightly north, therefore there will be a noticeable adverse change in existing views resulting in a change of amenity. Expected increase of traffic flow along Lourin Close of approximately 300 vehicles per day. 	Moderate adverse	MPC1, MPC2	Moderate adverse residual effect on NMUs due to reduction in amenity.
Private Properties Assessment	<p>Land take</p> <p>A moderate loss of land associated with the north-western curtilage of private property Colrayne required for earthworks.</p>	Moderate adverse	MPC4, MPC3	Moderate adverse residual effects predicted.
	<p>Access to Private Properties</p> <p>Changes to private access and alterations to the local road network are predicted to have minor effects on access for 12 properties.</p>	Minor to Major adverse		Minor adverse residual effects predicted to a further 12 properties.

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Community Land and Facilities	<p>Land take, access and amenity</p> <p>Predicted significant effects to users of the Durno and Logie Woodland area resulting from land take and associated effects to amenity and access. The area of land lost from Durno and Logie Woodland area contains core path provision. Access therefore through the woodland will be severed.</p> <p>Predicted significant adverse effects on the amenity of and the journey to Kellockbank Country Emporium and Coffee Shop.</p> <p>Predicted significant adverse effects to the amenity of the River Urie as a result of the proximity of the scheme.</p>	Moderate to Major adverse	MPC1, MPC2, MPC4	<p>Major adverse effects due to land take from Durno and Logie Woodland area resulting in the partial loss of facility</p> <p>Moderate adverse residual effects due to changes to the amenity of the Kellockbank Country Emporium and Coffee Shop and to the amenity of the River Urie.</p>
Relief from Existing Severance	<p>The B992 Auchleven to Fisherford will see an increase in traffic routing to and from Kellockbank Junction (Brown).</p> <p>There will, however, be a significant reduction in traffic flows on the existing A96 between Colpy to Pitcaple predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities, and between local communities.</p>	Moderate beneficial	N/A	Moderate beneficial effects predicted for severance between Colpy and Pitcaple due to a significant reduction in traffic on the existing A96.

Table 12.9 Predicted Effects – Pitcaple to Kintore (Violet Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
NMU Assessment	Users on five NMU routes (High sensitivity) are predicted to experience significant effects as a result of changes to existing views and/or traffic flows to journey distance and amenity and/or the perceived safety of journeys:	Moderate to Major adverse	MPC1, MPC2	Moderate to Major adverse residual effect on NMUs due to

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
	<ul style="list-style-type: none"> • PRoW (GG53) – NMU route has been severed and will require diversion which is predicted to increase journey distance of greater than 500m for NMUs. Considerable adverse change in existing conditions and views resulting in a change of amenity. The path is a countryside off road route and will require diversions on the road network with features to navigate around. Perceived safety will likely be negatively impacted. • Core Path (408.06) – This NMU route will be severed by the new Tavelty Junction resulting in an increased journey length of 100m. Predicted noticeable adverse change in existing conditions and views resulting in a change of amenity. This core path connects other core paths to create an extended network. Both the northern and southern sections of this path are impacted. • Core Path (408.06R) – Only minor alterations are predicted to this path with barely noticeable changes in existing views, however this path connects other core paths to create an extended network. The path links to a wider path network therefore the effects are considered higher due to the impacts on community connectivity. • Core Path (309.04P) – Traffic flow increases along the C76C between the new Daviot Junction to Oldmeldrum (A920) are predicted to result in a noticeable adverse change in amenity and perceived safety. • Existing local route (GA3) - Predicted adverse effects due to a considerable adverse change in amenity. The new A96 will traverse the path and introduce junctions and a roundabout for NMUs to negotiate. Traffic flow increases along the C76C between the new Daviot Junction to Oldmeldrum (A920) is predicted to result in an adverse change in amenity and perceived safety of this route. This route has been impacted at several locations. 			<p>severance and reduction in amenity.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
	<p>Beneficial effects to users of four NMU routes (High sensitivity). Reductions in traffic volumes are associated with the beneficial effects to the amenity and potential safety of users:</p> <ul style="list-style-type: none"> • PRow (GG55) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the existing A96 between Blackhall (B9144) and Port Elphinstone (B993). • PRow (Unrecorded path passing from the B993 to Kemnay Road, Inverurie) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the existing A96 between Blackhall (B9144) and Port Elphinstone (B993). • Core Path (408.09) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along Oldmeldrum road, Inverurie (B9170). • Core Path (408.11P) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the B9001 in Inverurie between the Portstown Link to Harlaw Road. 	<p>Minor to moderate beneficial</p>	<p>N/A</p>	<p>Minor to moderate beneficial residual effect through significant reductions in traffic volumes and associated amenity benefits.</p>
	<p>No significant impacts predicted for users of six paths</p> <ul style="list-style-type: none"> • Core Path (410.01) – predicted to have little noticeable change from the current conditions. • Existing local route (GA3) – predicted to have little noticeable change from the current conditions along the B9170 between Oldmeldrum (A920) and the new Uryside Junction. • Existing local route (GA2) – predicted to have little noticeable change from the current conditions along the C116C. • Core Path (408.04) – predicted to have little noticeable change from the current conditions along the C116C. • Core Path (309.05) – predicted to have little noticeable change from the current conditions along the B9170. • Existing local route (A96 Inverurie to Kintore: Foot/Cycleway) – predicted to increase journey distance by up to 250m. 	<p>Minor adverse</p>		<p>Minor adverse residual effects due to slight increases in journey distance or increase in traffic with barely noticeable adverse amenity impacts.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Private Properties Assessment	<p>Land take</p> <p>Less than 10% land take required from Broadward, the Industrial property at Hillhead of Lethenty, Greenacre, Sunnyside and 52 Forest Road.</p> <p>Between 10% and 50% land loss required from The Lodge at Lethenty, Whinstone House and Isaacstown Steading.</p> <p>Demolition of Roundhaugh outbuilding and a structure in a field opposite Eastfield and Orcadia required (low sensitivity).</p>	Minor to Moderate adverse	MPC4, MPC3	<p>Minor adverse residual effects predicted for Broadward, the Industrial property at Hillhead of Lethenty, Greenacre, Sunnyside and 52 Forest Road.</p> <p>Moderate adverse residual effects predicted due to loss of land from The Lodge at Lethenty, Whinstone House and Isaacstown Steading, and demolition of low sensitivity buildings e.g. outbuildings.</p>
	<p>Access to Private Properties</p> <p>The main access to the industrial property at Hillhead of Lethenty leads on to the B9001. This access has been severed. This property can be accessed via a second route at Parkview. Using this route will increase distance for access of 1000-5000m.</p> <p>Complete severance to field access at private property Roundhaugh. Access route via fields, via B9170 at Bourtie Industrial Park. Uryside Junction East severs access to the B9170 at this location with no alternative access provided.</p> <p>Complete severance to a derelict building (low sensitivity) near private property Little Hillbrae.</p> <p>Changes to some private accesses and alterations to the local road network, are predicted to have minor effects to 31 private properties and Kintore Business Park.</p>	Moderate to Major adverse		<p>Minor to Moderate adverse residual effects predicted due to journey distances increase at the industrial property, and on the basis that access is provided to Roundhaugh.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Community Land and Facilities	<p>Land take, Access and Amenity</p> <p>Predicted significant adverse effects on the amenity of Fyfe House (Girl Guides) and the journey to Overdon Care Home.</p> <p>Predicted significant adverse effects on the amenity of and the access road to the Kintore Cemetery.</p> <p>Predicted significant effects resulting from land take and associated effects on the amenity of or the access/journey to Orcadia equestrian property, impacting the function of this facility.</p> <p>Small loss of land associated with the curtilage of Hogholm Stables equestrian property impacting the function of this facility.</p>	Moderate to Major adverse	MPC1, MPC2, MPC3, MPC4	<p>Major adverse residual effects on Orcadia due to land take required.</p> <p>Moderate adverse residual effect on Overdon Care Home, Fyfe House (Girl Guides) and Hogholm Stables due to change in amenity.</p> <p>Moderate adverse residual effect on Kintore Cemetery where journey distance can be reduced.</p>
Relief from Existing Severance	<p>Moderate reduction in traffic flows on the existing A96 between Pitcable and Kintore are predicted to lead to improvements in amenity and to facilitate access to properties and community land and facilities, and between local communities.</p> <p>Traffic using the Violet route option will re-join the existing A96 at Tavelty Junction which results in reduced traffic flow on existing A96 between Thainstone and Kintore. It is predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities for users of the road between Port Elphinstone and Kintore.</p>	Moderate beneficial	N/A	<p>Moderate beneficial effects predicted for severance between Pitcable and Kintore due to reduction in traffic flow.</p>

Table 12.10 Predicted Effects – Pitcaple to Kintore (Orange Route Option)

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
<p>NMU Assessment</p>	<p>Predicted significant effects on journey distance and amenity of journeys and/or the perceived safety of users on nine NMU routes (High sensitivity) as a result of changes to existing views and/or traffic flows:</p> <ul style="list-style-type: none"> • PRow (GG55) - Route is severed and will result in diversion increasing journey distance by approximately 400m. There would be loss of provision at Wooded Burn as a result of this route option and considerable adverse changes in amenity. This route also connects other core paths (e.g. 408.05P) to create an extended network. • Core Path (408.04R) – Predicted journey distance increase of approximately 100m with noticeable changes to amenity due to the Blackhall Road Junction. • Core Path (408.05P) – Route is severed with a predicted increase in journey distance of greater than 500m for NMUs. This path currently traverses a large woodland area therefore it is predicted to have considerable changes to existing amenity. • Core Path (408.04) – Noticeable adverse changes to amenity due to the new Blackhall Road Junction at this location. Slight traffic flow increases also predicted along the C116C resulting in NMUs experiencing change in amenity. • Core Path (408.06) – Route is severed resulting in diversions with a predicted increase in journey distance of greater than 500m for NMUs and considerable adverse changes in existing conditions and views. • Existing local route (GA3) – This route has been adversely impacted at several locations. At its most impacted location it sits adjacent to the Orange route option and is severed by the new A96 exposing users to a noticeable adverse change in amenity. Traffic flow increases along the C76C are 	<p>Moderate to Major adverse</p>	<p>MPC1, MPC2</p>	<p>Moderate to Major adverse residual effects due to severance and reduction in amenity of routes.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
	<p>predicted to result in a noticeable adverse change in amenity and perceived safety at this location.</p> <ul style="list-style-type: none"> • Existing local route (GA2) – Predicted considerable adverse effects to amenity as this path is severed several times within a short distance. • Core Path (309.04P) – Predicted adverse effects due to traffic flow increases along the C76C resulting in a noticeable adverse change in amenity and perceived safety. • Existing local route (A96 Inverurie to Kintore: Foot/Cycleway) - Predicted adverse effects due to traffic flow increases along the realigned A96 between Thainstone Junction and Tavelty Junction. <p>Beneficial effects to users of six NMU routes (High sensitivity). Reductions in traffic volumes are associated with the beneficial effects to the amenity and potential safety of users:</p> <ul style="list-style-type: none"> • PRoW (GG55) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the existing A96 between Blackhall (B9144) and Port Elphinstone (B993). • PRoW (Unrecorded path passing from the B993 to Kemnay Road, Inverurie) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the existing A96 between Blackhall (B9144) and Port Elphinstone (B993). • Core Path (408.09) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along Oldmeldrum road, Inverurie (B9170). • Core Path (408.11P) – Predicted to experience an improvement to the amenity of the path as a result of traffic 	<p>Minor to moderate beneficial</p>	<p>N/A</p>	<p>Minor to moderate beneficial residual effect through significant reductions in traffic volumes and associated amenity benefits.</p>

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
	<p>flow reductions along the B9001 in Inverurie between the Portstown Link to Harlaw Road.</p> <ul style="list-style-type: none"> Existing local route (GA3) - Traffic flow reductions along the B9001 are predicted to result in beneficial change in amenity and perceived safety. Existing local route (Pitcaple Wood) – Predicted to experience an improvement to the amenity of the path as a result of traffic flow reductions along the existing A96. <p>No significant impacts predicted for users of three paths</p> <ul style="list-style-type: none"> Core Path (309.05) – Slight traffic flow increases along the B9170 are predicted to result in NMUs experiencing little noticeable change in amenity from the current conditions at this location Existing local route (GA3) – Traffic flow increases along the B9170 and the B9001 between Wartle (A920) to Daviot (U77C) are predicted to occur however NMUs are likely to experience little noticeable change in amenity from the current conditions at these locations Existing local route (GA2) – Slight traffic flow increases along the C116C are predicted to result in NMUs experiencing little noticeable change in amenity from the current conditions at this location. 	Minor adverse	N/A	Minor adverse residual effect due to slight increases in traffic with barely noticeable adverse amenity impacts.
Private Properties Assessment	<p>Land take Less than 10% land take required from Whinstone House at Tavelty.</p>	Minor adverse	MPC4	Minor adverse as a result of land take of the curtilage of the property.
	<p>Access to Private Properties Changes to some private accesses and alterations to the local road network are predicted to have minor effects on 11 additional properties.</p>	Minor adverse	MPC3 and MPC4	Minor adverse residual effects predicted on the

Sub-topic	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
				basis that access is maintained.
Community Land and Facilities	<p>Land take, Access and Amenity Predicted significant effects to users of Kemnay Wood – Roquharold Hill and surrounding woodland area resulting from land take and associated effects on amenity and access. The area of land lost from the woodland area contains core path provision. Access therefore through the woodland will be severed.</p> <p>Predicted significant adverse effects on amenity and access to Newseat walks and trails, Crichtiebank Business Centre Woodland, and River Don.</p>	Major adverse	MPC1, MPC2, MPC4	<p>Major adverse effects due to land take from Kemnay Wood – Roquharold Hill and surrounding woodland area resulting in the partial loss of facility.</p> <p>Moderate adverse effects predicted to River Don and Crichtiebank Business Centre Woodland area due to changes in amenity.</p> <p>Major adverse effects predicted to Newseat walks and trails due to changes in amenity.</p>
Relief from Existing Severance	<p>Moderate reduction in traffic flows on the existing A96 between Pitcaple and Thainstone are predicted to lead to improvements in amenity and to facilitate access to properties and community land and facilities, and between local communities.</p> <p>Traffic using the Orange Route Option will re-join the existing A96 at Thainstone Roundabout / Junction which results in increased traffic flow on existing A96 between Thainstone and Kintore. Therefore, the orange route option will not perform as well as the Violet Route Option across this stretch of the existing A96.</p>	Moderate beneficial	N/A	Moderate beneficial effects predicted for severance between Pitcaple and Thainstone due to reduction in traffic flow.

12.7 Cumulative Effects

- 12.7.1 A review of the proposed future development areas outlined in the Aberdeenshire LDP 2017 has identified the potential for cumulative effects to occur on people and communities between Pitcaple and Kintore.
- 12.7.2 Most of the proposed developments identified are small scale developments (for instance, construction of single dwelling houses, general purpose agricultural storage barns/sheds and pathways, and erection of signage) which will have a minimal cumulative effect on people and communities when considered in combination with the proposed route options.
- 12.7.3 There are however a number of larger development proposals identified in the LDP Settlement Statements, particularly around the towns of Inverurie and Kintore, which may give rise to cumulative effects on people and communities within the route option study areas. These are:
- Old Rayne/OP1: allocation for 30 houses, business and retail use;
 - Old Rayne/OP2: allocation for 30 houses, business and retail use;
 - Inverurie & Port Elphinstone/OP3: allocation for 250 houses;
 - Inverurie & Port Elphinstone/OP4 & OP11: allocation for 737 houses, business and industrial uses, community facilities and retail use;
 - Inverurie & Port Elphinstone/OP7-OP9: allocation for 750 houses;
 - Inverurie & Port Elphinstone/OP10: allocation for 220 houses;
 - Inverurie & Port Elphinstone/OP14: allocation for 25 houses;
 - Inverurie & Port Elphinstone/OP12, OP13 & OP16: allocation for business use;
 - Inverurie & Port Elphinstone/SR1/2: allocation for business use;
 - Inverurie & Port Elphinstone/BUS5-10: allocation for business use;
 - Kintore/BUS1: allocation for business use; and
 - Kintore/BUS2 & R2: proposed new station and transport interchange.
- 12.7.4 The following developments are located within the study area of the Orange route option and are considered to result in a cumulative effect:
- Inverurie & Port Elphinstone/OP4 & OP11: allocation for 737 houses, business and industrial uses, community facilities and retail use. The provision of this development in combination with the Orange route option and the new Thainstone Junction to the south of Port Elphinstone is predicted to have significant cumulative effects; and
 - Inverurie & Port Elphinstone/OP12: The allocation is to include office development only (Class 4). The site conditions must contribute proportionally towards major improvements in relation to the Thainstone and Port Elphinstone roundabouts/junctions, including the construction of a new grade separated interchange to replace the Thainstone and Port Elphinstone

roundabouts. This will have a minor cumulative effect on the Orange route option.

- 12.7.5 Significant cumulative effects are predicted to the amenity of Kemnay Wood – Roquharold Hill and surrounding woodland, and of the NMU routes associated with and surrounding this facility (GG55 and 408.05P) as a result of the Orange route option in combination with the effects of OP4 and OP11. The location of the woodland area and NMU routes to the route option and to the future development results in significant changes to the amenity of these receptors.
- 12.7.6 Significant cumulative effects are predicted to the NMU routes along the River Don (ELR – GA2) as well as the amenity of the River Don as a result of their location due to the Orange route option and to OP4 and OP11.
- 12.7.7 Further significant cumulative effects are predicted to the following NMU routes due to changes to journey amenity as a result of the Orange route option:
 - 408.06; and
 - 408.6R.
- 12.7.8 Further significant cumulative effects are predicted to the community outdoor area-based facilities at Crichtiebank Business Centre Woodland area due to changes to amenity as a result of the Orange route option.
- 12.7.9 From the information available at this stage, it is considered that there would be no cumulative effects on other NMU routes, community land and facilities, private properties or communities for any other route options.

12.8 Summary of Effects

- 12.8.1 This section sets out a summary of the key findings of the assessment based on the predicted significant residual effects. The summaries are presented in Tables 12.11 to 12.13 and should be reviewed with reference to Volume 5, Figures 12.1 to 12.13.

Summary of East of Huntly to Colpy – Cyan and Red Route Options

Table 12.11 Summary of Significant Residual Effects - East of Huntly to Colpy (Cyan and Red Route Options)

Criteria	Significant Residual Effects for Cyan Route Option	Significant Residual Effects for Red Route Option
NMU Routes	It is predicted that NMUs would experience major adverse effects on Huntly to Greenmyres community path and moderate adverse residual effects on Scotston Loop as a result of changes to the amenity of their journey.	It is predicted that NMUs would experience major adverse effects on Huntly to Greenmyres community path and moderate adverse residual effects on Scotston Loop as a result of changes to the amenity of their journey.

Criteria	Significant Residual Effects for Cyan Route Option	Significant Residual Effects for Red Route Option
Private Properties	Demolition of outbuilding structure at the existing A96/U82S junction is predicted to result in moderate adverse effects.	Demolition of outbuilding structure at the existing A96/U82S junction is predicted to result in moderate adverse effects. Major adverse effects predicted on the private burial site on Hill of Foudland.
Community Land and Facilities	Moderate adverse effect due to change in existing views resulting in a change of amenity to Morgan M ^c Veighs Restaurant and Culsalmond Education Centre.	Moderate adverse effects on Culsalmond Education Centre due to a noticeable change in existing views resulting in a change of amenity.
Relief from Existing Severance	Reduction in traffic flows on the existing A96 and A920 are predicted to lead to improvements in amenity and facilitate access between local communities surrounding Colpy. People will therefore experience major beneficial effects.	Reduction in traffic flows on the existing A96 and A920 are predicted to lead to improvements in amenity and facilitate access between local communities surrounding Colpy. People will therefore experience major beneficial effects.

- 12.8.2 The Cyan route option will have significant effects due to the demolition of an outbuilding structure. It is not predicted that any further demolition or significant loss of land will occur. Significant amenity effects to community land and facilities are predicted to occur to Morgan M^cVeighs Restaurant and Culsalmond Education Centre.
- 12.8.3 The Red route option will have significant effects due to the demolition of an outbuilding structure. Direct impacts on a private burial site on Hill of Foudland are predicted to result in major adverse effects. It is not predicted that any further demolition or significant loss of land will occur. Significant amenity effects to community land and facilities are predicted to occur to Culsalmond Education Centre.
- 12.8.4 Both route options result in similar beneficial effects through reducing traffic along the existing A96 and A920, and relieving severance for a number of communities including Colpy. Additionally, they both are expected to result in significant residual effects on two existing local routes; Huntly to Greenmyres community path and Scotston Loop.
- 12.8.5 Overall, the Cyan route option is predicted to have less impact on people and communities.

Summary of Colpy to Pitcaple – Pink and Brown Route Options

Table 12.12 Summary of Significant Residual Effects - Pink and Brown Route Options

Criteria	Significant Residual Effects for Pink Route Option	Significant Residual Effects for Brown Route Option
NMU Routes	<p>It is predicted that NMUs would experience moderate adverse effects on two core paths (L3R and 415.02) and major adverse effects to a further core path (404.01). Users of these routes are expected to experience adverse effects to amenity and considerable hindrance to their existing journey.</p> <p>Core Path 404.01 is predicted to be most affected with major adverse residual effects as it is predicted users will experience considerable adverse effects on amenity and an increase in journey length.</p> <p>Major beneficial effects predicted for NMUs using one existing local route (GA1) as a result of a predicted reduction of traffic flow where GA1 meets the existing A96.</p>	<p>It is predicted that NMUs would experience major adverse effects on two core paths (404.02 and 404.01) and two existing local routes (GA1 and GA3). Users of these routes are expected to experience adverse effects to amenity and hindrance to their existing journey.</p> <p>Core Paths 404.01 and 404.02 are predicted to be most affected as it is predicted users will experience considerable adverse effects on amenity and an increase in journey length.</p>
Private Properties	Moderate adverse effects are predicted at Colrayne due to land loss.	Moderate adverse effects are predicted at Colrayne due to land loss.
Community Land and Facilities	Major adverse effects due to land take resulting in the partial loss of land used by the community, with major adverse changes to amenity and access to users of Durno and Logie Woodland area.	<p>Major adverse effects due to land take resulting in the partial loss of land used by the community, with major adverse changes to amenity and access to users of Durno and Logie Woodland area.</p> <p>Visitors to the River Urie and Kellockbank Country Emporium and Coffee Shop are predicted to experience moderate adverse effects on amenity.</p>
Relief from Existing Severance	Moderate beneficial effects due to reduction in traffic flows on the existing A96 between Colpy to Pitcaple is predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities for users of the road.	Moderate beneficial effects due to reduction in traffic flows on the existing A96 between Colpy to Pitcaple predicted to lead to improvements in amenity and facilitate access to properties and community land and facilities for users of the road.

12.8.6 The Pink route option is predicted to result in significant adverse effects on three core paths. Users of these paths are predicted to experience significant changes in amenity and hindrances to their existing journey. One existing local route (GA1) is predicted to experience major beneficial residual effects, where GA1 briefly meets the existing A96, due to traffic flow reductions along the existing A96

between Kellockbank (B992) and the proposed Carden Junction. Land take required from 'Colrayne' is predicted to result in a significant adverse effect on this property. Significant adverse effects on community land and facilities from the Pink route option are predicted due to loss of land at the northern extents of the Durno and Logie Woodland area.

- 12.8.7 The Brown route option is predicted to result in significant adverse effects to users of two core paths and two existing local routes, through an adverse change in amenity. Land take required from 'Colrayne' is predicted to result in a significant adverse effect on this property. No significant effects on journey length are predicted for private property accesses. The Brown route option is also predicted to have significant adverse effects on the Durno and Logie Woodland area due to loss of land at two locations through the centre of the facility, with significant adverse effects on amenity. Visitors to the River Urie and Kellockbank Country Emporium and Coffee Shop are expected to experience adverse effects on the amenity of their visits.
- 12.8.8 Both route options reduce traffic flow considerably along the existing A96 between Colpy to Pitcaple, which leads to significant beneficial effects in terms of relief from severance, predicted to lead to improvements in amenity and facilitate access to properties, community land and facilities for users of the road.
- 12.8.9 Overall, the Pink route option is predicted to have less impact on people and communities due to having less impact on community facilities and severance.

Summary of Pitcaple to Kintore - Violet and Orange Route Options

Table 12.13 Summary of Significant Residual Effects - Violet and Orange Route Options

Criteria	Significant Residual Effects for Violet Route Option	Significant Residual Effects for Orange Route Option
NMU Routes	<p>It is predicted that NMUs would experience major adverse residual effects on one PRoW (GG53), one core path (408.06) and one existing local route (GA3). Users of these routes are expected to experience an increased journey length and adverse effects to amenity.</p> <p>Users of Core Path 408.06R and 309.04P are predicted to experience moderate adverse effects due to adverse change to amenity of journey.</p> <p>Moderate beneficial effects predicted for NMUs using two routes (GG55 and the unrecorded PRoW passing from the B993 to Kemnay Road, Inverurie) as a result of traffic flow decreases.</p>	<p>It is predicted that NMUs would experience major adverse residual effects on five routes (GG55, 408.05P, 408.06, GA3 and GA2) and moderate adverse effects on five routes (GA3 where the path follows the C76C, 309.04P, 408.04R, 408.04 and ELR - A96 Inverurie to Kintore: Foot/Cycleway).</p> <p>Users of all nine NMU routes above are expected to experience adverse changes to the amenity of their journey.</p> <p>Moderate beneficial effects predicted for NMUs using four routes (408.11P, GA3 where the path follows the B9001 in Inverurie, GG55 and the unrecorded PRoW passing from the B993 to Kemnay Road, Inverurie) as a result of traffic flow decreases.</p>

Criteria	Significant Residual Effects for Violet Route Option	Significant Residual Effects for Orange Route Option
Private Properties	<p>Moderate adverse effects at the Industrial property at Hillhead of Lethenty, and major adverse effects at Roundhaugh are predicted due to increases in journey length.</p> <p>It is predicted The Lodge at Lethenty, Whinstone House and Isaacstown Steading will experience loss of land resulting in moderate adverse residual effects. Demolition is required of a derelict building at Roundhaugh also resulting in moderate adverse effects.</p>	No significant effects.
Community Land and Facilities	<p>Major adverse effects are predicted at Orcadia equestrian facility due to loss of land which may impact the function of this facility.</p> <p>Moderate adverse effects on amenity and/or journey length increase are predicted to Overdon Care Home, Fyfe House, Hogholm Stables and Kintore Cemetery.</p>	<p>Major adverse effects due to land take resulting in the partial loss of land used by the community with major adverse changes to amenity and access to users of Kemnay Wood – Roquharold Hill and surrounding woodland area. Visitors to Newseat walks and trails will also experience major adverse effects on the amenity of the site.</p> <p>Moderate adverse effects predicted to River Don and Crichtiebank Business Centre Woodland area due to changes in amenity.</p>
Relief from Existing Severance	<p>Overall moderate reduction in traffic flows on the existing A96 between Pitcable and Thainstone predicted to lead to moderate beneficial improvements in amenity and facilitate access to properties, community land and facilities for users of the road.</p> <p>Traffic using the Violet route option will re-join the existing A96 at Tavelty Junction which results in reduced traffic flow on existing A96 between Thainstone and Kintore. This is predicted to lead to improvements in amenity and facilitate access to properties, community land and facilities for users of the road between Port Elphinstone and Kintore.</p>	<p>Overall moderate reduction in traffic flows on the existing A96 between Pitcable to Thainstone predicted to lead to moderate beneficial improvements in amenity and facilitate access to properties, community land and facilities for users of the road.</p> <p>Traffic using the Orange route option will re-join the existing A96 at Thainstone Roundabout / Junction which results in increased traffic flow on existing A96 between Thainstone and Kintore. Therefore, the Orange route option will not perform as well as the Violet route option in terms of relief from severance across this stretch of the existing A96.</p>

12.8.10 The Violet route option is predicted to result in significant adverse effects to users of three core paths, a PRow and one existing local route by increasing journey distances and/or a reduction in the amenity for users. Two PRows are predicted

to experience beneficial residual effects due to traffic flow reductions along the existing A96. In terms of effects on private property, the demolition of one outbuilding is required, and significant land take is required from a further three private properties. Adverse effects on access to three private properties is predicted to be significant due to the increase in journey length. Orcadia equestrian facility is the only community facility predicted to be significantly affected by the Violet route option due to loss of land. Visitors to Overdon Care Home, Fyfe House, Hogholm Stables and Kintore Cemetery are predicted to experience significant adverse effects to amenity and/or journey length.

- 12.8.11 The Orange route option is predicted to result in significant adverse effects to users of nine NMU routes with all of these routes predicted to be adversely affected through changes in amenity and/or increases in journey length. NMU routes affected by the Orange route option make up a wider path network and are therefore predicted to negatively impact on the connectivity of the community. Four NMU routes are predicted to experience beneficial residual effects due to traffic flow reductions. Direct effects to community land and facilities are predicted to occur at Kemnay Wood – Roquharold Hill and surrounding woodland area due to land take, with further adverse effects on access and amenity predicted at Newseat walks and trails, Crichtiebank Business Centre Woodland area. There are no significant effects predicted to private property as a result of the Orange route option.
- 12.8.12 Both route options are predicted to have similar effects in terms of reducing community severance between Pitcaple and Thainstone however the Violet route option is predicted to perform better than the Orange route option. This is because the Orange route option shows an increase of traffic flows on the existing A96 between Thainstone and Kintore whereas the Violet route option shows a decrease in traffic flows.
- 12.8.13 Overall, the Orange route option is predicted to have less impact on private property and therefore less impact on people and communities.

12.9 Scope of DMRB Stage 3 Assessment

12.9.1 The DMRB Stage 3 assessment for people and communities will be undertaken in accordance with the DMRB (LA 112 Population and Human Health). The DMRB Stage 3 assessment will include a more detailed assessment of the Preferred Option for the following:

- NMU Assessment:
 - Confirm the information gathered from relevant statutory bodies and local councils, including types of users, through desk-based assessment and site visits;
 - Review the DMRB Stage 2 assessment of the amenity value of NMU routes utilising traffic flow data and the relevant assessments (e.g. air quality, noise and vibration and landscape and visual);
 - Update and define the level of significance of impacts for changes in journey length and amenity, taking into account mitigation;
 - Propose appropriate mitigation measures based on more detailed assessments; and

- Enhancement opportunities will be identified and developed at DMRB Stage 3 Assessment.
- Private Properties:
 - Further consideration of any properties at risk of demolition or land take and associated consideration of effect on the future viability of businesses;
 - Establish full land ownership details and update and define the level of significance of impacts for any land taken from private properties;
 - Update and refine the assessment of changes in journey lengths to access private properties; and
 - Consultation with landowners will be carried out to fully assess the potential impacts on future business viability which have not been assessed at DMRB Stage 2.
- Community Land and Facilities:
 - Confirm the information gathered from relevant statutory bodies, the local council and the general public to identify community land and facilities including any areas of importance for informal use; and
 - Update and refine the level of significance of impact for changes in accessibility, journey length and amenity, taking into account embedded mitigation.
- Community Severance:
 - Using updated traffic data for the Preferred Option to assess relief from existing severance and the potential for new severance within affected communities.

12.9.2 Further consultation will be undertaken with landowners, business owners and other key consultees to discuss the impact of the Preferred Option and to incorporate appropriate mitigation into the scheme design.

13 Agriculture, Forestry and Sporting Interests

13.1 Introduction

13.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 Assessment of the potential impacts of the route options on agriculture, sporting (including fishing) and forestry interests.

13.1.2 The assessment includes a discussion of the potential impacts of the route options and assessments of effects on land take, severance of land, land take of associated land and access arrangements for agricultural and forestry land holdings.

13.1.3 This assessment is supported by Figures 13.1 to 13.13 (Volume 5) and the following appendices (Volume 4b):

- Appendix A13.1: Assessment Methodology;
- Appendix A13.2: Land-take Calculations; and
- Appendix A13.3: Land Capability for Agriculture in Scotland Classifications.

Policy Context

13.1.4 The national, regional and local planning policies along with guidance relevant to community and private assets are identified in Paragraphs 13.1.5 to 13.1.15. Various national, structure and local plan policies that are relevant to agriculture, forestry and sporting issues are also summarised. Relevant documents are referenced further in Chapter 9, Policies and Plans.

National Planning Policy and Guidance

13.1.5 National planning policy on a variety of themes is contained within Scottish Planning Policy (SPP)⁵⁰. In terms of the impact of the route options on agriculture, forestry and sporting assets, SPP is focussed on:

- Achieving a sustainable economy;
- Supporting the efficient use of land, buildings and infrastructure;
- Promoting regeneration and the full and appropriate use of land, buildings and infrastructure;
- Supporting development, which will enhance local competitiveness and promoting the creation of mixed communities; and
- Supporting healthier living by improving the quality of the built environment, by increasing access to amenities, services and active travel opportunities, and by addressing environmental problems affecting communities.

13.1.6 SPP indicated that the fundamental principle of sustainable development is that it integrates economic, social and environmental objectives. The aim is to achieve the right development in the right place. SPP provides that the planning system

⁵⁰ Scottish Government, 2014, *Scottish Planning Policy*, available at: <https://www.gov.scot/publications/scottish-planning-policy/pages/2/>

should promote development that supports the move towards a more economically, socially and environmentally sustainable society.

13.1.7 Circulars and Planning Advice Notes (PANs) published by the Scottish Government provide further guidance on specific topics⁵¹.

13.1.8 The Scottish Government's Policy on Control of Woodland Removal (2009) has a particularly strong presumption against woodland removal.

Regional and Local Planning Policy and Guidance

13.1.9 The key development plan policies that are of relevance to agriculture, forestry and sporting interests are listed below:

- Aberdeenshire Local Development Plan (LDP) (2017)⁵²; and
- Aberdeen City and Shire Strategic Development Plan (2014)⁵³.

13.1.10 The Aberdeenshire LDP is the land-use plan, which will guide the development and investment in the region until 2026. The relevant policies in relation to this assessment include:

- Policy R1 Special rural areas;
- Policy P2 Open space and access in new development;
- Policy PR1 Protecting important resources; and
- Policy C3 Carbon sinks and stores.

13.1.11 Aberdeenshire LDP also provides planning advice through supplementary guidance, and the guidance of relevance to this assessment includes:

- Aberdeenshire Forestry and Woodland Strategy (2017)⁵⁴.

13.1.12 Aberdeen City and Shire Strategic Development Plan sets out the direction for future development within the region to ensure sustainable growth, protecting the natural environment and quality of life.

Review of Planning Policy

13.1.13 The key aspects of the relevant planning policies are discussed in the following paragraphs in relation to their relevance for agriculture, forestry and sporting interests.

13.1.14 As prime quality agricultural land is a finite national resource, SPP emphasises that development on it would not be permitted unless it is an essential component of

⁵¹ Scottish Government, 2008, *PAN 65: Planning and Open Space*, available at: <https://www.gov.scot/publications/planning-advice-note-pan-65-planning-open-space/> and *Circular 18/1987 (as amended by 29/1988 and 25/1994): Development involving agriculture land, are of relevance to agricultural, forestry and sporting interest* available at: <https://www2.gov.scot/Publications/1987/10/circular-18-1987>

⁵² Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan 2017*, available at: <https://www.aberdeenshire.gov.uk/planning/plans-and-policies/aberdeenshire-local-development-plan-2017/>,

⁵³ Aberdeen City and Shire, 2014, *Aberdeen City and Shire Strategic Development Plan*, available at: <http://www.aberdeencityandshire-sdpa.gov.uk/nmsruntime/saveasdialog.aspx?IID=1111&SID=38>

⁵⁴ Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan: Supplementary Guidance- Aberdeenshire Forestry and Woodland Strategy*, available at: <https://www.aberdeenshire.gov.uk/media/20174/8-aberdeenshire-forestry-and-woodland-strategy.pdf>

the settlement strategy or it is necessary to meet an essential need (e.g. major infrastructure) where no other suitable site is available.

- 13.1.15 Policy PR1 states that prime agricultural land should not normally be developed unless it is allocated in the local development plan. The Aberdeen City and Shire Strategic Development Plan (2014) states the Scottish Government's commitment to the dualling of the A96 and values this as a strategic growth area between Aberdeen to Huntly.
- 13.1.16 SPP recommends that planning authorities should consider preparing woodland strategies to inform future development of woodland (including forestry) in their area. In response to this, Aberdeenshire Council have prepared supplementary guidance (Aberdeenshire Forestry and Woodland Strategy, 2017), which provides further information in support of Policy PR1. This strategy reflects the Council's strong presumption in favour of protecting woodlands, and development resulting in its loss will not be supported unless it can offer clear and significant public benefit and provide compensatory planting.

13.2 Approach to Assessment

- 13.2.1 The assessment has been undertaken with reference to DMRB Interim Advice Note 125/09 'Supplementary Guidance for users of DMRB Volume 11 Environmental Assessment' (Highways Agency, 2009) (hereafter referenced as IAN 125/09). This states that the guidance in DMRB (Volume 11, Section 3, Part 6 'Land Use' (Highways Agency *et.al.*, 2001)) should be followed.
- 13.2.2 During this assessment updated DMRB guidance was issued, and a review of this new guidance was undertaken to ensure the assessment was robust. Details are provided in Section 13.2.19.
- 13.2.3 For the purposes of this assessment, agriculture, forestry and sporting interests include:
- Land used for the practice of cultivating the land and rearing stock to produce food products;
 - Land used for growing trees to produce wood and wood products for commercial purposes;
 - Land used for grazing horses, livery yards or riding stables (note that recreational equestrian routes for hacking and horse trekking is covered in Chapter 12, People and Communities); and
 - Land used for activities such as shooting and stalking over agricultural land, as well as water and fishing activities in and on lochs, reservoirs, rivers, burns, canals and ponds (recreational) (note that fisheries, such as Loch Insch Fishery, are considered within Chapter 12, People and Communities).
- 13.2.4 The impact of the route options on sporting interests, except for equestrian and fishing access routes, where known, within the context of agricultural and forestry land interests has been scoped out at this stage. This is due to land use in the study area mainly focused on agricultural and forestry operations, with sporting interests being a smaller element of land use. The information required to carry out an assessment of the full extent of sporting activity is not available at a DMRB Stage 2 level. A more detailed and comprehensive study, including landowner interviews will occur at DMRB Stage 3 where this information will be gathered. This assessment of land take and disruption to agricultural and forestry operations

through severance of fields and access is considered to provide enough differentiation between the route options for the purpose of the DMRB Stage 2 assessment. Sporting interests, including fishing, will be considered further during the DMRB Stage 3 assessment. Study Area

- 13.2.5 The study area for the assessment has been defined as 500m from the centreline of each route option, however, in some cases, this may extend beyond this to allow for consideration of the potential impacts of severance to access to farms, forests and equestrian units.

Sources of Information

- 13.2.6 Baseline conditions for agriculture, forestry and equestrian interests were identified through a review of the following:
- Aerial photographs;
 - Ordnance Survey (OS) maps;
 - Macaulay Land Use Research Institute (MLURI), now the James Hutton Institute (JHI), Land Capability for Agriculture data⁵⁵; and
 - Ancient Woodland Inventory (Scotland)⁵⁶.

Assessment Methodology

- 13.2.7 The assessment of impacts on agriculture, forestry and equestrian holdings is undertaken by determining the sensitivity and magnitude according to the criteria provided in Volume 4b, Appendix A13.1: Table 1.1 and 1.2. The impact significance was determined using Volume 4b, Appendix A13.1: Table 1.3.
- 13.2.8 In respect of agriculture, forestry and equestrian land, the four main areas covered in the assessment are specified as:
- Land take in relation to the quality of agricultural, forestry and equestrian land;
 - Type of land use affected (arable, grassland, woodland);
 - Severance, including the number of fields affected; and
 - The need for major accommodation works beyond that which are embedded in the DMRB Stage 2 route option designs and which would be developed during the DMRB Stage 3 assessment.
- 13.2.9 The area is mapped by the JHI for Land Capability for Agriculture (LCfA). This classification system gives an indication of the capability of the land to grow certain types of crops and grass. Land is classified into seven main classes, some of which have subdivisions. Class 1 is the best quality land and Class 7 is the poorest quality land. Classes 1, 2 and 3.1 are known as prime quality land and Classes 3.2-7 are known as non-prime land. For full descriptions of land classifications see Volume 4b, Appendix A13.3: Land Capability for Agriculture in Scotland Classifications.
- 13.2.10 The estimation of land take from each land holding is approximate and is based on the footprint of the route options. The estimation includes a maintenance strip,

⁵⁵ The James Hutton Institute, 2013, *1:250,000 & 1:50,000 Land Capability for Agriculture Data*, user licence no. JHI/2013/394.

⁵⁶ Scottish Government, 2015, *Ancient Woodland Inventory (Scotland)*, available at: <https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=AWI>

since this is typically required on all Transport Scotland trunk road schemes to enable maintenance of earthwork slopes, fencing etc., however, at this stage of development, it does not include any additional land required for construction or any land take required for compensatory landscape planting or other possible mitigation measures, which cannot be accurately quantified at DMRB Stage 2.

- 13.2.11 At this stage the details of how farmers take access to their fields and farm buildings are not fully known, therefore, it is difficult to assess how access would be impacted by each of the route options. As a result, professional judgement was used to assess the potential impacts on access. A detailed assessment of the impacts on access will be undertaken at DMRB Stage 3.

Assumptions and Limitations

New Guidance

- 13.2.12 An update to the Agricultural, Forestry and Sporting interests assessment methodology, now referred to as LA 112 Population and human health and LA 109 Geology and soils (hereafter referred to as the 'New Guidance') outlined in the DMRB was released in October 2019 and further updated in January 2020. The environmental assessment had commenced at the time of the release of the New Guidance and this followed a structure outlined in the previous published DMRB guidance, (hereafter referred to as the Withdrawn Guidance'). It has been agreed with Transport Scotland that following a review of the New Guidance, the DMRB Stage 2 environmental assessment would be completed following the structure of the Withdrawn Guidance, as an assessment was undertaken, which established that there is no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.
- 13.2.13 This section outlines the key differences between the Withdrawn Guidance and New Guidance and describes how this chapter meets the objectives of the New Guidance.
- 13.2.14 The New Guidance has separated out key factors considered for agriculture into two separate documents - LA 112 Population and human health and LA 109 Geology and soils. The Withdrawn Guidance previously titled 'DMRB Volume 11, Section 3, Part 6 Land Use', is now covered by LA 112 Population and human health where a definition of agricultural land holdings is given as:
- 'Land and associated infrastructure for the purpose of agricultural production, e.g. arable farming, dairy farming, etc.'
 - LA 109 Geology and soils covers agricultural land and soils. Areas pertinent to agriculture include prime land, defined as:
 - 'Land in grades 1, 2 and 3.1 of the Land Capability of Agriculture Classification.'
 - Soil function in LA 109 Geology and soils is defined as:
 - 'The ability of soil to provide a range of environmental services, such as support of vegetation growth, ecological habitats and biodiversity.'

Effects of the New Guidance

- 13.2.15 Rather than identifying an explicitly three stage assessment, the New Guidance advocates a reporting process differentiating between two elements; scoping and assessment. The conclusion of the scoping phase is the production of a report

answering a set of scoping questions, based on a baseline scenario underpinned by desk study/data collection, site walkover (data collection and surveys should be proportionate and appropriate to the stage of development/assessment) and incorporating an evaluation of the potential significant effects on agricultural land holdings and agricultural soil; including loss/reduction of agricultural land (prime agricultural land and other land) and soil function. This leads into an assessment phase underpinned by detailed surveys to inform the final assessment and design. The DMRB Stage 2 Scheme Assessment Report fits well into this new process at the scoping reporting stage. It answers the scoping question 'what is the Preferred Option?', reports any potential significant effects and outlines what surveys and further work need to be carried out to inform design and mitigation and to deliver the detailed assessment report.

- 13.2.16 Aside from the need to incorporate factors from two separate guidance documents (Population and human health and Geology and soils) as opposed to one (Land Use), the New Guidance requires an almost identical assessment of resource value as the Withdrawn Guidance, with the levels of resource importance (prime land classification, access requirements, future use etc) remaining the same. There is nothing in the New Guidance that would suggest a change to magnitude of impact for agricultural land uses or the significance of effects.
- 13.2.17 The New Guidance includes a significance matrix to be used to determine the significance of effect appropriate for a particular level of impact on a resource of a given value, which is similar to that provided in the Withdrawn Guidance. The DMRB Stage 2 assessment assigns significance of effect using information from the literature, baseline assessment and professional judgement. The purpose of the DMRB Stage 2 Scheme Assessment Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance. At subsequent reporting stages, the Preferred Option will be assessed using the New Guidance significance matrix alongside information from the literature, baseline assessment and professional judgement, as suggested by LA 109 Geology and soils stating:
- 'Soils not categorised as best and most versatile or prime land can be allocated in a higher sensitivity category where particular agricultural practices contribute to the quality and character of the environment or local economy (e.g. in upland areas where lower quality agricultural land is integral to agricultural practices).'*
- 13.2.18 Once the scheme progresses on to the DMRB Stage 3 reporting phase and onto an assessment of the Preferred Option, the New Guidance does diverge from the Withdrawn Guidance.
- 13.2.19 The New Guidance explicitly identifies mitigation design as an iterative process requiring early and ongoing engagement between the design engineers and the environmental team. Environmental enhancement opportunities should also be identified and reported during all stages.
- 13.2.20 Monitoring of designed mitigation is also cited as a key element to be considered but as the agricultural, forestry and sporting land uses are now covered across two broad guidance documents, care will be taken to ensure:
- 13.2.21 'Duplication of monitoring requirements for effects associated with environmental topics shall be avoided.'

Other Assumptions and Limitations

- 13.2.22 Baseline information has been determined on data available at the time of the assessment. Following the selection of a Preferred Option, detailed site visits and

consultation with landowners along the line of the Preferred Option will be undertaken to confirm the baseline to inform the DMRB Stage 3 Assessment.

- 13.2.23 Land take calculations are approximate and are based on the footprint of the route options including groundworks and an assumed minimum three-metre maintenance strip to take account of any land required for maintenance access. It does not include land required for construction of the route options (e.g. for construction compounds), or any additional land take required for aspects such as landscape planting or other essential mitigation. These will be identified during the DMRB Stage 3 assessment. Professional best judgement is used to establish what is classed as agricultural, forestry and sporting land uses on occasions where this is unclear from the desk-based assessment. Accurate land uses and boundaries will be established during the DMRB Stage 3 assessment.
- 13.2.24 It should be noted that the land take calculations presented in this chapter may vary from those reported in other chapters as in this assessment some of the agriculture and forestry land may form part of a development land allocation, and as such, will be assessed as potential impacts (e.g. land take) under development.
- 13.2.25 The assessment of potential impacts on access considers there to be an adverse impact where access is expected to be stopped-up as part of the dual carriageway design and where no alternative access is provided. The potential effects associated with increased journey length and amenity brought about by the construction and operation of these alternative access routes will be further assessed at DMRB Stage 3.
- 13.2.26 The information gathered from the desk-based assessment for the agricultural, forestry and equestrian assessment is limited in relation to confirming the extent of each land interest holding and the full nature of its agricultural, forestry and equestrian operations. To inform the assessment, general observational fieldwork was undertaken in the study area to determine the nature of farm enterprises. Specific farm visits and interviews were not undertaken at this stage but will be undertaken as part of DMRB Stage 3.
- 13.2.27 As indicated in Paragraph 13.2.11 details of how farmers take access to their fields and farm buildings are not fully known, the number of fields where land take occurs is used as a measure of likely severance and is considered for this assessment to represent potential impacts on access. A detailed assessment of the impacts on access will be undertaken at DMRB Stage 3.

13.3 Baseline

- 13.3.1 The baseline conditions for each geographical section of the study area are described below in relation to agricultural, forestry and equestrian land.

Land Use

- 13.3.2 There is a high proportion of agricultural land throughout the study area. This land varies in agricultural value across the different route options. While woodlands are present, including scrub woodland and buffer strips (area of land maintained for permanent vegetation), the areas of substantial forest woodland are limited to a few of the route options. Approximately 9% of farmland is woodland within the Aberdeenshire area with the area supporting very mixed farming⁵⁷. This very

⁵⁷ The Land Based Sector in NE Scotland (A study for the NE Scotland Agricultural Advisory Group, March 2016)

mixed farming incorporates improved grass, arable crops (cereals, oilseed rape), rough grazing, vegetables and others including poultry, pigs and dairy production.

- 13.3.3 Most of the forestry land in the study area, which is not farm woodlands, is owned by Forestry and Land Scotland (formerly Forestry Commission Scotland) or private estates and is managed for commercial purposes. This will be further investigated during the DMRB Stage 3 assessment.

Study Area Context

- 13.3.4 The study area consists of land holdings and interests intersected by the footprint of the scheme for each of the six route options, or where land and access arrangements may be impacted as a result of the proposed footprint (see Volume 5, Figures 13.1 to 13.13). In some cases, this may include land out with the footprint, for example, if access is disrupted or field severance occurs.
- 13.3.5 Details of the total land take, land take of prime agricultural land, land take from forestry, and the number of different holdings that are located within the footprint of each route option are included in Table 13.1 to Table 13.3.
- 13.3.6 For the East of Huntly to Colpy geographical section, Table 13.1 indicates that agricultural land take is similar for both route options. Both pass through commercial forestry with the Red route option severing slightly more parcels while the Cyan route option primarily runs alongside forestry parcels. Prime agricultural land is not extensive in this area.

Table 13.1 Land Use Baseline – East of Huntly to Colpy

Category	Quantity Within Study Area	
	Cyan route option	Red route option
Total land take from agriculture, including equestrian land use (ha)	159	164
Area of land take of prime agricultural land (ha)	2	2
Area of land take of prime agricultural land as a percentage of total agricultural land take (%)	1%	1%
Total land take from forestry (ha)	4.5	13.5
Total number of known agricultural, forestry and equestrian land holdings (No.) within route option study area.	26	24

- 13.3.7 Table 13.2 indicates that agricultural land take between Colpy to Pitcaple, is slightly higher for the Brown route option. The Pink and Brown route options sever forestry parcels, with the Brown route option taking more forestry land. Both Pink and

Brown route options intersect prime agricultural land with the Brown route option taking more agricultural land.

Table 13.2 Land Use Baseline - Colpy to Pitcaple

Category	Quantity Within Study Area	
	Pink route option	Brown route option
Total land take from agriculture, including equestrian land use (ha)	92.5	106.5
Area of land take of prime agricultural land (ha)	41.5	61.5
Area of land take of prime agricultural land as a percentage of total agricultural land take (%)	45%	58%
Total land take from forestry (ha)	7	13
Total number of known agricultural, forestry and equestrian land holdings (No.) within route option study area.	24	25

13.3.8 For the Pitcaple to Kintore geographical section, Table 13.3 indicates that the land take is similar for both route options. There are greater areas of land where ownership is to be confirmed within the Orange route option, which will affect the total number of land holdings. The Violet route option has greater land take on prime agricultural land. The Orange route option takes slightly more forestry land than the Violet route option.

Table 13.3 Land Use Baseline - Pitcaple to Kintore

Category	Quantity Within Study Area	
	Violet route option	Orange route option
Total land take from agriculture, including equestrian land use (ha)	183.5	178
Area of land take of prime agricultural land (ha)	53	18.5

Category	Quantity Within Study Area	
	Violet route option	Orange route option
Area of land take of prime agricultural land as a percentage of total agricultural land take (%)	29%	10%
Total land take from forestry (ha)	17	18
Total number of known agricultural, forestry and equestrian land holdings (No.) within route option study area.	40	25

13.4 Potential Impacts

13.4.1 This section presents the potential impacts of each route option. The magnitude of predicted impacts on land holdings impacted by each route option has been considered in combination with the sensitivity of the receptor to determine the potential for significance of effect on agriculture, forestry and equestrian interests (Volume 4b, Appendix A13.1: Tables 1.1-1.3).

13.4.2 The impact assessment has been undertaken with reference to the following:

- At this stage in the design, the likely nature and location of the construction activities (e.g. location of construction compounds) is unknown. As such, it is not possible to undertake an assessment of the full impacts as a result of construction, therefore, the assessment of impacts focusses on the operational and known access impacts only;
- Impacts on agricultural, forestry and equestrian land are reported collectively with specific reference to impacts on prime agricultural land and forestry;
- Severance of agricultural fields, farmland and woodland, which would lead to the land becoming fragmented, this can result in permanent restrictions to access including land locking (e.g. where no access is available). In other cases, field accesses and farm tracks could be severed necessitating the provision of alternative access arrangements;
- Watercourses and drainage systems on agricultural land may be required to be diverted, changing the existing field drainage systems. This would require redesign and alternative systems to be developed to avoid increasing flood risk or waterlogging of soils and farmland;
- Boundary features of agricultural land may be changed requiring the provision of suitable alternative boundary features to secure the boundaries of individual fields and woodland parcels; and
- Public and private utilities such as field water supplies may be changed, necessitating localised diversion or provision of alternative supplies.

- 13.4.3 The predicted impacts are presented in Tables 13.4 to 13.9. Land holdings with effects shown in the tables, which are not predicted to be potentially significant, have not been assessed or reported on further in this chapter. The land interests have been ordered from west to east as shown in Volume 5, Figures 13.1 to 13.13. Land ownership boundaries are approximate at this stage and precise boundaries and details of landownership will be confirmed during landowner interviews and legal land searches in DMRB Stage 3.

Table 13.4 Predicted Impacts on Land Holding – East of Huntly to Colpy (Cyan Route Option)

Land Interest	Potential Impact ⁵⁸	Sensitivity	Magnitude	Significance of Effect
1	Predicted land take of <0.5% of land holding going through two fields of Land Capability for Agriculture (LCfA) Class 3.2.	Medium	Minor	Minor
2	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.2. Field and access routes severed.	Medium	Minor	Minor
3	Predicted land take of 16% of land holding from multiple fields of LCfA class 3.2 and 4.1.	High	Major	Major
4	Predicted land take of 13.5% of land holding from multiple fields of LCfA Class 3.2, 4.1 and 4.2. Field severance and inaccessibility of fields.	Medium	Major	Moderate
5	Predicted land take of 2.5% of land holding from one field of LCfA Class 4.1.	Low	Minor	Minor
6	Predicted land take of <0.5% of land holding going through one field consisting of LCfA Class 4.1.	Medium	Negligible	Negligible
7	Predicted land take of 21% of land holding from multiple fields of LCfA Class 4.1, 4.2 and 5.3. Woodland will be removed, and fields severed.	High	Major	Major
8	Predicted land take of 0.5% of land holding from two fields of LCfA Class 4.1 and 4.2. Appears to skim edge of potential horse paddock.	High	Minor	Minor
10	Predicted land take of 13% of land holding going through multiple fields of LCfA Class 3.2, 4.1 and 4.2. Fields severed and access issues, forestry and pond/SuDS.	Medium	Major	Major
13	Predicted land take of 8% of land holding from multiple fields of LCfA Class 3.2, 4.1 and 4.2. Field severance and access issues.	Medium	Moderate	Moderate
14	Predicted land take of 3.5% of land holding going through multiple fields of LCfA Class 3.2, 4.1 and 4.2.	Medium	Minor	Minor
16	Predicted land take of <0.5% of land holding going through two fields of LCfA Class 4.2 and small part of river.	Low	Negligible	Negligible

⁵⁸ Note all land holding areas are current known land holdings. During DMRB Stage 3 assessment this will be reviewed to show the full extent of business land holding.

Land Interest	Potential Impact ⁵⁸	Sensitivity	Magnitude	Significance of Effect
17	Predicted land take of 21.5% of land holding from multiple fields of LCfA Class 3.2, 4.1, 4.2 and 5.3. Field severance and inaccessibility of remaining fields.	Medium	Major	Major
23	Predicted land take of 3.5% of land holding from two fields of LCfA Class 3.2 and 4.2. Field severance and inaccessibility of remaining fields.	Low	Minor	Minor
24	Predicted land take of 2.5% of land holding from area of LCfA Class 4.2 and field access route.	Medium	Minor	Minor
25	Predicted land take of 2.5% of land holding from field of LCfA Class 4.2 and woodland parcel.	Medium	Minor	Minor
26	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.2 and 4.2. Mostly 2 fields impacted by severance and inaccessibility from remaining fields.	Low	Minor	Minor
27	Predicted land take of 15% of land holding from one field of LCfA Class 3.2.	High	Moderate	Moderate
28	Predicted land take of 65% of land holding from one field of LCfA Class 3.2. Field severance.	High	Major	Major
29	Predicted land take of 18.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Field severance and inaccessibility of remaining fields.	High	Major	Major
30	Predicted land take of 3% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor
31	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor
32	Predicted land take of 4.5% of land holding from field of LCfA Class 3.1 and 3.2. Wood parcel severed in two.	High	Moderate	Moderate
34	Predicted land take of 6% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Field severance and inaccessibility of remaining fields.	High	Moderate	Major
35	Predicted land take of 22% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2. Field severance.	High	Major	Major
36	Predicted land take of 1% of land holding from two fields of LCfA Class 3.1 and 3.2.	High	Minor	Minor
Unknown	Multiple agricultural fields of LCfA Class 3.1, 3.2, 4.1, 4.2 and 5.3 and forestry parcels/areas impacted.	High	Moderate	Moderate
26 known land interests impacted by route option				

Table 13.5 Predicted Impacts on Land Holding – East of Huntly to Colpy (Red Route Option)

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
1	Predicted land take of <0.5% of land holding from two fields LCfA class 3.2.	Medium	Minor	Minor
2	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.2.	Medium	Minor	Minor
3	Predicted land take of 16% of land holding from multiple fields of LCfA Class 3.2 and 4.1.	High	Major	Major
4	Predicted land take of 14% of land holding from multiple fields of LCfA Class 3.2, 4.1 and 4.2. Fields will be severed and isolated.	Medium	Major	Major
5	Predicted land take of 3% of land holding going through multiple fields of LCfA Class 4.1.	Low	Minor	Minor
6	Predicted land take of 3% of land holding from multiple fields of LCfA Class 4.1, 4.2 and 5.3.	High	Minor	Minor
9	Predicted land take of 12% of land holding from multiple fields of LCfA Class 4.1, 4.2, 5.3 and 6.1. Potential issues with access to steading and fields severed.	Medium	Major	Moderate
10	Predicted land take of 2.5% of land holding going through multiple fields consisting of LCfA Class 4.1 and 4.2. Potential land loss due to severance and access issues.	Medium	Minor	Minor
11	Predicted land take of 7% of land holding from multiple fields of LCfA Class 4.1 and 4.2 including two wooded areas. Potentially significant land loss due to severance and access issues.	Medium	Moderate	Moderate
12	Predicted land take of 1% of land holding from multiple fields of LCfA Class 4.1. Potential issues with access and fields sub-divided.	Medium	Minor	Minor
13	Predicted land take of 10.5% of land holding from multiple fields of LCfA Class 4.1, 4.2 and 5.3. Potentially significant land loss due to severance and access issues.	Medium	Major	Moderate
14	Predicted land take of 2.5% of land holding from two fields of LCfA Class 4.1.	Medium	Minor	Minor
17	Predicted land take of 4% of land holding from multiple fields of LCfA Class 4.1, 4.2 and 5.3.	Medium	Minor	Minor
18	Predicted land take of 1% of land holding going through corner of one field of LCfA Class 4.1 and small section of woodland wind break.	Medium	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
19	Predicted land take of 11% of land holding from multiple fields of LCfA Class 3.2 and 4.1. Woodland and access severed.	Medium	Major	Moderate
20	Predicted land take of 12% of land holding from multiple fields of LCfA Class 3.2. Woodland and field severance.	High	Major	Major
21	Predicted land take of <0.5% of land holding on edge of woodland of LCfA Class 3.2.	High	Negligible	Minor
22	Predicted land take of 7% of land holding from a field of LCfA Class 3.2 including woodland and burn.	High	Moderate	Moderate
29	Predicted land take of 23% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Farmland holding would be cut in two.	High	Major	Major
30	Predicted land take of 1% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor
32	Predicted land take of 8% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Woodland severed in two.	High	Moderate	Major
34	Predicted land take of 8.5% of land holding from two fields of LCfA Class 3.1 and 3.2. Increased land take likely due to field severance.	High	Moderate	Major
35	Predicted land take of 6% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2.	High	Moderate	Major
36	Predicted land take of 1% of land holding from two fields of LCfA Class 3.1 and 3.2.	High	Minor	Minor
Unknown	Predicted 10 agricultural fields of LCfA Class 3.1, 3.2, 4.1, 4.2, 5.2, 5.3 and 6.3 and forestry parcels/areas impacted.	High	Moderate	Moderate
24 known land interests impacted by route option				

Table 13.6 Predicted Impacts on Land Holdings – Colpy to Pitcaple (Pink Route Option)

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
130	Predicted land take of 7.5% of land holding from field of LCfA Class 3.2. Farm may be sub-divided in two.	High	Moderate	Moderate
35	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.2.	High	Negligible	Minor
36	Predicted land take of 1% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
37	Predicted land take of 10% of land holding land of LCfA Class 3.1 and 3.2. Includes woodland buffer strip and access.	High	Moderate	Moderate
38	Predicted land take of 2.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Moderate	Moderate
39	Predicted land take of 12% of land holding from a field of LCfA Class 3.1.	High	Major	Major
40	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. One field severed in two.	Low	Minor	Minor
41	Predicted land take of 21% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	High	Major	Major
46	Predicted land take of 6.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Major	Moderate
47	Predicted land take of 3.5% of land holding from a field of LCfA Class 3.1	Medium	Moderate	Moderate
50	Predicted land take of 1% of land holding access.	High	Negligible	Minor
51	Predicted land take of 5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Woodland severed.	Medium	Moderate	Moderate
52	Predicted land take of 9.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Potential severance and access issues.	High	Major	Major
53	Predicted land take of 1.5% of land holding from a field of LCfA Class 3.1. Section of woodland windbreak.	High	Minor	Minor
54	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.1.	Low	Minor	Negligible
55	Predicted land take of 11.5% of land holding from two fields of LCfA Class 3.1 and 3.2. Access issues.	High	Major	Major
56	Predicted land take of 28% of land holding from a field of LCfA Class 3.1 and 3.2.	High	Major	Major
57	Predicted land take of 3% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Some fields split in two and severance issues.	Low	Moderate	Minor
58	Predicted land take of 3% of land holding from two fields of LCfA Class 3.2. One field sub-divided in two.	Medium	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
61	Predicted land take of 2.5% of land holding from two fields of LCfA Class 3.2. Field severance and access issues.	Medium	Minor	Minor
63	Predicted land take of 3.5% of land holding from multiple fields of LCfA Class 3.2. Severance and access issues.	Medium	Moderate	Moderate
65	Predicted land take of 12.5% of land holding from mostly woodland parcels. Field of LCfA Class 3.2 and 4.2.	High	Major	Major
67	Predicted land take of 9% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2.	High	Moderate	Major
68	Predicted land take of 2% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2. Three fields split in two.	Low	Minor	Minor
Unknown	Predicted multiple agricultural fields of LCfA Class 3.1, 3.2 and 4.2 and forestry parcels/areas impacted.	High	Moderate	Moderate
24 known land interests impacted by route option				

Table 13.7 Predicted Impacts on Land Holdings – Colpy to Pitcaple (Brown Route Option)

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
130	Predicted land take of 9% of land holding from a field of LCfA Class 3.1. Field cut in two.	High	Moderate	Moderate
35	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.2.	High	Negligible	Minor
36	Predicted land take of 1% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor
37	Predicted land take of 11.5% of land holding land of LCfA Class 3.1 and 3.2. Includes woodland buffer strip and access.	High	Moderate	Moderate
38	Predicted land take of 2.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Moderate	Moderate
39	Predicted land take 11% of land holding from a field of LCfA Class 3.1.	High	Major	Major
40	Predicted land take of 1% of land holding from a field of LCfA Class 3.1 and 3.2. Field would be cut in two.	Low	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
42	Predicted land take 1.5% of land holding from a field of LCfA Class 3.2.	Medium	Minor	Minor
43	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.2.	Low	Minor	Negligible
44	Predicted land take 16% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Includes severance, access issues and woodland.	High	Major	Major
45	Predicted land take of 12% of land holding from multiple fields of LCfA Class 3.1.	High	Major	Major
46	Predicted land take of 4% of land holding from two fields of LCfA Class 3.1. Land severed and reduction in field size but should remain viable.	Medium	Minor	Minor
48	Predicted land take of 4% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Woodland areas sub-divided.	Medium	Moderate	Moderate
49	Very small area of road access	Low	Minor	Negligible
59	Predicted land take of 5.5% of land holding from two fields of mostly LCfA Class 3.1 and a small area of LCfA Class 3.2.	High	Moderate	Moderate
60	Predicted land take of 11.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Woodland parcels.	Medium	Major	Moderate
61	Predicted land take of 3% of land holding from two fields of LCfA Class 3.2. One field may be lost and small area of ancient woodland.	Medium	Minor	Minor
62	Predicted land take of 15.5% of land holding from land of woodland parcel of LCfA Class 3.2.	High	Major	Major
63	Predicted land take of 4.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Moderate	Moderate
64	Predicted land take of 10.5% of land holding from woodland parcel of LCfA Class 3.2 and 4.2.	High	Moderate	Moderate
65	Predicted land take of 5.5% of land holding of LCfA Class 3.2 and 4.2 and from woodland parcel.	High	Moderate	Moderate
66	Predicted land take of 35% of land holding from a field of LCfA Class 4.2. Woodland removed.	High	Major	Major

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
67	Predicted land take of 8.5% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2.	High	Moderate	Moderate
68	Predicted land take of 2.5% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2. Some severance of fields.	Low	Minor	Minor
131	Predicted land take of 24.5% of land holding from a field of LCfA Class 3.2.	High	Major	Major
Unknown	Predicted multiple agricultural fields of LCfA Class 3.1, 3.2 and 4.2 and forestry parcels/areas impacted.	High	Moderate	Moderate
25 known land interests impacted by route option				

Table 13.8 Predicted Impacts on Land Holdings – Pitcaple to Kintore (Violet Route Option)

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
69	Predicted land take of 1.5% of land holding from a field of LCfA Class 3.2, 4.2 and 5.3. Forestry parcel would be sub-divided in two.	Low	Minor	Minor
70	Predicted land take of 10.5% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 5.3. Access disrupted.	High	Moderate	Major
71	Predicted land take of <0.5% of land holding from field of LCfA Class 3.2.	Medium	Negligible	Negligible
72	Predicted land take of 7% of land holding from forestry parcels of LCfA Class 3.1, 3.2 and 4.2. Potentially significant land loss due access and severance issues	Medium	Moderate	Moderate
73	Predicted land take of 16.5% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2. Potentially significant land loss due access and severance issues and woodland parcels.	Medium	Major	Major
76	Predicted land take of <0.5% of land holding from woodland of LCfA Class 3.2.	High	Minor	Minor
78	Predicted land take of 5.5% of land holding from fields of LCfA Class 3.1 and 3.2.	High	Moderate	Moderate
79	Predicted land take of 8% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Potentially significant land loss due to fields split in two and severance issues.	Low	Moderate	Minor
80	Predicted land take of <0.5% of land holding from field of LCfA Class 3.2.	High	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
91	Predicted land take of 21.5% of land holding from field of LCfA Class 3.1. Woodland present.	High	Major	Major
100	Predicted land take of 6.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Moderate	Moderate
101	Predicted land take of 15% of land holding from a field of LCfA Class 3.2.	High	Major	Major
102	Predicted land take of <0.5% of land holding from field of LCfA 3.2.	Medium	Minor	Minor
103	Predicted land take of 15% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 5.3. Includes woodland.	High	Major	Major
104	Predicted land take of 1% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	High	Minor	Minor
105	Predicted land take of 1% of land holding from two fields of LCfA Class 3.1 and 3.2.	High	Minor	Minor
106	Predicted land take of 4.5% of land holding from two fields of LCfA Class 3.1. Potential access issues.	High	Moderate	Moderate
107	Predicted land take of 4% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Potential of severance and inaccessibility in one field.	High	Minor	Minor
109	Predicted land take of 2% of land holding from two fields of LCfA Class 3.1 and 3.2.	High	Minor	Minor
108	Predicted land take of 2% of land holding from a field of LCfA Class 3.1, 3.2 and 4.2. Most of one field lost.	Medium	Minor	Minor
110	Predicted land take of 7% of land holding from multiple fields of LCfA Class 3.2 and 4.2. Potentially significant land loss due to severance issues.	Medium	Moderate	Moderate
111	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.2. Some inaccessibility.	Low	Minor	Minor
112	Predicted land take of 5% of land holding from multiple fields of LCfA Class 3.2. Potential access issues to fields.	Medium	Minor	Minor
113	Predicted land take of 31% of land holding from field and woodland of LCfA Class 3.2.	High	Major	Major

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
114	Predicted land take of 47% of land holding from two fields of LCfA Class 3.2. Includes small woodland section.	High	Major	Major
115	Predicted land take of 9% of land holding from multiple fields of LCfA Class 3.2. Potentially access issues.	Medium	Moderate	Moderate
119	Predicted land take of 0.5% of land holding from two fields of LCfA Class 3.2.	Low	Minor	Negligible
121	Predicted land take of 7.5% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Potentially significant land loss due to fields split in two and severance issues.	Medium	Moderate	Moderate
122	Predicted land take of 19% of woodland area of LCfA Class 3.2.	High	Major	Major
123	Predicted land take of 7.5% of land holding from multiple fields of LCfA Class 3.2. Potentially significant land loss due to fields split in two and severance issues.	Medium	Moderate	Moderate
124	Predicted land take of 1% of land holding from two fields of LCfA Class 3.2.	High	Minor	Minor
125	Predicted land take of 1% of land holding from corner of a field of LCfA Class 3.2.	High	Minor	Minor
126	Predicted land take of 5.5% of land holding from multiple fields of LCfA Class 3.2.	High	Moderate	Moderate
127	Predicted land take of 17% of land holding from multiple fields of LCfA Class 3.2. Potentially significant land loss due to fields split in two and severance issues.	High	Major	Major
128	Predicted land take of 10% of land holding from multiple fields of LCfA Class 3.1 and 3.2. Includes woodland.	Medium	Major	Moderate
129	Predicted land take of 0.5% of land holding from multiple fields of LCfA Class 3.2. Includes small woodland area.	Low	Minor	Minor
132	Predicted land take of 6.5% of forestry parcels of LCfA Class 3.2.	High	Moderate	Moderate
133	Predicted land take of 0.5% of land holding from a field of LCfA Class 3.2.	High	Minor	Minor
134	Predicted land take of 35.5% of land holding from multiple fields of LCfA Class 3.2. Potentially significant land loss due to fields split in two and severance issues.	High	Major	Major
135	Predicted land take of 1% of land holding from two fields of LCfA Class 3.2.	High	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
Unknown	Predicted multiple agricultural fields of LCfA Class 3.1, 3.2, 4.2 and 5.3 and forestry parcels/areas impacted.	High	Moderate	Moderate
40 known land interests impacted by route option.				

Table 13.9 Predicted Impacts on Land Holdings – Pitcaple to Kintore (Orange Route Option)

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
69	Predicted land take of 3.5% of land holding from multiple fields of LCfA Class 3.2, 4.2 and 5.3. Woodland parcel would be totally removed.	Low	Minor	Minor
70	Predicted land take of 43% of land holding from multiple fields of LCfA Class 3.1, 3.2, 4.2 and 5.3. Severance issues.	High	Major	Major
71	Predicted land take of 3% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Minor	Minor
72	Predicted land take of <0.5% of land holding from a field of LCfA Class 3.1.	Medium	Minor	Minor
73	Predicted land take of 2% of land holding from two fields of LCfA Class 3.1, 3.2 and 4.2. Potentially greater land loss due to fields split in two and severance issues.	Medium	Minor	Minor
75	Predicted land take 4% of land holding from a field of LCfA Class 3.1, 3.2 and 4.2. Main field still viable.	High	Minor	Minor
76	Predicted land take <0.5% of land holding from LCfA class 4.2 of boundary and access to farm	High	Minor	Minor
77	Predicted land take of 3% of land holding from multiple fields of LCfA Class 3.1 and 3.2.	Medium	Minor	Minor
136	Predicted land take of 10% of land holding from multiple fields of LCfA Class 3.2.	High	Moderate	Moderate
92	Predicted land take of 12% of land holding from multiple fields of LCfA Class 3.1, 3.2 and 4.2. Potentially significant land loss due to fields split in two and severance issues.	Medium	Major	Moderate
93	Predicted land take of 0.5% of land holding from a field of LCfA Class 3.1.	Low	Minor	Minor

Land Interest	Potential Impact	Sensitivity	Magnitude	Significance of Effect
94	Predicted land take of 7% of land holding from multiple fields of LCfA class 3.2. Potentially greater land loss due to fields split in two and severance issues.	Medium	Moderate	Moderate
95	Predicted land take of 3% of land holding from two fields of LCfA Class 3.2.	High	Minor	Minor
96	Predicted land take of 50% of land holding from two fields and woodland of LCfA Class 3.2.	High	Major	Major
97	Predicted land take of 30% of farm access of LCfA Class 3.2.	High	Major	Major
98	Predicted land take of 8.5% of land holding from multiple fields of LCfA Class 3.2. Includes woodland. Potential severance and access issues.	Medium	Moderate	Moderate
99	Predicted land take of 4.5% of land holding from multiple fields of LCfA Class 3.2 and slither of woodland.	High	Minor	Minor
116	The Orange route option crosses the River Don where fishing rights are present. Section of riverbank may be impacted by bridge.	High	Minor	Minor
117	Predicted land take of 3% of land holding from multiple fields of LCfA Class 3.2 and 4.2. Small area of woodland and one field would be removed.	Low	Minor	Minor
118	Predicted land take of 25% of land holding from multiple fields of LCfA Class 3.2 and 4.2 and woodland.	Medium	Major	Major
119	Predicted land take of 4.5% of land holding from multiple fields of LCfA Class 3.2 and woodland.	Low	Minor	Minor
120	Predicted land take of 8% of land holding from a field of LCfA Class 3.2.	High	Moderate	Moderate
121	Predicted land take of 1.5% of land holding from multiple fields of LCfA Class 3.2. Potentially increased land take due to severance and inaccessibility between existing A96 and the Orange route option.	Medium	Minor	Minor
122	Predicted land take of 9.5% of land holding from small fields of LCfA Class 3.2.	High	Minor	Minor
137	Predicted land take of 0.5% of woodland of LCfA Class 4.2.	High	Minor	Minor
Unknown	Predicted multiple agricultural fields of LCfA Class 3.1, 3.2, 4.2 and 5.3 and forestry parcels/areas impacted.	High	Moderate	Moderate
25 known land interests impacted by route option.				

13.5 Mitigation

- 13.5.1 At this stage, the design has not been sufficiently developed to allow the mitigation measures to be defined. The objective of this section is to identify anticipated mitigation considering best practice, legislation and guidance, which will be further developed and refined during the DMRB Stage 3 assessment. Potential mitigation measures for the operational phase are described in Paragraph 13.5.2. The mitigation measures will be developed with the aim of protecting the agricultural capability of land and soils and the maintenance of the viability of farming units.
- 13.5.2 Mitigation measures for Agricultural, Forestry and Sporting Interests (AFS1 - AFS2) to avoid or reduce the effects on agriculture, forestry and equestrian interests are likely to include:
- AFS1: Minimise the engineering footprint of the scheme, avoiding severance of land within the land holding where possible;
 - AFS2: Providing access to farms, fields and forestry during and post construction; and
 - AFS3: Minimise the loss of woodland and ensure that unavoidable woodland loss is compensated by replanting schemes where possible.
- 13.5.3 Mitigation measures AFS1, AFS2 and AFS3 are embedded in the design of the route options and have been included in the assessment of all farm holdings as set out in Section 13.6. As a result, the significance of potential and residual effects (pre and post mitigation) are predicted to be the same.

13.6 Predicted Environmental Effects

- 13.6.1 This section presents information on the assessment of the key predicted significant effects of the options on agriculture, forestry and equestrian interests (see Tables 13.10 to 13.15). A 'significant' effect is any land interest classed as moderate or major significance and these will be shown in bold.

Table 13.10 Predicted Effects on Land Holdings - East of Huntly to Colpy (Cyan Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
3	Predicted land take of 10.5ha (16% of land holding) from six pastoral fields primarily used for grazing of LCfA Class 3.2 and 4.1. One field would be significantly affected with the other fields subject to small areas of land take.	Major adverse residual effect as a result of agricultural land take from holding.
4	Predicted land take 21.5ha (13.5% of land holding) from ten pasture fields of LCfA Class 3.2, 4.1 and 4.2. Some fields significantly severed and would be unlikely to be able to go back to agricultural use. Other parts of fields will be cut off and inaccessible, which would remove them from agricultural use.	Moderate adverse residual effect as a result of agricultural land take and field severance.
7	Predicted land take of 2ha (21% of land holding) going through four fields consisting of LCfA Class 4.1, 4.2 and 5.3. The forestry parcel and three fields will be significantly affected.	Major adverse residual effect as a result of agricultural land take and loss of fields.
10	Predicted land take of 26.5ha (13% of land holding) from 17 pasture fields, arable land of LCfA Class 3.2, 4.1 and 4.2 and forestry areas. Land take and fragmentation of land holding would arise due to field severance and access routes may be inhibited including underpass. Pond/SuDS within the route boundary will need relocated.	Major adverse residual effect as a result of agricultural land take, field severance and access.
13	Predicted land take of 11ha (8% of land holding) through eight fields. Fields near the existing A96 will be significantly affected. Access issues to fields and to farm steading would arise.	Moderate adverse residual effect as a result of agricultural land take and access to farm steading.
17	Predicted land take of 23.5ha (21.5% of land holding) from nine fields of LCfA Class 3.2, 4.1, 4.2 and 5.3. Agricultural land take and fragmentation would arise. Considerable field severance would result in a larger land take due to remaining areas of fields not able to be returned to agricultural use.	Major adverse residual effect as a result of agricultural land take and field severance.
27	Predicted land take of 0.5ha (15% of land holding) from one field of LCfA Class 3.2. Field impacted to south-east, running alongside existing A96.	Moderate adverse residual effect as a result of agricultural land take.
28	Predicted land take of 1.5ha (65% of land holding) from one arable field of LCfA Class 3.2. Significant loss of land to this field and access.	Major adverse residual effect as a result of agricultural land take and access.
29	Predicted land take of 13ha (18.5% of land holding) from six arable and pastoral fields of LCfA Class 3.1 and 3.2. Some fields will be significantly severed and may unable to go back to agricultural use. Other parts of fields will be cut off and may be inaccessible, which may render them unusable.	Major adverse residual effect as a result of agricultural land take and field severance.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
32	Predicted land take of 0.5ha (4.5% of land holding) of LCfA Class 3.1 and 3.2 predominantly going through a woodland parcel. Section of woodland impacted is classed under the AWI as a 2b long established woodland of plantation origin. The ancient woodland will be sub-divided and isolated.	Moderate residual effect as a result of division on land holding.
34	Predicted land take of 2ha (6% of land holding) from two arable fields of LCfA Class 3.1 and 3.2. One field significantly affected with increased land take expected due to field severance.	Major adverse residual effect as a result of agricultural land take including prime land and field severance.
35	Predicted land take of 5ha (22% of land holding) from five fields of LCfA Class 3.1, 3.2 and 4.2. Three fields severed with north-east corners of two fields subject to small areas of land take.	Major adverse residual effect as a result of agricultural land take and severance.
Unknown	Predicted ten agricultural fields impacted of LCfA Class 3.1, 3.2, 4.1, 4.2 and 5.3 and one forestry parcel/area. Fields and forestry severed/isolated.	Moderate adverse residual effect as a result of division of holdings and land take of agricultural land including some prime land.
<p>A total of 12 known landowners are predicted to be significantly affected by the route option.</p> <p>Permanent loss from route option of 159ha of which 2ha (1.5%) is of high agricultural value and 4.5ha of woodland and forestry parcels.</p>		

Table 13.11 Predicted Effects on Land Holding – East of Huntly to Colpy (Red Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
3	Predicted land take of 10.5ha (16% of land holding) from six pastoral fields primarily used for grazing of LCfA Class 3.2 and 4.1. One field would be significantly affected with the other fields subject to small areas of land take.	Major adverse residual effect as a result of agricultural land take from holding.
4	Predicted land take 22.5ha (14% of land holding) from ten pasture fields of LCfA Class 3.2, 4.1 and 4.2. Some fields will be significantly severed and would be unlikely to be able to go back to agricultural use. Other parts of fields will be cut off and inaccessible, which may render them unusable.	Major adverse residual effect as a result of agricultural land take and field severance.

⁵⁹ Note all land holding areas are current known land holdings. During DMRB Stage 3 assessment this will be reviewed to show the full extent of business land holding.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
9	Predicted land take 15ha (12% of land holding) from eight arable, pastoral and rough grazing fields of LCfA Class 4.1, 4.2, 5.3 and 6.1. Total loss of nearly two fields and potential access issues to pastoral ground. In addition, there will be access issues to the steading.	Moderate adverse residual effect as a result of agricultural land take, severance and access to farm steading.
11	Predicted land take of 19.5ha (7% of land holding) from 14 primarily arable fields of LCfA Class 4.1 and 4.2 including wooded areas. Arable and wooded areas severed. Access will be inhibited and land take increased due to severance of field parts, rendering them unsuitable to be returned to productive agricultural use.	Moderate adverse residual effect as a result of agricultural land take, severance and access.
13	Predicted land take of 13.5ha (10.5% of land holding) going through ten pastoral and arable fields consisting of LCfA Class 4.1, 4.2 and 5.3. Will significantly effect these fields with severance and access issues	Moderate adverse residual effect as a result of agricultural land take, field severance and access.
19	Predicted land take of 9ha (11% of land holding) going through four fields of LCfA Class 3.2 and 4.1. Woodland and access route both severed.	Moderate adverse residual effect as a result of land take, severance and access.
20	Predicted land take of 7ha (12% of land holding) from four pastoral fields of LCfA Class 3.2 including going through a woodland parcel. Field access will be impacted, and land take will increase due to severance of fields.	Major adverse residual effect as a result of fragmentation and division of land holding.
22	Predicted land take of 0.5ha (6.5% of land holding) from one field of LCfA Class 3.2 and woodland parcel. Route option aligned through section of Jordan Burn, corner of field & northern perimeter of woodland.	Moderate adverse residual effect as a result of agricultural land take.
29	Predicted land take of 16.5ha (23% of land holding) from nine fields of LCfA Class 3.1 and mostly 3.2. Route option aligned through farm sub-dividing fields.	Major adverse residual effect as a result of division on land holding.
32	Predicted land take of 0.5ha (8% of land holding) going through predominantly woodland parcel and land of LCfA Class 3.1 and 3.2. Area impacted is classed under the AWI as a 2b long established woodland of plantation origin. The ancient woodland will be sub-divided and isolated	Major adverse residual effect as a result of land take and division on land holding.
34	Predicted land take of 3ha (8.5% of land holding) from two arable fields of LCfA Class 3.1 and 3.2. One field significantly affected with increased land take expected due to field severance.	Major adverse residual effect as a result of agricultural land take including prime land and field severance.
35	Predicted land take of 5.5ha (23% of land holding) from five fields of LCfA Class 3.1, 3.2 and 4.2. Three fields severed with north-east corners of two fields removed.	Major adverse residual effect as a result of agricultural land take and severance.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
Unknown	Predicted 11 agricultural fields impacted of LCfA Class 3.1, 3.2, 4.1, 4.2, 5.2, 5.3 and 6.2 and two forestry parcels/areas. Fields and forestry severed.	Moderate adverse residual effect as a result of division of holdings and land take of agricultural land including some prime land.
<p>A total of 12 known landowners are predicted to be significantly affected by the route option.</p> <p>Permanent loss from route option of 164ha of which 2ha (1%) is of high agricultural value and 13.5ha of woodland and forestry parcels.</p>		

Table 13.12 Predicted Effects on Land Holdings – Colpy to Pitcaple (Pink Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
130	Predicted land take of 0.5ha (7.5% of land holding) from one field of LCfA class 3.2. Field would be split in half, precise extent of land ownership to be confirmed.	Moderate adverse residual effect as result of land take agricultural land and severance.
37	Predicted land take of 0.5ha (10.5% of land holding) from land of LCfA Class 3.1 and 3.2. Windbreaks severed.	Moderate adverse residual effect as result of access disruption and severance.
38	Predicted land take of 4ha (2.5% of land holding) from four arable fields of LCfA Class 3.1 and 3.2. Route option runs through farm sub-dividing two fields.	Moderate adverse residual effect as result of agricultural land take including prime land, severance and disruption to access.
39	Predicted land take of 0.5ha (12% of land holding) from one pastoral field of LCfA Class 3.1. Pastoral field split in two, with access issues to south-west of field after construction.	Major adverse residual effect as result of land take of prime agricultural land, division and access to field.
41	Predicted land take of 11ha (21% of land holding) from six fields of LCfA Class 3.1 and 3.2. The fields are mostly arable fields with one pastoral. Three fields will be sub-divided in two potentially leaving fragments, which may be unable to be returned to agricultural production leading to increased land take. Wind turbine within the farm may need to be moved/removed.	Major adverse residual effect as result of land take of prime agricultural land, land take due to fragmentation and wind turbine.
46	Predicted land take of 6ha (6.5% of land holding) from three fields of LCfA Class 3.1 and 3.2. One field will be significantly severed and sub-divided, potentially at a risk of losing the whole field. The other fields will be severed and will result in isolated land parcels with potential of increasing agricultural land take.	Moderate adverse residual effect as result of land take of prime agricultural land, land take due to fragmentation.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
47	Predicted land take of 3.5ha (3.5% of land holding) from one field of LCfA Class 3.1 and one wooded area. Field will have the south-west section removed with additional land take due to inaccessibility of land to the south-west not being viable after construction.	Moderate residual effect as result of land take of prime agricultural land, access disruption and land take due to fragmentation.
51	Predicted land take of 7ha (5% of land holding) from three fields of LCfA Class 3.1 and 3.2. One field will be severed in half with corners of other fields impacted. The present woodland parcel/windbreak will be split and benefits from this will be reduced.	Moderate residual effect as result of land take of prime agricultural land and severance.
52	Predicted land take of 4ha (9.5% of land holding) from four mixed agricultural fields of LCfA Class 3.1 and 3.2. Three fields will encounter significant land loss, causing access issue to remaining parts of fields.	Major adverse residual effect as result of land take of agricultural land including prime agricultural land and inaccessibility.
55	Predicated land take of 3ha (11.5% of land holding) from two fields of LCfA Class 3.1 and 3.2. Removes half of one field & north edge of second. Access to farm shed severely affected.	Major adverse residual effect as result of land take of agricultural land including prime agricultural land and access.
56	Predicated land take of 2ha (28% of land holding) from one field of LCfA Class 3.1 and 3.2. Whole field will be taken out of agricultural use, likely increased land take as remaining parcels in field will not be able to return to productive agricultural use.	Major adverse effect as result of land take of prime agricultural land and fragmentation of land.
63	Predicated land take of 4.5ha (3.5% of land holding) from five mixed farming fields of LCfA Class 3.2. Fields sub-divided in two, one field would be significantly affected. Two woodland wind breaks severed. Farm would be sub-divided in two resulting in access issues.	Moderate adverse residual effect as result of division of land holding and access issues.
67	Predicated land take of 4ha (9% of land holding) from four mixed farming fields of LCfA Class 3.1, 3.2 and 4.2. One field will have a large land take with potential to increase land take due to severed parcels that may not be viable for agricultural use.	Major adverse residual effect as a result of division of land holding and land take of agricultural land including prime land.
Unknown	Predicted six agricultural fields of LCfA Class 3.1, 3.2 and 4.2 and two forestry parcels/areas impacted. Fields and forestry severed including one ancient woodland parcel.	Moderate adverse residual effect as a result of division of holdings and land take of agricultural land including some prime land.
<p>A total of 13 known landowners are predicted to be significantly affected by the route option.</p> <p>Permanent loss from route option of 92.5ha of which 41.5ha (45%) is of high agricultural value and 7ha of woodland and forestry parcels.</p>		

Table 13.13 Predicted Effects on Land Holdings – Colpy to Pitcaple (Brown Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
130	Predicted land take of 0.5ha (9% of land holding) from one field of LCfA class 3.2. Field would be sub-divided, precise extent of land ownership to be confirmed.	Moderate adverse residual effect as result of land take agricultural land take and severance.
37	Predicted land take of 0.5ha (11.5% of land holding) from land of LCfA Class 3.1 and 3.2. Windbreaks severed.	Moderate adverse residual effect as result of disruption to access and severance.
38	Predicted land take of 4ha (2.5% of land holding) from four arable fields of LCfA Class 3.1 and 3.2. Route runs through farm splitting two fields.	Moderate adverse residual effect as result of agricultural land take including prime land, severance and disruption to access.
39	Predicted land take of 0.5ha (11% of land holding) from one pastoral field of LCfA Class 3.1. Pastoral field sub-divided, potential access issues to south-west of field after construction resulting in greater land take.	Major adverse residual effect as result of land take of prime agricultural land, division and access to field.
44	Predicted land take of 8ha (16% of land holding) from four arable and pastoral fields of LCfA Class 3.1 and 3.2 including a wooded area. Fields sub-divided, with two fields potentially unviable after construction. Cistern shown on OS map suggesting potential water supply to field disrupted. Access road severed.	Major adverse residual effect as result of land take of prime agricultural land, division of holding and access issues.
45	Predicted land take of 2ha (12% of land holding) from four fields of LCfA Class 3.1. Three pastoral fields significantly affected, and farm access roads severed.	Major adverse residual effect as result of land take of prime agricultural land and access issues.
48	Predicted land take of 12ha (4% of land holding) from eight fields of LCfA Class 3.1 and 3.2. Arable Fields will be sub-divided in two and in many cases may cause the field to not be able to return to agricultural use post construction. Wooded sections sub-divided including ancient woodland class 2b long established woodland of plantation origin. Access roads severed.	Moderate adverse residual effect as result of land take of prime agricultural land, severance and access issues.
59	Predicted land take of 2.5ha (5.5% of land holding) from two arable fields of LCfA Class 3.1 and 3.2. North-east ends of fields sub-divided.	Moderate adverse residual effect as result of land take of prime agricultural land.
60	Predicted land take of 25ha (11.5% of land holding) from seven fields of LCfA Class 3.1 and 3.2 and two woodland parcels including one ancient woodland class 2b long established woodland of plantation origin.	Moderate adverse residual effect as result of land take of agricultural land including prime land.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
62	Predicted land take of 4ha (15.5% of land holding) from predominantly ancient woodland AWI class 2b long established woodland of plantation origin and land parcel of LCfA Class 3.2 and disruption to access tracks.	Major adverse residual effect as result of land take of ancient woodland and disruption to access.
63	Predicted land take of 6ha (4.5% of land holding) from five fields of LCfA Class 3.1 and 3.2. Two fields sub-divided in two, with significant loss to the other three fields.	Moderate adverse residual effect as result of loss of agricultural land including prime agricultural land and division of land holding.
64	Predicted land take of 3ha (10.5% of land holding) from ancient woodland parcel AWI class 2b long established woodland of plantation origin. and land of LCfA Class 3.2 and 4.2. Access track will be impacted.	Moderate adverse residual effect as result of land take of ancient woodland and disruption to access.
65	Predicted land take of 2ha (5.5% of land holding) from ancient woodland parcel of AWI class 2b long established woodland of plantation origin and land of LCfA Class 3.2 and 4.2. Access track will be impacted.	Moderate adverse residual effect as result of land take of ancient woodland and disruption to access.
66	Predicted land take of 2ha (35% of land holding) from one pastoral field of LCfA Class 4.2 and two woodland parcels. Field will be sub-divided in two, with future viability questionable. Wooded area to south-west would be impacted.	Major adverse residual effect as result of division of land holding and land take of agricultural land.
67	Predicated land take of 4ha (8.5% of land holding) from four mixed farming fields of LCfA Class 3.1, 3.2 and 4.2. One field will have a large land take with potential to increase due to severed parcels that may not be viable for agricultural use.	Major adverse residual effect as a result of division of land holding and land take of agricultural land including prime land.
131	Predicated land take of 1ha (24.5% of land holding) from one field of LCfA Class 3.2. Southern end of field will be affected.	Major adverse residual effect as a result of land take of agricultural land.
Unknown	Predicted eight agricultural fields of LCfA Class 3.1, 3.2 and 4.2 and one forestry parcel impacted, including ancient woodlands. Fields and access severed.	Moderate adverse residual effect as a result of division of holdings and land take of agricultural land including some prime land.
<p>A total of 16 known landowners are predicted to be significantly affected by the route option.</p> <p>Permanent loss from route option of 106.5ha of which 61.5ha (58%) is of high agricultural value and 13ha of woodland and forestry parcels.</p>		

Table 13.14 Predicted Effects on Land Holdings – Pitcaple to Kintore (Violet Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
70	Predicted land take of 3.5ha (10.5% of land holding) from five fields of LCfA 3.1, 3.2 and 5.3. Small area of woodland also removed. One field sub-divided and access disrupted to steading and farmhouse. Potential other industrial activities on site.	Major adverse residual effect as a result of land take including prime agricultural land, severance and access.
72	Predicted land take of 7.5ha (7% of land holding) from five fields of LCfA Class 3.1, 3.2 and 4.2 and forestry parcels. Forestry parcels would be sub-divided. Access issues would arise resulting in inaccessibility of land parcels. Forest or crop for potential Christmas tree plantation to be confirmed.	Moderate adverse residual effect as a result of land take, including prime agricultural land, inaccessibility and access issues.
73	Predicted land take of 24.5ha (16.5% of land holding) from 15 fields of LCfA 3.1, 3.2 and 4.2 and a woodland area. Two fields will suffer significant land loss, with others being sub-divided. Potential access issues, including to steading. Two woodland parcels impacted including one ancient woodland.	Major adverse residual effect as a result of land take including prime agricultural land, severance and access.
78	Predicted land take of 4.5ha (5.5% of land holding) from five fields of LCfA 3.1 and 3.2. Three fields sub-divided with only small sections of other two fields removed.	Moderate adverse residual effect as a result of land take including prime agricultural land.
91	Predicted land take of 0.5ha (21.5% of land holding) from one field of LCfA Class 3.1 and woodland. Woodland would be entirely impacted and small section of field.	Major adverse residual effect as a result of prime agricultural land take.
100	Predicted land take of 8ha (6.5% of land holding) from seven fields of LCfA Class 3.1 and 3.2. Three fields will have significant land loss with viability unknown, potential increase in land take due to land inaccessibility. Possible access issues.	Moderate adverse residual effect as a result of land take including prime agricultural land and severance of fields.
101	Predicted land take of 1ha (15% of land holding) from one field of LCfA Class 3.2. Southern end of field would be removed with potential increase in land take due to isolated pocket of land.	Major adverse residual effect as a result of agricultural land take and severance.
103	Predicted land take of 7.5ha (15% of land holding) from seven fields of LCfA Class 3.1, 3.2 and 5.3. Pastoral farm including some woodland. Violet route option runs through farm, splitting fields with significant loss in four fields. Ancient woodland parcel of AWI class 2b long established woodland of plantation origin is severed in two.	Major adverse residual effect as a result of agricultural land take, including prime agricultural land and severance.
106	Predicted land take of 3ha (4.5% of land holding) from two fields of LCfA Class 3.1. Fields split in two, potential access issues to other fields.	Moderate adverse residual effect as a result of prime agricultural land take and farm division.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
110	Predicted land take of 6.5ha (7% of land holding) from six fields of LCfA Class 3.2 and 4.2. North-east of fields will be severed with inaccessibility of parcels, which would increase land take.	Moderate adverse residual effect as a result of agricultural land take and severance.
113	Predicted land take of 0.5ha (31% of land holding) from one field of LCfA Class 3.2 and woodland parcel. Field will be reduced by nearly half and large section of woodland area would be impacted.	Major adverse residual effect as a result of agricultural land take.
114	Predicted land take of 1.5ha (47% of land holding) from two fields of LCfA Class 3.2 and woodland parcel. One field would be totally removed, and woodland section removed. Wind turbine also impacted in field and would need relocated.	Major adverse residual effect as a result of agricultural land take and severance.
115	Predicted land take of 9.5ha (9% of land holding) from seven fields on a mixed farm of LCfA Class 3.2. Four fields will be heavily impacted with land take and access issues. There will be issues with accessing existing fields from steading.	Moderate adverse residual effect as a result of agricultural land take and access to steading and fields.
121	Predicted land take of 8ha (7.5% of land holding) from six fields of LCfA Class 3.1 and 3.2. Arable field would be significantly reduced in size. While other fields split in two. Potential for increase in land take due to inaccessibility of field parcels.	Moderate adverse residual effect as a result of agricultural land take, including prime land and field severance.
122	Predicted land take of 0.5ha (19% of land holding) from two mostly woodland parcels and land of LCfA Class 3.2. Woodland area would be significantly reduced and is between two access roads.	Major adverse residual effect as a result of agricultural land take.
123	Predicted land take of 9ha (7.5% of land holding) from six fields on a mixed farm of LCfA Class 3.2. Route option will sever fields, sub-dividing them in two. Potential for greater land take as result of inaccessibility of field parcels.	Moderate adverse residual effect as a result of agricultural land take and severance.
126	Predicted land take of 0.5ha (5.5% of land holding) from three pastoral fields of LCfA Class 3.2. One field will be significantly reduced in size. Equestrian centre impacted by land take.	Moderate adverse residual effect as a result of agricultural land take.
127	Predicted land take of 3ha (17% of land holding) from four pastoral fields of LCfA Class 3.2. Pastoral, fields will be sub-divided in two, leading to potential increase in land take due to severed fields not being viable after construction. Small area of woodland adjacent to existing minor road may be impacted by widening of this road to meet slip road to new road.	Major adverse residual effect as a result of agricultural land take and severance.
128	Predicted land take of 12.5ha (10% of land holding) from 12 fields from a mixed farm of LCfA Class 3.1 and 3.2. Potential for increased land take due to field inaccessibility. Section of woodland removed. Fields adjacent to River Don impacted and subdivided.	Moderate adverse residual effect as a result of agricultural land take, including prime land and field severance.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
132	Predicted land take of 3.5ha (6.5% of land holding) from four forestry parcels and land of LCfA Class 3.2. Route option runs right through land, severing fields. Potential access issues to remaining forestry to south-west. Includes equestrian centre with potential access impacted.	Moderate adverse residual effect as a result of land take and severance.
134	Predicted land take of 2.5ha (35.5% of land holding) from six pastoral fields of LCfA Class 3.2. Three fields will be significantly sub-divided and fields potentially not viable for agricultural use after construction.	Major adverse residual effect as a result of agricultural land take and severance.
Unknown	Predicted five agricultural fields impacted of LCfA Class 3.1, 3.2, 4.2 and 5.3 and one ancient woodland parcel. Field and access severed.	Moderate adverse residual effect as a result of sub-division of holdings and land take of agricultural land including some prime land.
<p>A total of 21 known landowners are predicted to be significantly affected by the route option.</p> <p>Permanent loss from route option of 183.5ha of which 53ha (29%) is of high agricultural value and 17ha of woodland and forestry parcels.</p>		

Table 13.15 Predicted Effects on Land Holdings – Pitcaple to Kintore (Orange Route Option)

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
70	Predicted land take of 14ha (43% of land holding) from eight fields of LCfA Class 3.1, 3.2, 4.2 and 5.3. Inaccessibility of fields and cutting off sections, which could lead to larger land take. One field dissected into two, remaining fields edges removed.	Major adverse residual effect as a result of agricultural land take, including prime land and field severance.
136	Predicted land take of under 0.5ha (10% of land holding) from three small fields of LCfA class 3.2. Small fields, which will be removed from use. Will isolate the land to south-east. Land interest may not be a farm but appears in agricultural use.	Moderate adverse residual effect as a result of agricultural land take.
92	Predicted land take of 29.5ha (12% of land holding) from 11 fields from a mixed farm of LCfA Class 3.1, 3.2 and 4.2. Fields sub-divided with some fields significantly affected. Parcels of land will be left inaccessible, increased land take expected.	Moderate adverse residual effect as a result of agricultural land take, including prime land and field severance.
94	Predicted land take of 6.5ha (7% of land holding) from five arable fields of LCfA Class 3.2 and small area of woodland. Fields will be sub-divided with land parcels left inaccessible, leading to potential greater land take.	Moderate adverse residual effect as a result of agricultural land take and field severance.
96	Predicted land take of 1.5ha (50% of land holding) from two fields of LCfA Class 3.2 and woodland parcel. Majority of field and woodland would be impacted.	Major adverse residual effect as a result of agricultural land take.

Land Interest	Potential Effects ⁵⁹ on Agricultural Business	Predicted Residual and Significance of Effect
97	Predicted land take of 0.5ha (30% of land holding) from narrow farm access track and land of LCfA Class 3.2. Potential access issues.	Major adverse residual effect as a result of agricultural access issues.
98	Predicted land take of 10ha (8.5% of land holding) from 13 fields of LCfA Class 3.2 including woodland. Fields will be sub-divided and access impacted.	Moderate adverse residual effect as a result of agricultural land take, severance and access issues.
118	Predicted land take of 30ha (25% of land holding) from 16 fields and woodland of LCfA Class 3.2 and 4.2. Fields will be sub-divided, with significant land take to those impacted. Potentially three to five fields will be lost to agricultural use. Ancient woodland impacted of AWI class 2b long established woodland of plantation origin will be sub-divided.	Major adverse residual effect as a result of agricultural land take and field severance.
120	Predicted land take of 0.5ha (8% of land holding) from one field of LCfA Class 3.2.	Moderate adverse residual effect as a result of agricultural land take.
Unknown	Predicted 28 agricultural fields of LCfA Class 3.1, 3.2, 4.2 and 5.3 and 11 forestry parcels impacted. Field and access severed. Four ancient woodlands impacted of AWI class 2b long established woodland of plantation origin due to sub-division and partially removed.	Moderate adverse residual effect as a result of sub-division of holdings and land take of agricultural land including some prime land.
<p>A total of nine known landowners are predicted to be significantly affected by the route option.</p>		
<p>Permanent loss from route option of 178ha of which 18.5ha (10.5%) is of high agricultural value and 18 ha of woodland and forestry parcels.</p>		

13.7 Cumulative Effects

- 13.7.1 The assessment of cumulative effects has taken account of the interactions of the route options with any potential land take required for future development, based on those identified in the Aberdeenshire LDP⁵⁴. This assessment has focussed on the loss of prime agricultural land as a key environmental and land use resource and has identified whether a cumulative effect is predicted to occur.
- 13.7.2 The Violet route option on the Pitcaple to Kintore geographical section will pass close to proposed housing developments, which will affect prime agricultural land and may result in significant cumulative loss of prime agricultural land in a concentrated area.

13.8 Summary of Effects

- 13.8.1 This section sets out a summary of key findings based on the predicted significant residual effects on agriculture.

Table 13.16 Summary of Predicted Effects on Agriculture: East of Huntly to Colpy

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
<p>The total number of known land holdings with a predicted significant adverse effect is 12 with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Eight Major adverse; and</p> <p>Four Moderate adverse (including unknown land owner assessment).</p> <p>The total agricultural land take (including forestry) for the option is 159ha of which:</p> <p>2ha (1%) is prime agricultural land;</p> <p>152.5ha (96%) is lower quality agricultural land; and</p> <p>4.5ha (3%) is forestry and woodland.</p>	<p>The total number of known land holdings with a predicted significant adverse effect is 12 with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Seven Major adverse; and</p> <p>Five Moderate adverse (including unknown land owner assessment).</p> <p>The total agricultural land take (including forestry) for the option is 164ha of which:</p> <p>2ha (1%) is prime agricultural land;</p> <p>149ha (91%) is lower quality agricultural land; and</p> <p>13ha (8%) is forestry and woodland.</p>

- 13.8.2 The Cyan route option impacts a total of 26 land holdings between East of Huntly and Colpy, of which 12 known land holdings are predicted to have significant adverse effect. The Cyan route option is predominantly aligned through areas of non-prime agricultural land, with only approximately 1% prime agricultural land.
- 13.8.3 The Red route option impacts a total of 24 land holdings between East of Huntly and Colpy, of which 12 known land holdings are predicted to have significant adverse effect. The Red route option is predominantly aligned through areas of non-prime agricultural land, with only approximately 1% prime agricultural land and more forestry than the Cyan route option.

13.8.4 Overall, no material differences have been identified in predicted effects between the two route options for agricultural, forestry and sporting interests.

Table 13.17 Summary of Predicted Effects on Agriculture: Colpy to Pitcaple

Predicted Residual Effects for Pink Route Option	Predicted Residual Effects for Brown Route Option
<p>The total number of known land holdings with a predicted significant adverse effect is 13 with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Six Major adverse; and</p> <p>Seven Moderate adverse (including unknown land owner assessment).</p> <p>The total agricultural land take (including forestry) for the option is 92.5ha of which:</p> <p>41.5ha (45%) is prime agricultural land;</p> <p>44ha (48%) is lower quality agricultural land; and</p> <p>7ha (7%) is forestry and woodland.</p>	<p>The total number of known land holdings with a predicted significant adverse effect is 16 with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Seven Major adverse; and</p> <p>Nine Moderate adverse (including unknown land owner assessment).</p> <p>The total agricultural land take (including forestry) for the option is 106.5ha of which:</p> <p>61.5ha (58%) is prime agricultural land;</p> <p>32ha (30%) is lower quality agricultural land; and</p> <p>13ha (12%) is forestry and woodland.</p>

13.8.5 The Pink route option impacts a total of 24 land holdings between Colpy and Pitcaple, of which 13 known land holdings are predicted to have significant adverse effect. The Pink route option is aligned through areas of prime and non-prime agricultural land.

13.8.6 The Brown route option impacts a total of 25 land holdings between Colpy and Pitcaple, of which 16 known land holdings are predicted to have significant adverse effect. The Brown route option is predominantly aligned through areas of prime agricultural land, approximately 58% of land take.

13.8.7 Overall, the Pink route option is considered to result in less effect on agricultural, forestry and sporting interests.

Table 13.18 Summary of Predicted Effects on Agriculture: Pitcaple to Kintore

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>The total number of known land holdings with a predicted significant adverse effect is 21 with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Ten Major adverse; and</p> <p>11 Moderate adverse (including unknown land owner assessment).</p>	<p>The total number of known land holdings with a predicted significant adverse effect is nine with residual effects primarily related to a loss of agricultural land and fragmentation of holdings comprising:</p> <p>Four Major adverse; and</p> <p>Five Moderate adverse (including unknown land owner assessment).</p>

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>The total agricultural land take (including forestry) for the option is 183.5ha of which:</p> <p>53ha (29%) is prime agricultural land;</p> <p>113.5ha (62%) is lower quality agricultural land; and</p> <p>17ha (9%) is forestry and woodland.</p>	<p>The total agricultural land take (including forestry) for the option is 178ha of which:</p> <p>18.5ha (10%) is prime agricultural land;</p> <p>141.5ha (80%) is lower quality agricultural land; and</p> <p>18ha (10%) is forestry and woodland.</p>

- 13.8.8 The Violet route option impacts a total of 40 land holdings between Pitcaple and Kintore, of which 21 known land holdings are predicted to have significant adverse effect. The Violet route option is aligned through areas of prime (29%) and non-prime agricultural land.
- 13.8.9 The Orange route option impacts a total of 25 land holdings between Pitcaple and Kintore, of which nine known land holdings are predicted to have significant adverse effect. The Orange route option is predominantly aligned through areas of non-prime agricultural land with 10% going through prime land.
- 13.8.10 Overall, the Orange route option is considered to result in less effect on agricultural, forestry and sporting interests.

13.9 Scope of DMRB Stage 3 Assessment

- 13.9.1 Following the selection of the Preferred Option, the DMRB Stage 3 Assessment for agriculture, forestry and sporting interests will be undertaken in accordance with DMRB (LA 112 Population and Human Health) and LA 109 (Geology and Soils) and will include the following:
 - Consultation with impacted landowners. Information gathered as part of this consultation will be used to determine the sensitivity of land interest, magnitude of impact and to identify appropriate mitigation and, therefore, the overall significance of impacts. Information gathered to assess future viability will include cropping, sporting, stocking, drainage and access information;
 - In relation to the agricultural and forestry land use assessment, land take calculations, including those from construction works, together with fragmentation of land holdings and increased journey times to severed land will be considered; and
 - Site visits along the Preferred Option will be carried out. Information gathered from the farm consultations and site visits will be used to inform the DMRB Stage 3 assessment and detailed design development.

14 Materials

14.1 Introduction

- 14.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the potential impacts and effects on material resources and generation of waste for each of the route options. The assessment includes the following:
- Baseline conditions within the study area;
 - Potential impacts of each route option regarding the baseline conditions; and
 - Anticipated mitigation measures that might be developed at DMRB Stage 3 for the Preferred Option.
- 14.1.2 Material resources include primary raw materials (materials that are from a non-renewable source, such as aggregates and minerals), recycled materials, site won materials and manufactured construction products. Material resources may originate offsite, and some on-site such as excavated natural materials, or recycled road plainings. Waste is surplus materials generated from the construction process which are unsuitable for re-use on-site.
- 14.1.3 The assessment has been carried out based upon estimated quantities of construction materials and waste based on preliminary engineering designs (appropriate for DMRB Stage 2) and professional judgement. Given the early stage of scheme development, these quantities are not final and will be further refined throughout DMRB Stage 3 and detailed design. Quantities include high-level cut and fill estimates for each route option, along with estimates of materials required for structures and road pavements and area of woodland clearance required. At this stage the assessment has not considered the effects of quarrying, handling and transportation of material or waste as there is insufficient information on construction methods, material sources and haulage routes to predict specific effects.
- 14.1.4 Relative carbon sequestration potential of the site, carbon requirements associated with energy for earthworks and processing of materials and waste have not been considered within this assessment. Further details can be found within Chapter 21, Climate and will be assessed in further detail within the DMRB Stage 3 assessment.

14.2 Approach to Assessment

Introduction

- 14.2.1 The assessment of materials has been undertaken with reference to guidance contained within DMRB (Volume 11, Section 2, Part 5, HA 205/08 Assessment and Management of Environmental Effects), Interim Advice Note (IAN) 153/11, Guidance on the Environmental Assessment of Material Resources (referred to as IAN 153/11) and taking account of, where relevant, the draft DMRB HD 212/11 Materials⁶⁰.
- 14.2.2 Due to the level of information available at this stage of the project, IAN 153/11 recommends a simple assessment of the environmental consequences of the scheme design to inform project decisions is undertaken. A simple assessment assembles the data and information that is readily available to reach an understanding of the likely environmental effects to inform the final design.
- 14.2.3 Professional judgement has been used in the prediction and evaluation of environmental effects of the different types of materials and waste arisings, drawing on relevant technical guidance as appropriate.

Relevant Legislation and Policy

- 14.2.4 A desktop review of current legislation, planning policy and technical guidance was carried out to identify all relevant information to the project in relation to materials and waste.
- 14.2.5 The European Waste Framework Directive⁶¹ (WFD) is the legislative framework for the handling of waste in the European Union (EU).
- The directive sets out aims of waste management and disposal for EU members so that waste is not disposed of in a manner that could impact on human health or the environment and encourages waste reduction, recycling and re-use;
 - It states that all member states are to increase the percentage by weight of waste recycled, re-used and recovered by other methods, to 70% by 2020.
 - Article 3(1) of the WFD defines waste as “any substance or object which the holder discards or intends or is required to discard”.
- 14.2.6 The following legislation, regulations and guidelines are also applicable to the assessment:
- Waste (Scotland) Regulations 2012;
 - Waste Management Licensing (Scotland) Regulations 2011;

⁶⁰ Department for Transport, 2011, *Interim Advice Note 153/11, Guidance on the Environmental Assessment of Material Resources*, available at: <http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian153.pdf>

⁶¹ European Commission, 2008, *European Waste Framework Directive 2008/98/EC*, available at: <http://ec.europa.eu/environment/waste/framework/>

- Waste Management Licensing (Scotland) Amendment Regulations 2016;
- Special Waste Regulations 1996;
- Special Waste Amendment (Scotland) Regulations 2004;
- Pollution Prevention and Control (Scotland) Regulations 2012;
- Environment Act 1995;
- Environmental Protection Act 1990;
- Environmental Protection (Duty of Care) (Scotland) Regulations 2014;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009);
- Regulatory guidance: promoting the sustainable reuse of greenfield soils in construction (Natural Scotland 2010);
- Waste Classification Guidance on the classification and assessment of waste (1st Edition v1.1) Technical Guidance WM3 SEPA (2018); and
- Scotland's Zero Waste Plan (The Scottish Government, 2010).

14.2.7 Scotland's Zero Waste Plan⁶² published in 2010, is the Scottish Government's policy which implements the Directive. It aims to reduce Scotland's demand on primary resources, stating that by 2025 the target for the construction industry is to halve the waste sent to landfill. The policy also states that in line with the European Directive, the Scottish Government will aim to secure 70% recycling of construction and demolition waste by 2020, to contribute to the achievement of the UK target. The plan also sets out to recycle 70% of all waste and have a maximum of 5% waste sent to landfill, both by 2025

14.2.8 Additional to Scotland's Zero Waste Plan, the Scottish Government issued a report in October 2013; Safeguarding Scotland's Resources: Blueprint for a more resource efficient and circular economy⁶³. The report details a waste prevention programme which aims to achieve a 15% reduction of waste by 2025 (from 2011 levels). The approved Aberdeenshire Council Waste Strategy 2019-2023⁶⁴ also supports the Scottish Government's ambition for moving towards a more circular economy.

14.2.9 A detailed review of policy is not provided here as the policy and regulatory context for waste management and materials is extensive and does not specifically inform the option-based assessment presented in this chapter. Further detailed consideration of the effects of the options on policy, including those in the

⁶² *Scotland's Zero Waste Plan*, 2010, available at: <https://www.gov.scot/publications/scotlands-zero-waste-plan/>

⁶³ Natural Scotland, The Scottish Government, 2013, *Safeguarding Scotland's Resources: Blueprint for a more resource efficient and circular economy*, available at <https://www.gov.scot/publications/safeguarding-scotlands-resources-blueprint-more-resource-efficient-circular-economy/>

⁶⁴ Aberdeenshire Council, 2019, *Waste Strategy 2019-2023 (Approved)*, available at: <https://www.aberdeenshire.gov.uk/waste/waste-strategy/>

Aberdeenshire Local Development Plan, is presented in Chapter 9 (Policies and Plans).

Sources of Information

- 14.2.10 Information on earthwork quantities including cut/fill volumes has been calculated for the route option designs which are detailed further in Volume 1, Part 2, Chapters 5 to 7, Engineering Assessment.
- 14.2.11 Information on the predicted area of woodland clearance was obtained from the assessment in Chapter 13, Agriculture, Forestry and Sporting Interests.
- 14.2.12 Information on the potential for encountering contaminated land for each route option was obtained from Chapter 19, Geology, Soils, Contaminated Land and Groundwater.

Consultations

- 14.2.13 No specific consultation was undertaken for materials.

Study Area

- 14.2.14 The study area for this assessment considers impacts that occur within the footprint of the route options, which is taken as the outermost edge of all the route options including the maintenance strip. With regard to material availability, a study area of 10km has been used, and for waste infrastructure, a review has been undertaken of the local authority area (Aberdeenshire). As the guidance does not define study area guidelines, professional judgement has been applied to determine suitable areas based on the level of assessment required at DMRB Stage 2.

Assessment Methodology

- 14.2.15 The magnitude of predicted effects from each of the route options has been considered in combination with the sensitivity of the receptors to determine the potential significant effects. The assessment matrices have been determined from guidance set out in DMRB HA205/08 Assessment and Management of Environmental Effects, Chapter 2 Determining Significance of Environmental Effects and from the draft DMRB guidance HD 212/11 Materials.
- 14.2.16 The method for assessing the sensitivity of the receptors is undertaken at a general level for the DMRB Stage 2 assessment and is detailed in Table 14.1.

Table 14.1 Sensitivity of Receptors

Value (Sensitivity)	Receptors
High	Materials: International resource import or scarce resource on a national scale.
	Waste: There is very limited or no capacity available at local or regional waste management facilities.

Value (Sensitivity)	Receptors
Medium	Materials: Readily available resource on a national scale.
	Waste: Capacity available at regional waste management facilities and limited capacity available locally.
Low	Materials: Readily available resource on a local and national scale.
	Waste: Capacity available at local and regional waste management facilities.

14.2.17 The magnitude of impacts is defined in Table 14.2. The assessment considers the quantities of materials required and the quantities of waste generated (during site preparation and construction phases) for each of the route options and includes the following:

- The length of each route option including mainline, side roads and junctions;
- Earthworks estimates (cut and fill volumes) including an assessment of material suitability for re-use;
- Indicative quantities of required construction materials for all structures, based on deck area of the structures;
- Potential for encountering and handling contaminated materials;
- Estimated areas of woodland clearance required; and
- Demolition of existing structures.

14.2.18 The assessment for waste arisings also includes the potential for encountering contaminated land and handling contaminated materials. This information has been obtained from Chapter 19, Geology, Soils, Contaminated Land and Groundwater.

14.2.19 The assessment has included the area of woodland clearance required for each route option which has been obtained from Chapter 13, Agriculture, Forestry and Sporting Interests as this has the potential to generate waste (however, most timber is assumed to be re-used) which may require transportation for processing.

Table 14.2 Assessment Criteria for Magnitude of Impacts

Magnitude	Typical Critical Descriptors
Major	Materials: Majority of materials used are primary and imported. Limited or no potential for use of recycled or site won material.
	Waste: High volumes of waste generated. Treatment and disposal options are limited. Waste arisings from the scheme are predominantly disposed of to landfill with little or no prior segregation.

Magnitude	Typical Criterial Descriptors
Moderate	Materials: Primary and imported materials used in conjunction with recycled or site won material.
	Waste: Waste arisings are segregated and re-used where possible, alongside the use of incineration, composting and landfill facilities.
Minor	Materials: Small proportion of primary and imported materials used. Use of recycled or site won material maximised.
	Waste: Waste arisings from the scheme are predominantly re-used onsite or sent to recycling/composting facilities, with minimal waste going to landfill.

14.2.20 Significance of predicted effects takes account of the sensitivity of the receptors and the magnitude of the potential impacts. The matrix for this assessment is shown in Table 14.3. A simple matrix of minor, moderate and major adverse significance has been used at this stage.

Table 14.3 Matrix for Determination of Significance of Effect

Magnitude of Impact	Sensitivity of Receptor		
	High	Medium	Low
Major	Major adverse	Major adverse	Moderate adverse
Moderate	Major adverse	Moderate adverse	Minor adverse
Minor	Moderate adverse	Minor adverse	Minor adverse

14.2.21 The assessment of the route options was carried out using three sub-topics which were derived from the reporting matrix for a simple assessment set out in IAN 153/11. These are depletion of natural resources, demand on aggregates and material handling, and demand on handling capacity of regional waste management and disposal facilities.

14.2.22 Following the assessment, mitigation measures were then identified and applied to the impacts. Any residual effect post-mitigation was then assessed for significance.

Assumptions and Limitations

New Guidance

14.2.23 An update to the Materials assessment methodology, now referred to as LA 110 Material assets and waste (hereafter referred to as the 'New Guidance') outlined in the DMRB was released after the DMRB Stage 2 environmental assessment for this scheme had commenced. This assessment followed a structure outlined in the previous DMRB draft guidance (Volume 11 Section 3 Part 6 HD 212/11 Materials), (hereafter referred to as the 'Withdrawn Guidance'). Following discussions with Transport Scotland, it has been agreed that the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report produced

following the New Guidance in terms of the detail incorporated or the conclusions drawn.

- 14.2.24 The following Paragraphs 14.2.25 to 14.2.36 outline the key differences between the Withdrawn Guidance and New Guidance and describe how this chapter meets the objectives of the New Guidance.
- 14.2.25 The New Guidance is titled LA 110 'Material assets and waste', rather than 'Materials', and the definition of waste is given as:
'Any substance or object which the holder disposes or intends / is required to dispose.'
- 14.2.26 The New Guidance assumes that the assessor will be suitably experienced in order to exercise professional judgement and also seeks to further improve resource efficiency and sustainability.

Effects of the New Guidance

- 14.2.27 Rather than identifying an explicitly three stage assessment, the New Guidance advocates a reporting process differentiating between two elements; scoping and assessment. The conclusion of the scoping phase is reporting whether further assessment is required, or whether either element (material assets or waste) can be scoped out.
- 14.2.28 In the New Guidance, there is no separation between Simple Assessment and Detailed Assessment, as there was within the Withdrawn Guidance.
- 14.2.29 Further assessment involves identifying the study area(s), describing a baseline scenario, data collection, evaluation of the significance criteria for material assets and/or waste (depending on the outcome of the scoping), and evaluation of the significance of effects on material assets and/or waste (depending on the outcome of the scoping stage). Within the assessment, design and mitigation measures adopted should be evidenced, and enhancement opportunities should be identified. The New Guidance also requires that monitoring is undertaken and reported within the Environmental Management Plan.
- 14.2.30 The New Guidance includes impacts to mineral safeguarding sites and peat resource. These were previously included within the Withdrawn Guidance Geology and Soils. This is included within Chapter 19 Geology, Soils, Contaminated Land and Groundwater of this DMRB Stage 2 report.
- 14.2.31 The Withdrawn Guidance required a calculation of associated carbon emissions to be undertaken. This is now undertaken in accordance with the New Guidance, LA 114 Climate, and will be included in a separate chapter within the DMRB Stage 2 report.
- 14.2.32 The terminology of the assessment has changed in the New Guidance; however, the overall findings are comparable. Previously, for materials and waste receptors, the value and/or sensitivity were determined, then the nature and characteristic of the impacts were established and described. This enabled the magnitude of each impact to be assessed. The significance of effects matrix then allowed the effects to be ranked (neutral, slight, moderate, large, and very large). These are the same ranks as used for significance categories in the New Guidance; however, this is further split into 'significant' and 'not significant' using significance criteria provided.

- 14.2.33 The DMRB Stage 2 Report assigns significance of effect using information from the literature, baseline assessment and professional judgement. The purpose of the DMRB Stage 2 Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance. At subsequent reporting stages the Preferred Option will be assessed using the New Guidance significance category descriptions and significance criteria.
- 14.2.34 Once the scheme progresses to the DMRB Stage 3 Reporting phase and onto an assessment of the Preferred Option, the New Guidance does diverge from the Withdrawn Guidance.
- 14.2.35 The New Guidance explicitly identifies mitigation design as an iterative process requiring early and ongoing engagement between the design engineers and the environmental team. As part of the reporting framework, the New Guidance states that “the environmental assessment shall evidence the adoption of design and mitigation measures for material assets” and waste for the construction phase of works and the opening year of operation⁶⁵.
- 14.2.36 The New Guidance also highlights environmental enhancement opportunities as an integral part of project design which should be identified, reported and implemented through the material asset and waste assessment process and project life cycle. Monitoring of data and recording/reporting is also cited as a key element to be considered.

Other Assumptions and Limitations

- 14.2.37 Information on construction quantities for key materials is set out for each route option in Table 14.4.
- 14.2.38 At DMRB Stage 3, the Preferred Option will be subject to design development and, therefore, all quantities are indicative only at this stage. At DMRB Stage 2, the indicative quantities are considered appropriate to inform the route options assessment.
- 14.2.39 Earthworks quantities are indicative and have been derived from the engineering assessment and a preliminary earthwork estimate. The preliminary earthworks estimates considered bulk earthwork quantities (total cut and fill) and the amount of material that is suitable for re-use. For each route option, an estimated deficit or surplus of suitable and unsuitable site won material is provided. The estimates of suitable cut material are indicative only and will be further refined as the scheme progresses and more detailed information from the ground investigation to be undertaken in DMRB Stage 3 is available.
- 14.2.40 No consideration has been included for total kerbing, drainage, fencing or lighting as these are proportional to route option length. No landscaping material requirements have been considered in the assessment.

⁶⁵ There are annexes detailing alternative or supplementary guidance specific to different Overseeing Organisations for schemes in different UK nations which are known as National Application Annexes. No additional guidance is given for Scotland in LA 110.

- 14.2.41 No consideration has been included in this assessment for the total embodied carbon in the materials required or wastes generated at this stage. Embodied carbon is considered within Chapter 21, Climate.
- 14.2.42 Information presented in Table 14.4 shows estimated earthworks quantities in each of the route options derived from preliminary earthworks calculations. The overall 'bulk' earthworks quantity (the sum of estimated cut and fill) followed by an estimate of the amount of material considered to be re-usable in earthworks (acceptable cut) is included. In each route option, there is either an estimated deficit or surplus of site won fill material depending on the required quantity of fill compared with the amount of excavated acceptable cut material.
- 14.2.43 In general, the East of Huntly to Colpy geographical section of the scheme is predicted to produce a large surplus of suitable material for re-use. The Colpy to Pitcaple section is predicted to have either a relatively small surplus (Pink route option) or deficit (Brown route option) of fill material, and the Pitcaple to Kintore sections are predicted to require significant fill due to a deficit in material caused by a lesser requirement for road cuttings.
- 14.2.44 It has been assumed that where there is a surplus of suitable site won fill in the East of Huntly to Colpy section of the scheme, that this can be used in the Colpy to Pitcaple and the Pitcaple to Kintore sections, where a deficit exists. This is dependent on contract procurement and individual contractor construction methods. Any additional deficit is assumed to be provided by imported fill from an external source. Specific locations requiring imported fill have not been identified at this stage.
- 14.2.45 It is assumed that where possible, site won material (road cuttings) which is unsuitable for re-use as general fill, will be used for landscaping works. If this is not possible, the material will require disposal off-site.
- 14.2.46 A conversion factor of 1.25 tonnes/m³ has been used to calculate the tonnes of waste produced from the volume of unsuitable excavated material provided for each route option.
- 14.2.47 The assessment for potential of encountering contaminated land is based on a desk-based study. During DMRB Stage 3, an intrusive ground investigation will be undertaken to further inform the assessment, this may identify additional materials which are not suitable for re-use from either a contamination or geotechnical perspective.
- 14.2.48 Operational effects have not been considered within this assessment as they are minor in comparison to construction phase impacts.

Table 14.4 Summary of Baseline

	East of Huntly to Colpy		Colpy to Pitcaple		Pitcaple to Kintore	
	Cyan route option	Red route option	Pink route option	Brown route option	Violet route option	Orange route option
Mainline length (km)	13	12	10	11	18	13
Side road and slip road length (including roundabouts) (km)	12	10	5	7	19	23
Structure deck area (major and minor structures) (m ²)	17,500	14,900	21,900	26,200	46,100	45,500
Volume of bulk fill material required (m ³)	1,660,000	2,040,000	1,310,000	2,020,000	3,390,000	3,670,000
Volume of Bulk Excavated Material (m ³)	3,720,000	5,050,000	1,780,000	1,980,000	1,980,000	3,010,000
Volume of Suitable Excavated Material (m ³)	3,170,000	4,120,000	1,560,000	1,740,000	1,740,000	2,640,000
Volume of Unsuitable Excavated Material (m ³)	550,000	930,000	220,000	240,000	240,000	370,000
Balance (m ³)	+1,510,000 (Suitable) Surplus	+2,080,000 (Suitable) Surplus	+250,000 (Suitable) Surplus	-280,000 (Deficit)	-1,650,000 (Deficit)	-1,030,000 (Deficit)
Volume of fill required (m ³)	0	0	0	280,000	1,650,000	1,030,000
Area of Woodland Clearance required (ha)	5	13	7	13	17	18

	East of Huntly to Colpy		Colpy to Pitcaple		Pitcaple to Kintore	
Potential for contaminated waste streams ⁶⁶ .	Low potential. No potentially significant sources of contamination identified.	Low potential. No potentially significant sources of contamination identified.	Low potential. No potentially significant sources of contamination identified.	Low potential. No potentially significant sources of contamination identified.	Moderate potential. Potential for contamination associated with landfills, urban and industrial activities Port Elphinstone and Kintore.	Moderate potential. Potential for contamination associated with landfills, urban and industrial activities Port Elphinstone and Kintore.
<p>The following applies to all quantities mentioned within this chapter:</p> <ul style="list-style-type: none"> • Road lengths are rounded to the nearest km • Structure deck area are rounded to the nearest 100m² • Earthworks quantities are rounded to the nearest 10,000m³ • Area of woodland clearance has been rounded to the nearest ha <p>It should be noted that at this stage all quantities are approximate.</p>						

⁶⁶ Refer to Chapter 19, Geology, Soils, Contaminated Land and Groundwater for further details on contaminated land

14.3 Baseline

14.3.1 The baseline for this chapter provides a general context of the estimated materials and waste for each option and the available material sources and waste facilities in the study area. Receptors or baseline conditions in a materials assessment are not defined specifically as they are for other environmental topics, except for quarries and other sources of minerals/finite raw material resources and waste management facilities and landfill sites. Table 14.4 provides a summary of the key indicative quantities of construction materials and waste quantities for each option, which are based on the high-level estimates from the engineering assessment presented in Volume 1, Part 2.

Material Availability in the Area

14.3.2 The scheme is in an area of Scotland with several sources of finite materials which have the potential to be used as material sources for aspects of construction which cannot be completed using site won materials.

14.3.3 The Scottish Aggregates Survey 2012⁶⁷ identified that there are nine hard rock quarries and six sand and gravel pits in the North East Scotland region.

14.3.4 A review of the British Geological Survey's Geindex online map⁶⁸ indicates that there are several active quarries within approximately 10km of the current A96 between Huntly and Kintore, these include:

- Pitcaple Quarry – operated by Aberdeenshire Council and located 1km north of the A96 to the west of Whiteford. The quarry has planning permission for operation until May 2021, although planning documents indicate the quarry to have a perspective lifespan beyond 2025. The quarry is a hard rock quarry (Norite and Gabbronorite) producing rock aggregate, coated roadstone and sub-base material;
- Tom's Forest Quarry – operated by Breedon and located approximately 2.5km east of the A96/B987 junction at Kintore. The quarry has planning permission for operation until February 2042. The quarry is a hard rock quarry (granite and psammite) and produces rock aggregates;
- Smiddy Burn Quarry – privately operated and located at Folla Rule, Rothienorman, approximately 9.5km east of Colpy. The quarry has planning permission for continued operation until 2026. The quarry is a hard rock quarry and produces rock aggregate and sand; and
- Craigenlow Quarry – privately operated and located at Dunecht, approximately 7.5km south of Kintore. The quarry has planning permission to continue operation until June 2023 and produces ready-mix concrete, aggregates and asphalt.

14.3.5 It should be noted that part of the Pitcaple Quarry is a Geological Site of Special Scientific Interest and is also a Geological Conservation Review Site.

14.3.6 A small area of Tom's Forest Quarry is located within the Aberdeenshire Council's Tom's Forest Local Nature Conservation Site.

⁶⁷ The Scottish Government, 2015, *Scottish Aggregates Survey 2012*.

⁶⁸ British Geological Survey, *Onshore Geo-index*, available at: <http://mapapps2.bgs.ac.uk/geoindex/home.html>

14.3.7 There are no sand and gravel pits within the study area; the closest pits to the current A96 between Huntly and Kintore are:

- Lochhills Quarry- privately operated and located approximately 13.2km east of Kintore. The quarry produces sand and gravel and has planning permission to operate until 2022; and
- Park Quarry- privately operated and located approximately 16.5km south of Kintore. This quarry is, at the time of writing this DMRB Stage 2 report, awaiting decision from the planning authority to allow continued extraction.

14.3.8 Given the number of active quarries available locally and sand and gravel pits available regionally, which may be capable of producing high quality aggregates typically used for road pavement construction, there could be potential to source material import requirements locally/regionally. However, the decision of where to source the required import material will be made at a later stage by the contractor appointed to construct the scheme. Material will be sourced to meet the requirements of the Specification of Highway Works.

14.3.9 These quarries may not still be active in the future at the time of construction of the scheme but provide an indication of locally available material resources.

Waste Infrastructure in the Area

14.3.10 The disposal of waste materials can be assessed in terms of where and how they can be disposed and the associated impact of this disposal. Materials which may be classified as waste include the following:

- Excavated arisings, construction and demolition materials not suitable for re-use within the scheme and are surplus to requirements; and
- Excavated material classified as hazardous due to the presence of contaminants.

14.3.11 There is insufficient information at present to accurately determine the anticipated waste streams. However, registered landfills and other waste management sites have potential to be used for the treatment or disposal of waste generated as a result of the scheme that cannot be re-used on site. Therefore, Scottish Environment Protection Agency (SEPA) data⁶⁹ has been reviewed to obtain information on the active landfill sites within Aberdeenshire. A full review of waste management sites will be undertaken as part of the DMRB Stage 3 assessment.

14.3.12 There are four active landfill sites in the Aberdeenshire Local Authority area:

- Easter Hatton Environmental LTD, Balmedie – Non-hazardous landfill with 2 million tonnes remaining capacity and an annual capacity of 190,000 tonnes. The estimated date for ceasing landfill for this site is 2043;
- Stoneyhill Environment Park, Peterhead, Aberdeen – Non-hazardous landfill with 2 million tonnes remaining capacity and an annual capacity of 355,000 tonnes. The estimated date for ceasing landfill for this site is 2024. It is unlikely that this landfill will still be operational to serve the scheme unless an extension permit is obtained by the operators;

⁶⁹ SEPA, *Waste sites and capacity tool*, available at <https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/>. Information provided is based on 2018 data.

- Joss (Aberdeen) LTD, Parkhill, Dyce, Aberdeen – Inert landfill with a remaining capacity of 1.4 million tonnes and an annual capacity of 100,000 tonnes. The estimated date for ceasing landfill for this site is 2035; and
- Savoch Quarry Landfill Site, Peterhead, Aberdeen – Non-hazardous landfill with 61,500 tonnes remaining capacity and an annual capacity of 24,999 tonnes. The estimated ceasing date for landfill at this site is 2069. The low capacity of this landfill means it is unlikely to be able to serve the scheme.

14.3.13 There is only one waste facility registered for hazardous wastes in Scotland; Avondale Hazardous Landfill Site, Falkirk. This is only anticipated to remain in operation until 2023. This means the waste facility is unlikely to be able to serve the scheme. Alternative hazardous waste facilities are available in northern England, should they be required. The Environment Agency Waste Data Tables (2020)⁷⁰ show that in North East England, sites within Tees Valley Unitary Authorities have a remaining capacity of 6,852,000m³, and in North West England, sites within Lancashire have a remaining capacity of 1,711,000m³, with a further 4,289,00m³ available at sites within Cheshire.

Potential for Contamination

14.3.14 The study area is predominantly rural, with developed land around the towns of Inverurie, Port Elphinstone, Kintore, and smaller settlements. Several industrial activities (historic and current) are located around these settlements, including gas works, locomotive works, paper manufacturing and other manufacturing processes. Other potentially contaminative activities and sites within the study area include quarrying, landfilling, sewage works, railways, timber works, cemeteries, mills, tanks and fuel storage. Areas of infilled ground, such as backfilled ponds, canals and pits, and made ground in spoil heaps and embankments also present a potential contamination risk.

14.3.15 Farmland is also a potential source of contamination. Potentially contaminative agricultural activities include fuel tanks, pesticide use and storage and unrecorded burial of waste in pits. For further information on contaminative land uses refer to Chapter 19, Geology, Soils, Contaminated Land and Groundwater.

14.3.16 The area of required woodland clearance has been included in this assessment as a source of site generated waste. For full information on woodland clearance see Chapter 13, Agriculture, Forestry and Sporting Interests.

14.4 Potential Impacts

14.4.1 This section presents the potential impacts of each route option. The magnitude of the impact has been combined with the sensitivity of the receptor to determine the potential for significant effects (see Section 14.2).

14.4.2 Table 14.5 outlines the potential impacts that could arise as a result of the scheme. Impacts have been divided into three categories which are representative of the key environmental issues associated with materials and waste at this stage;

- Depletion of natural resources from the import of finite materials to site;
- Use of materials: aggregates & manufactured construction products; and

⁷⁰ Environment Agency, 2020, *2019 Waste Summary Tables for England - Version 2*, available at: <https://environment.data.gov.uk/portalstg/home/item.html?id=74618e52d7904d709bc910809d4235a8>

- Demand on the local waste infrastructure.

14.4.3 The potential impacts are assessed in the absence of any mitigation, and residual effects are assessed post application of mitigation.

Table 14.5 Summary of Receptors and Potential Impacts for all Route Options

Receptor	Receptor Sensitivity	Impact	Classification of Impact	Magnitude of Impact	Is the Effect Potentially Significant	Route Options Affected
Materials	Medium	Depletion of natural resources from the import of finite materials to site. <ul style="list-style-type: none"> Cuttings and required imported fill 	Adverse	Minor to Moderate	Yes	All Options
	Medium	Use of materials: aggregates and manufactured construction products. <ul style="list-style-type: none"> Required pavement areas and materials for structures 	Adverse	Moderate to Major	Yes	All Options

Receptor	Receptor Sensitivity	Impact	Classification of Impact	Magnitude of Impact	Is the Effect Potentially Significant	Route Options Affected
Waste	High	<p>Demand on the local waste infrastructure.</p> <ul style="list-style-type: none"> • Surplus excavated material to be disposed of to waste facility. • Sorting and processing of waste streams. • Handling and treatment of any contaminated wastes generated or removed from site. • Areas of cleared woodland to be processed and transported from site. 	Adverse	Minor to Moderate	Yes	All Options

14.5 Mitigation

14.5.1 The primary method of mitigation with regards to materials and waste is minimising the use of natural materials and maximising the re-use of site won materials. The DMRB Stage 2 designs have been developed thus far to reduce the cost/materials/earthworks requirements where possible. The design will be further developed and optimised during DMRB Stage 3, which may further reduce the cost/materials use and earthworks requirements. The following mitigation measures for Materials (MM1 – MM7) have been assumed within the assessment:

- MM1: The potential for cut-fill balance will be optimised where possible, with re-use of suitable material from other areas of the scheme where there is a material deficit. It may be possible to re-use excavated material which is not appropriate for fill material to complete landscaping and so reducing the quantity of waste requiring removal from site. This will be undertaken in accordance with relevant guidance and in consultation with SEPA, where necessary;
- MM2: The quantity of construction materials and imported raw materials will be informed by detailed design and so will produce minimal wastage;
- MM3: The handling of hazardous materials/waste onsite will be avoided where possible or will be conducted in accordance with relevant guidance and legislation;
- MM4: Soils will be handled and stockpiled according to DEFRA's Code of Practice for the Sustainable Use of Soils on Construction Sites⁷¹;
- MM5: A Materials Management Plan (MMP) and Waste Management Plan (WMP), to be included within the Construction Environmental Management Plan (CEMP), will be in place to suitably deal with the handling and transporting of materials and waste onsite;
- MM6: Woodland cleared from site will be processed for re-use onsite where possible or will be sent to a recycling/processing centre for timber products or composting site; and
- MM7: The key material elements used within the scheme will be responsibly sourced, with the use of secondary or recycled aggregates promoted.

⁷¹ Department for Environment, Food & Rural Affairs, 2009, *Code of Practice for the Sustainable Use of Soils on Construction Sites*, available at: <https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites/>

Predicted Environmental Effects

- 14.5.2 The predicted environmental effects for each route option have been assessed prior to mitigation and the residual effects have then been assessed following the application of mitigation. A 'significant' residual effect is classed as moderate or major significance, and these will be shown in bold.
- 14.5.3 The results of the assessments are presented as follows:
- East of Huntly to Colpy (Cyan and Red route options) – Tables 14.6 and 14.7;
 - Colpy to Pitcaple (Pink and Brown route options) – Tables 14.8 and 14.9; and
 - Pitcaple to Kintore (Violet and Orange route options) – Tables 14.10 and 14.11.
- 14.5.4 The comparative route options assessment is presented in Section 14.8.

Table 14.6 Predicted Effects for East of Huntly to Colpy (Cyan Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	<p>Depletion of Natural Resources:</p> <ul style="list-style-type: none"> • Cuttings in the region of 3,720,000m³, of which 3,170,000m³ is suitable for re-use onsite. • Fill required is 1,660,000m³ leaving a surplus of 1,510,000m³ of suitable fill which can be used elsewhere on the scheme/for landscaping/ or will require removal for disposal offsite. 	Minor	Minor adverse	MM1, MM3, MM4, MM5	Minor adverse
		<p>Use of Materials: aggregates & manufactured construction products.</p> <ul style="list-style-type: none"> • 370,000m² of pavement including side roads and junctions. Requires c.135,000m³ asphalt, c.90,000m³ type 1 aggregate and c.70,000m³ capping materials. • 90,000m² of central reservation: Requires c.10,000m³ of type 1 aggregate. • Total deck area (minor and major structures) 17,500m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Waste	High	Demand on the capacity of waste handling and disposal facilities; <ul style="list-style-type: none"> Low potential for encountering contaminated land. 550,000m³ unsuitable excavated material. Area of woodland clearance is c.5 ha. 	Moderate	Major adverse	MM1, MM3, MM4, MM5, MM6	Moderate adverse

Table 14.7 Predicted Effects for East of Huntly to Colpy (Red Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	Depletion of Natural Resources: <ul style="list-style-type: none"> Cuttings in the region of 5,050,000m³, of which 4,120,000m³ is suitable for re-use onsite. Fill required is 2,040,000m³ leaving a surplus of 2,080,000m³ of suitable fill which can be used elsewhere on the scheme/for landscaping/ or will require removal for disposal offsite. 	Minor	Minor adverse	MM1, MM3, MM4, MM5	Minor adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
		<p>Use of Materials: aggregates & manufactured construction products.</p> <ul style="list-style-type: none"> 310,000m² of pavement including side roads and junctions. Requires c.100,000m³ asphalt, c.70,000m³ type 1 aggregate and c.60,000m³ capping materials. 80,000m² of central reservation. Requires c.10,000m³ of type 1 aggregate. Total deck area (minor and major structures) 14,900m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse
Waste	High	<p>Demand on the capacity of waste handling and disposal facilities;</p> <ul style="list-style-type: none"> Low potential for encountering contaminated land. 930,000m³ unsuitable excavated material. Area of woodland clearance is c.13 ha. 	Moderate	Major adverse	MM1, MM3, MM4, MM5, MM6	Major adverse

Table 14.8 Predicted Effects for Colpy to Pitcable (Pink Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	<p>Depletion of Natural Resources:</p> <ul style="list-style-type: none"> Cuttings in the region of 1,780,000m³, of which 1,560,000m³ is suitable for re-use onsite. Fill required is 1,310,000m³ leaving a surplus of 250,000m³ of suitable fill which can be used elsewhere on the scheme/for landscaping/ or will require removal for disposal offsite. 	Minor	Minor adverse	MM1, MM3, MM4, MM5	Minor adverse
		<p>Use of Materials: aggregates & manufactured construction products.</p> <ul style="list-style-type: none"> 230,000m² of pavement including side roads and junctions. Requires c.80,000m³ asphalt, c.50,000m³ type 1 aggregate and c.50,000m³ capping materials. 60,000m² of central reservation. Requires c.10,000m³ of type 1 aggregate. Total deck area (minor and major structures) 21,900m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse
Waste	High	<p>Demand on the capacity of waste handling and disposal facilities;</p> <ul style="list-style-type: none"> Low potential for encountering contaminated land. 220,000m³ unsuitable excavated material. 	Minor	Moderate adverse	MM1, MM3, MM4, MM5, MM6	Minor adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
		<ul style="list-style-type: none"> Area of woodland clearance is c.7 ha. 	Minor	Minor adverse		

Table 14.9 Predicted Effects for Colpy to Pitcaple (Brown Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	Depletion of Natural Resources: <ul style="list-style-type: none"> Cuttings in the region of 1,980,000m³, of which 1,740,000m³ is suitable for re-use onsite. Fill required is 2,020,000 m³ leaving a deficit of 280,000m³ which will require imported fill from elsewhere on the scheme or external import. 	Moderate	Moderate adverse	MM1, MM3, MM4, MM5	Moderate adverse
		Use of Materials: aggregates & manufactured construction products. <ul style="list-style-type: none"> 260,000m² of pavement including side roads and junctions. Requires c.90,000m³ asphalt, c.60,000m³ type 1 aggregate and c.60,000m³ capping materials. 70,000m² of central reservation. Requires c.10,000m³ of type 1 aggregate. Total deck area (minor and major structures) 26,200m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Waste	High	Demand on the capacity of waste handling and disposal facilities; <ul style="list-style-type: none"> Low potential for encountering contaminated land. 240,000m³ unsuitable excavated material. 	Minor	Moderate adverse	MM1, MM3, MM4, MM5, MM6	Minor adverse
		<ul style="list-style-type: none"> Area of woodland clearance is c.13 ha. 	Minor	Minor adverse		

Table 14.10 Predicted Effects for Pitcaple to Kintore (Violet Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	Depletion of Natural Resources: <ul style="list-style-type: none"> Cuttings in the region of 1,980,000m³, of which 1,740,000m³ is suitable for re-use onsite. Fill required is 3,390,000 m³ leaving a deficit of 1,650,000m³ which will require imported fill from elsewhere on the scheme and external import. 	Moderate	Moderate adverse	MM1, MM3, MM4, MM5	Moderate adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
		<p>Use of Materials: aggregates & manufactured construction products.</p> <ul style="list-style-type: none"> • 480,000m² of pavement including side roads and junctions. Requires c.160,000m³ asphalt, c.110,000m³ type 1 aggregate and c.110,000m³ capping materials. • 100,000m² of central reservation. Requires c.20,000m³ of type 1 aggregate. • Total deck area (minor and major structures) 46,100m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse
Waste	High	<p>Demand on the capacity of waste handling and disposal facilities;</p> <ul style="list-style-type: none"> • Moderate potential for encountering contaminated land. 	Moderate	Major adverse	MM1, MM3, MM4, MM5, MM6	Moderate adverse
		<ul style="list-style-type: none"> • 240,000m³ unsuitable excavated material. • Area of woodland clearance required is c.17 ha • One structure to be demolished; Forest Road overbridge 	Minor	Moderate adverse		Minor adverse

Table 14.11 Predicted Effects for Pitcaple to Kintore (Orange Route Option)

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
Materials	Medium	<p>Depletion of Natural Resources:</p> <ul style="list-style-type: none"> • Cuttings in the region of 3,010,000m³, of which 2,640,000m³ is suitable for re-use onsite. • Fill required is 3,670,000m³ leaving a deficit of 1,030,000m³ which will require imported fill from elsewhere on the scheme and potential external import. 	Moderate	Moderate adverse	MM1, MM3, MM4, MM5	Moderate adverse
		<p>Use of Materials: aggregates & manufactured construction products.</p> <ul style="list-style-type: none"> • 430,000m² of pavement including side roads and junctions. Requires c.140,000m³ asphalt, c.100,000m³ type 1 aggregate and c.90,000m³ capping materials. • 70,000m² of central reservation. Requires c.10,000m³ of type 1 aggregate. • Total deck area (minor and major structures) 45,500m² 	Moderate	Moderate adverse	MM2, MM5	Moderate adverse
Waste	High	<p>Demand on the capacity of waste handling and disposal facilities;</p> <ul style="list-style-type: none"> • Moderate potential for encountering contaminated land. 	Moderate	Major adverse	MM1, MM3, MM4, MM5, MM6	Moderate adverse

Receptor	Sensitivity	Predicted Impact	Magnitude of Impact	Significance of Effect	Mitigation	Significance of Residual Effects
		<ul style="list-style-type: none">370,000 m³ unsuitable excavated material.Area of woodland clearance required is c.18 ha	Minor	Moderate adverse		Minor adverse

14.6 Cumulative Effects

- 14.6.1 The 2017 Aberdeenshire Local Development Plan (LDP) identifies the Garioch area as being within the strategic growth area with substantial land allocations in Inverurie and Kintore to meet the demand for development near to the Violet and Orange route options from Pitcaple to Kintore. The LDP also highlights the plans for two new mixed-use development areas, south-east of Kintore.
- 14.6.2 Considering the long-term plans for growth, along with the route options, the potential exists to increase demand on materials resources (e.g. aggregates) and regional waste management facilities.
- 14.6.3 It is predicted that significant cumulative effects on materials would be reduced through adoption of value engineering, optimisation of material resource efficiency and minimisation of waste during construction of new housing and infrastructure sites. The final selection of materials (including aggregates) for the Preferred Option would be made by the eventual contractor, taking account of specific contract requirements for materials and waste management.
- 14.6.4 Cumulative effects are not predicted to increase the significance for any of the route options in combination with other anticipated future developments.

14.7 Summary of Effects

- 14.7.1 The following section sets out the key findings for each route option for residual materials and waste effects.

Table 14.12 Summary of Predicted Residual Effects for East of Huntly to Colpy

Impact	Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
Depletion of natural resources	<ul style="list-style-type: none"> • 3,720,000m³ cuttings. • No imported fill is required for the route option. • A surplus of 1,510,000m³ suitable cut for re-use. • Minor adverse residual effect. 	<ul style="list-style-type: none"> • 5,050,000m³ cuttings. • No imported fill is required for the route option. • A surplus of 2,080,000 m³ suitable cut for re-use. • Minor adverse residual effect.

Impact	Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
Use of materials aggregates & manufactured construction products.	<ul style="list-style-type: none"> • 370,000m² of pavements are required. • Total deck area for structures is 17,500m². • Moderate adverse residual effect. 	<ul style="list-style-type: none"> • 310,000m² of pavements required • Total deck area for structures 14,900m². • Moderate adverse residual effect.
Demand on the capacity of waste handling and disposal facilities.	<ul style="list-style-type: none"> • Low potential to encounter contaminated land. • 550,000m³ unsuitable fill, which will need disposed of if it cannot be reused in landscaped areas. • Woodland clearance c.5 ha. • Moderate adverse residual effect. 	<ul style="list-style-type: none"> • Low potential to encounter contaminated land. • 930,000m³ unsuitable fill, which will need disposed of if it cannot be reused in landscaped areas. • Woodland clearance c.13 ha. • Major adverse residual effect.

Summary: East of Huntly to Colpy

- 14.7.2 The predicted residual environmental effect on use of materials is moderate adverse based on the criteria used and considering there is ample resource for materials within Aberdeenshire. The requirement for materials for structures and pavements is similar for both route options.
- 14.7.3 The Red route option has a total cutting volume of approximately 5,050,000 m³, and the Cyan route option has a total of approximately 3,720,000 m³. Both have a significant quantity of materials which are suitable for re-use and so no imported fill is required.
- 14.7.4 A surplus of suitable fill is available for use on other areas of the scheme. The surplus from the Red route option could fill the deficit on both the Brown and the Violet route options (leaving a surplus of approximately 130,000 m³) or could fill the deficit on both the Brown and Orange route options (leaving a surplus of approximately 750,000 m³). The surplus from the Cyan route option could fill the deficit on the Brown route option, as well as partially filling the deficit of the Violet route option (leaving approximately 440,000m³ deficit) or fill the deficit on both the Brown and Orange route options (leaving a surplus of approximately 180,000m³).
- 14.7.5 Both route options will have unsuitable excavated materials, which are essentially waste if they cannot be reused in landscaped areas. The Red route option has

notably more (approximately 930,000m³) unsuitable excavated material than the Cyan Route option (approximately 550,000m³).

- 14.7.6 Both route options have some potential for encountering contaminated land, with the main sources in the study area being unknown infill materials, tanks of unknown contents and historic mills.
- 14.7.7 The Red route option has a major residual impact for waste compared to a moderate residual impact significance for the Cyan route option. This is due to limited capacity at local and regional landfill sites. The Red route option is predicted to have approximately 570,000m³ greater surplus of suitable excavated material and 380,000m³ more unsuitable excavated material than the Cyan route option.
- 14.7.8 The Cyan route option is expected to have slightly lower environmental residual effect for materials.

Table 14.13 Summary of Residual Effects for Colpy to Pitcaple

Impact	Residual Effects Pink Route Option	Residual Effects Brown Route Option
Depletion of natural resources.	<ul style="list-style-type: none"> • 1,780,000m³ cuttings. • No imported fill is required for the route option. • A surplus of 250,000 m³ suitable cut for re-use. • Minor adverse residual effect. 	<ul style="list-style-type: none"> • 1,980,000 m³ cuttings. • 280,000m³ of fill is required to be imported; some of this can be sourced from within the A96. • Moderate adverse residual effect.
Use of materials aggregates & manufactured construction products.	<ul style="list-style-type: none"> • 230,000m³ pavement area required. • Total deck area for structures 21,900m². • Moderate adverse residual effect. 	<ul style="list-style-type: none"> • 260,000m³ of pavement area required. • Total deck area for structures is 26,200m². • Moderate adverse residual effect.
Demand on the capacity of waste handling and disposal facilities.	<ul style="list-style-type: none"> • Low potential for encountering contaminated land. • Woodland clearance c.7 ha. • Minor adverse residual effect. 	<ul style="list-style-type: none"> • Low potential for encountering contaminated land. • Woodland clearance c.13 ha. • Minor adverse residual effect.

Summary: Colpy to Pitcaple

- 14.7.9 The Pink route option has a predicted residual effect of minor adverse for the use of materials (depletion of natural resources) as a significant quantity of materials are suitable for re-use and so no imported fill is required. A surplus of suitable fill is available for use on other areas of the scheme.
- 14.7.10 The predicted residual environmental effect for the use of materials (depletion of natural resources) for the Brown route option is moderate adverse. Earthworks

leave a deficit of 280,000m³ of fill material either requiring import or use of suitable material from elsewhere on the scheme.

- 14.7.11 The predicted environmental effect regarding use of materials for both route options is moderate adverse. The requirement for materials for structures and pavements is similar for both options.
- 14.7.12 Both route options have low potential for encountering contaminated land, with the main sources in the study area being historic railway lines, unknown infill materials and historic mills. The residual effect is minor adverse as it is anticipated that the risk can be mitigated.
- 14.7.13 The Pink route option is expected to have slightly lower environmental residual effect for materials.

Table 14.14 Summary of Residual Effects for Pitcaple to Kintore

Impact	Residual Effects Violet Route Option	Residual Effects Orange Route Option
Depletion of natural resources.	<ul style="list-style-type: none"> 1,980,000m³ cuttings 1,650,000m³ of imported fill is required from elsewhere on the scheme and external import. Moderate adverse residual effect. 	<ul style="list-style-type: none"> 3,010,000m³ cuttings. 1,030,000m³ of imported fill is required from elsewhere on the scheme and external import. Moderate adverse residual effect.
Use of materials aggregates & manufactured construction products.	<ul style="list-style-type: none"> 480,000m² pavement area required. Total deck area for structures 46,100m³. Moderate adverse residual effect. 	<ul style="list-style-type: none"> 430,000m² pavement area required. Total deck area for structures 45,500m². Moderate adverse residual effect.
Demand on the capacity of waste handling and disposal facilities.	<ul style="list-style-type: none"> Moderate potential for encountering contaminated land. Woodland clearance c.17 ha. Moderate adverse residual effect. 	<ul style="list-style-type: none"> Moderate potential for encountering contaminated land. Woodland clearance c. 18 ha. Moderate adverse residual effect.

Summary: Pitcaple to Kintore

- 14.7.14 The predicted residual environmental effect on use of materials is moderate adverse based on the criteria used and considering there is ample resource for materials within Aberdeenshire. The requirement for materials for structures and pavements is similar for both route options. Significant quantities of fill material will be required to be imported from site won or external sources.
- 14.7.15 The Violet route option requires a total of 1,650,000m³ of fill material which can potentially be sourced entirely from the Red route option, or the Cyan and Pink route options combined, assuming these surplus materials are suitable for reuse. Fill material from external sources will be required if the Cyan, Brown and Violet

route options were selected. The Orange route option requires a total of 1,030,000m³ fill material which can potentially be sourced entirely from the Red or Cyan route options, assuming that these materials are suitable for reuse. Imported material from external sources may not be required for the Orange route option. The residual effect for both route options is moderate adverse.

- 14.7.16 Both route options have moderate potential for encountering contaminated land with sources such as landfills, historic railway lines and historic industrial uses.
- 14.7.17 Both route options are similar regarding residual adverse environmental effects, however, the Orange route option's imported fill requirements can potentially be met entirely using site won materials, and it requires slightly less materials for pavements and structures. Overall, it is considered that the Orange route option is more favourable than the Violet route option for the materials assessment.

14.8 Scope of DMRB Stage 3 Assessment

- 14.8.1 The DMRB Stage 3 assessment for materials will be undertaken in accordance with DMRB LA 104 Environmental assessment and monitoring, LA 110 Material assets and waste (or published updates) and professional judgement. This will include more detailed assessment of the volumes and nature of materials likely to be used and estimates for waste generation during the construction phase and the first year of operational activities (opening year).
- 14.8.2 Earthworks estimates will be developed as the design is progressed, supported by available intrusive ground investigation data to determine the likely percentage of material acceptable for re-use within the scheme and any modifications to the earthworks design.
- 14.8.3 Professional judgement will be used to inform an assessment of effects on the following aspects:
- The availability/scarcity of the material resources and whether likely to be sourced on a regional, national or international level;
 - Mineral sites and peat resources;
 - The type of materials required, e.g. primary/virgin materials, manufactured materials, recycled materials;
 - The type of waste generated, e.g. inert, non-hazardous, hazardous;
 - The capacity and availability of suitable facilities within proximity to the Preferred Option to manage, treat or dispose of waste generated; and,
 - Implementation of the waste hierarchy, i.e. where the generation of the waste is avoided through design in the first instance, then minimised, recycled, recovered or disposed of.
- 14.8.4 An assessment of the carbon associated with the infrastructure for the Preferred Option will be undertaken during DMRB Stage 3 using an appropriate tool agreed with Transport Scotland and reported in the Environmental Impact Assessment Report together with other information on climate change issues for the scheme; this will be reported within Chapter 21, Climate.

15 Visual Effects

15.1 Introduction and Scope

15.1.1 This chapter presents the analysis and determination of the visual assessment of the route options of the A96 Dualling East of Huntly to Aberdeen (the scheme). The assessment has been undertaken in accordance with: Guidelines for Landscape and Visual Impact Assessment (GLVIA3)⁷²; and the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 5, Landscape Effects⁷³ which was replaced in 2010 by the Interim Advice Note 135/10 Landscape and Visual Effects Assessment⁷⁴.

15.1.2 The chapter is supported with the following figures (see Volume 5) and appendices (see Volume 4b):

- Figures 15.1 to 15.13: Visual Receptors and Figures 15.14 to 15.20: Visual Receptors (Long Range);
- Appendix A15.1: Visual Assessment Methodology; and,
- Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects.

15.1.3 The scope of this assessment includes the permanent visual effects of the route options. This assessment identifies the potential visual impacts arising from each route option during construction and operation of the scheme. It also describes proposed mitigation which is designed to minimise or reduce the overall impacts of the scheme upon receptors. However, temporary visual effects during construction have been scoped out because the visual effects during the construction phase are predicted to be similar for all route options and temporary visual effects during construction would therefore not contribute to a comparative assessment of differences in visual effects between the route options. Appropriate mitigation proposals are included in Volume 4b, Appendix A15.2: Visual receptors: Baseline Description and Assessment of Effects.

Policy Context

Landscape Designations and Planning Policy

15.1.4 Various national, structure and local plan policies are relevant to landscape and visual issues and these are summarised below. Relevant documents are referenced further in Chapter 9, Policies and Plans.

The European Landscape Convention

15.1.5 The European Landscape Convention (ELC) (Florence 2000) also known as the Florence Convention⁷⁵, came into force on 1 March 2004 and became binding in the UK on 1 March 2007. The UK Government is signatory to the ELC which aspires to enhance and maintain the quality and condition of all landscapes, not just those afforded policy protection by a local or national designation. The

⁷² Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*. Third revised edition.

⁷³ Design Manual for Roads and Bridges (DMRB), 1993, *Volume 11, Section 3, Part 5, Landscape Effects*.

⁷⁴ DMRB. *Interim Advice Note 135/10 Landscape and Visual Effects Assessment*. November 2010.

⁷⁵ Council of Europe, 2000, *European Treaty Series No 176*.

underlying principle of the ELC is that all landscapes are valuable, being the result of the interaction of people, places and nature over time.

15.1.6 The ELC recognises that all landscapes affect quality of life. Landscape is not a matter for individual states alone. It also needs to be considered in international policies and programmes.

15.1.7 The ELC concept relates to the 'outstanding universal value' of the world's cultural and natural heritage and that 'cultural landscape' is designed, evolves or associative. Scottish Natural Heritage (SNH) indicates the ELC underlies implementation of the European Union Rural Development Programme. A well-known tangible expression of this is the revision of the Landscape Institute and Institute of Environmental Management's Assessment Guidelines⁷².

Scotland's Third National Planning Framework⁷⁶

15.1.8 Scotland's Third National Planning Framework 3 (NPF3) sets out the Scottish Government's strategy to deliver sustainable economic growth in Scotland through the planning system. It identifies the importance of the natural environment to the well-being and economic prospects of residents and visitors to Scotland. NPF3 identifies the following aspirations for landscape:

- 'Landscape quality is found across Scotland and all landscapes support place making';
- 'Continue our strong protection for our wildest landscapes – wild land is a nationally important asset';
- 'Closer to settlements, landscapes have an important role to play in sustaining local distinctiveness and cultural identity, and in supporting health and well-being';
- 'We need to manage change on the urban edge and work to improve productivity and the quality of the landscape setting of our towns and cities'; and
- NPF3 also identifies a number of key priorities for Scotland's transport network which aim to stimulate economic growth, improve connectivity of rural communities and make travel on the network safer.

Transport Scotland; Fitting Landscapes

15.1.9 Fitting Landscapes⁷⁷ is the Scottish Government's policy statement addressing the landscape design and management of Scotland's transport corridors. It states that in addition to being designed and managed to meet their functional objectives as transport corridors it is important they are designed to '...fit with the landscape through which they pass – reflecting local distinctiveness, conserving and enhancing areas of high quality or, where appropriate, creating a positive contrast to the natural setting.'

15.1.10 Fitting Landscapes also recognises the importance of transport corridors as one of the main ways by which many people experience the landscape and that '...it is

⁷⁶ Scotland's third National Planning Framework 3 was laid in the Scottish Parliament on June 23, 2014. As well as a framework for the spatial development of Scotland as a whole, it includes 14 national developments, identified to deliver the strategy; available at: <https://www.gov.scot/publications/national-planning-framework-3/>

⁷⁷ Transport Scotland, 2014, *Fitting Landscapes; Securing More Sustainable Landscapes*.

vital that this experience is recognised, supported and enhanced by sensitive and appropriate design and management practices.’

15.1.11 The policy sets out the following four key policy aims:

- Aim 1 – ensure high quality of design and place. Aims to achieve integration of new transport projects with their surroundings, create new landscapes and enhance the experience for travellers;
- Aim 2 – enhance and protect natural heritage. Aims to achieve effective mitigation of adverse impacts on species and ecosystems through the positive enhancement of biodiversity and the creation and management of new habitats and green networks;
- Aim 3 – use resources wisely. Advocates the use of simple design principles and a clear understanding of future management to allow a natural equilibrium of balance to be achieved early in the creation of new landscapes; and
- Aim 4 – build in adaptability to change. Identifies how transport networks should respond to the implications of climate change and the role that they can play in accommodating storm drainage, providing refuge habitats and forming linkage to green networks.

15.1.12 By improving habitat connectivity, green networks can improve the health and viability of previously fragmented habitats and ecosystems, helping support adaptation to climate change. The objective of linking green spaces in and around settlements through green networks by creating or enhancing wildlife corridors is to ensure the delivery and long-term continuity of the benefits for people and nature.

Scottish Planning Policy⁷⁸

15.1.13 The purpose of the Scottish Planning Policy (SPP) is to set out national planning policies which reflect Scottish Ministers’ priorities for the development and use of land. They also set out how the Scottish Government expects the planning system to be delivered throughout Scotland by local planning authorities. Of the policy principles identified in SPP relating to the natural environment the following are of most relevance to the scheme:

- Facilitate positive change while maintaining and enhancing landscape character; and
- Protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woodlands, hedgerows and individual trees with high nature conservation or landscape value.

Scottish Natural Heritage’s Landscape Policy Framework⁷⁹

15.1.14 SNH advises the Scottish Government on the natural heritage including protection and management of designated areas and by statutory consultation on EIA development such as the scheme. The Landscape Policy Framework sets out

⁷⁸ The Scottish Government, 2014, *Scottish Planning Policy*.

⁷⁹ Scottish Natural Heritage/Simon Brooks, 2005, *Scottish Natural Heritage Landscape Policy Framework: Policy Statement No. 05/01*.

SNH's remit for landscape and states that SNH works for the benefit of all Scotland's landscapes by supporting the work of local authorities. The Landscape Policy Framework emphasises that all landscapes are important and the importance of design in managing change and ensuring sustainable long-term use of landscape.

Scottish Natural Heritage's National Scenic Areas Policy⁸⁰

- 15.1.15 SNH's policy on National Scenic Areas (NSA) recognises the importance and the quality of Scotland's scenery and natural heritage and considers NSAs 'are of least national importance'. SNH believe that such valued areas should be protected through designation as NSAs, with the aim to 'protect areas and sites of special natural heritage value and to secure their appropriate management.'

Scottish Natural Heritage's Wildness in Scotland's Countryside Policy⁸¹

- 15.1.16 SNH's policy, Wildness in Scotland's Countryside, sets out guidance on how to identify 'Wild land and Wildness' in Scotland and the difference between each. It also looks at how wildness is valued in society and the quality of wildness.

Policy E2 'Natural Heritage and Landscape'⁸²

- 15.1.17 The Aberdeenshire Council Local Development Plan (LDP) 2017 sets out this policy which aims to protect the landscape character and locally designated Special Landscape Areas (SLA) from inappropriate development that would harm the key qualities and characteristics of such areas.

Aberdeenshire Special Landscape Areas Supplementary Guidance⁸³

- 15.1.18 Aberdeenshire Special Landscape Areas Supplementary Guidance (SLASG) identifies proposed SLA and describes the valued qualities and characteristics that distinguish these areas from surrounding landscapes.

Aberdeenshire Forestry and Woodland Strategy Supplementary Guidance⁸⁴

- 15.1.19 Aberdeenshire Forestry and Woodland Strategy 2017 replaces the 'Forest and Woodland Strategy for Aberdeenshire and Aberdeen City' produced in 2005. It reflects national policy and is closely aligned to the Scottish Forestry Strategy⁸⁵.
- 15.1.20 The Strategy presents the key issues and opportunities in relation to forestry and woodlands in the region. It also presents a map of Preferred Areas for New Woodland Creation, identifying where new woodlands will maximise benefits and promote integrated land use.

⁸⁰ <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/national-scenic-areas/national-scenic-areas>.

⁸¹ Scottish Natural Heritage, 2002, *Wildness in Scotland's Countryside Policy Statement No. 02/03*.

⁸² Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan 2017 (LDP2017)*, page 54; *Natural Heritage and Landscape*.

⁸³ Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan Supplementary Guidance 9: Special Landscape Areas 2017 (LDP2017)*. This Supplementary Guidance is supported by the "Aberdeenshire Local Landscape Designation Review" prepared by LUC in March 2016. Its purpose is to support Policy E2 "Landscape" of the Aberdeenshire LDP2017 and has been produced to incorporate local landscape designations into the Aberdeenshire Local Development Plan (LDP) area.

⁸⁴ Aberdeenshire Council, 2017, *Aberdeenshire Local Development Plan Supplementary Guidance 8: Aberdeenshire Forestry and Woodland Strategy 2017 (LDP2017)*.

⁸⁵ The Scottish Government, 2019, *Scotland's Forestry Strategy*.

Aberdeenshire Core Paths Plan⁸⁶

15.1.21 The Land Reform (Scotland) Act 2003 was amended by the Community Empowerment (Scotland) Act 2015 (CEA 2015). The Land Reform (Scotland) Act 2003 places a duty on each local planning authority to prepare a Core Paths Plan for their administrative area. The Aberdeenshire Core Paths Plan⁸⁷ identifies Core Paths within Aberdeenshire. The purpose of Core Paths is:

- Provide the basic framework of paths to meet the communities' needs;
- Minimise any potential conflict with land management; and
- Be well sign posted, well maintained and welcoming.

Planning Advice: Landscaping Design Guidance

15.1.22 Aberdeenshire Council publishes Planning Advice documents which have the status of Supplementary Guidance. Planning Advice: Number 13 2015 Landscaping Design Guidance⁸⁸ describes the process and principles that should be adopted in new development of all types. It states that a quality landscape scheme should:

- Aid development to fit positively into its landscape setting;
- Promote and enhance biodiversity at an individual development site level;
- Enhance the overall appearance of new development of all types; and
- Add value to the development.

Planning Advice: Trees and Development

15.1.23 Planning Authorities have a duty to ensure that the amenity value of trees is not harmed where there is the potential for trees to be affected by development. Planning Advice: Number 11/2015 Trees and Development⁸⁹ sets out how developers should consider existing trees on development sites and the information that should be provided to inform decisions on planning applications where trees are present.

15.2 Approach to Assessment

Introduction

15.2.1 A visual impact assessment has been carried out to identify and assess the predicted visual effects for each of the route options. The visual assessment forms part of an overall Landscape and Visual Impact Assessment (LVIA), however, the visual assessment and landscape assessments have been separated into two chapters with distinct sections covering baseline, magnitude of impact and significance of effect. This is because the two assessments may result in different conclusions and recommendations and this approach aligns with that adopted for the DMRB Stage 2 assessment. This includes the landscape topic being identified

⁸⁶ Aberdeenshire Council, 2015, *Aberdeenshire Core Paths Plan*.

⁸⁷ <https://www.aberdeenshire.gov.uk/paths-and-outdoor-access/core-paths-plan/general-information/>.

⁸⁸ Aberdeenshire Council, 2015, *Planning Advice: Number 13/2015 Landscaping Design Guidance*.

⁸⁹ Aberdeenshire Council, 2015, *Planning Advice: Number 11/2015 Trees and Development*.

under the grouping of 'Natural and Cultural Heritage' and the visual topic grouped under 'People and Communities'. Reference should be made to Chapter 17, Landscape for the landscape assessment.

Sources of Information

15.2.2 The following sources of information have been used for this assessment:

- Ordnance Survey 1:50,000 and 1:25,000 maps;
- Aerial photographs and digital terrain model (5m resolution) data (2017);
- Aberdeenshire Council dataset for Special Landscape Areas (SLAs);
- The Forestry Commission Scotland. National Forest Estate Recreation Routes dataset. (2017);
- Zone of Theoretical Visibility (ZTV)⁹⁰;
- The Aberdeenshire Council Local Development Plan 2017⁹¹ and Policy E2 Landscape with relation to special landscape area's as well as any other landscape studies undertaken as part of the Local Development Plan;
- Historic Environment Scotland (HES) dataset for the Inventory Gardens and Designed Landscapes (GDL);
- The National Record of the Historic Environment (NRHE) available at <https://canmore.org.uk/>; and
- Data from site visits and field assessment undertaken during 2017, 2018 and 2019.

Consultation

15.2.3 Consultation regarding the LVIA has been undertaken with:

- Scottish Natural Heritage (SNH);
- Aberdeenshire Council (AC);
- Historic Environment Scotland (HES); and,
- Transport Scotland's Landscape Advisor, (this was carried out jointly for landscape and visual aspects).

15.2.4 The topics relevant to the visual assessment which were discussed included the following:

- The scope and method of the DMRB Stage 2 LVIA (including the extent of the study area);

⁹⁰ A full description of the ZTV methodology is included in the Appendix section 'Study Area and ZTV' page A15: 1-4.

⁹¹ Aberdeenshire Council. *Aberdeenshire Local Development Plan 2017, Supplementary Guidance 9; Aberdeenshire Special Landscape Areas*. Adopted on 17 April 2017.

- Landscape and visual design objectives including the preparation of the Technical Note and Addendum⁹²;
- The visual baseline assessment;
- Assessment of the experience of the landscape and views within the DMRB Stage 2 LVIA;
- AmeyArup's assessed and prepared Landscape Areas of High Sensitivity, used to inform the design principles of DMRB Stage assessment in accordance with the qualifying criteria of the Aberdeenshire Council's Supplementary Guidance Special Landscape Areas⁹³;
- Aberdeenshire Council's special landscape areas; and
- Other landscape studies undertaken as part of the Local Development Plan.

Assessment Methodology

- 15.2.5 The visual assessment methodology is detailed in Volume 4b, Appendix A15.1: Visual Assessment Methodology, with the key elements summarised below.
- 15.2.6 The visual assessment has been informed by a combination of desk and site-based assessment techniques. The study area for this assessment comprises an area within a 1km buffer from the centreline of each route option. The definition of the study area has been informed by a ZTV, prepared using a digital terrain model without buildings or trees as a 'worst-case' scenario. Intrinsically, the ZTV has been used as a tool for assessment and was supplemented by more site-specific information i.e. information collected during field survey such as, where visibility would be affected by screening of woodland or buildings. An initial ZTV for the corridor assessment considered a 10km wide area to enable the landscape and visual assessments to focus in on the selection of an appropriate study area. This was refined further, as described in Volume 4b, Appendix A15.1: Visual Assessment Methodology.
- 15.2.7 The identification of visual receptors is proportionate to that required for a DMRB Stage 2 assessment and to establish the visual receptors that may have potential views of the scheme, ZTV's were supplemented by site-based study. Site-based study has allowed the identification of visual screens, vegetation and buildings and where potential views for receptors may or may not be screened.
- 15.2.8 The effects experienced by receptors are described in Volume 4b, Appendix A15.1. Visual receptors are individuals and or defined groups of people who have the potential to be affected by the scheme. Visual receptors have been assessed and grouped with the aim of reducing the substantial number of baseline receptors in the assessment to a reasonable level. Visual receptors have generally been grouped based on the following approach:
- Combining receptors of a similar type, e.g. residential receptors have been grouped together;

⁹² AmeyArup 2020 *Landscape Appraisal Approach Technical Note and Addendum*, See Appendix A17.3 and A17.4.

⁹³ Aberdeenshire Council. *Aberdeenshire Local Development Plan 2017 Supplementary Guidance: 9 Aberdeen Special Landscape Areas*. April 2017.

- Grouping receptors within proximity to each other and with a similar view. (It is accepted that no two views are the same, however, for example, if a small group of three or four properties have a similar baseline view with a similar view of a route option, they have been grouped together as one receptor); and
- The focus is on high and medium sensitivity residential and recreational receptors throughout the study area to concentrate the assessment to locations where likely significant effects would be identified. Road users have been considered along local routes in the assessment, although they have not been included as specific receptors in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects. The reason for this is that they are mostly of lower sensitivity to the type of change than more static receptors such as pedestrian users of the same routes, or residents of adjacent properties. Drivers, in particular, are actively engaged and more focussed on the actual activity of driving and less focussed on actual views.

15.2.9 As part of the broader LVIA process, potential landscape and visual mitigation measures have been considered. Primary mitigation measures have been incorporated through design development of the route options, such as alterations to the horizontal and vertical alignment to limit landscape and visual effects. Secondary mitigation measures have been considered during the assessment process where these can be certain and may reduce significant landscape and visual effects which have been identified. They are detailed in Section 15.5, an example includes; 'M1 - Trees, woodland and hedgerows removed during construction of the scheme will be replaced in suitable locations as part of the landscape design'.

15.2.10 In accordance with DMRB Stage 2 the secondary mitigation measures have been considered in general terms. This also means that a precautionary approach has been taken during the LVIA regarding the ability of these measures to reduce adverse effects. Where, at this stage it has not been certain that effects could be mitigated, the residual level of effect is predicted to be the same as the pre-mitigation assessment. Further consideration of the mitigation for predicted effects will be given at DMRB Stage 3.

15.2.11 The visual assessment process includes consideration of a number of factors including:

- The sensitivity of receptors considers the susceptibility of different visual receptors to the likely changes that would be associated with the route options; and the value or importance that is attached to the view experienced by the visual receptor. The sensitivity of receptors has been categorised using a three-point scale of high, medium and low (refer to Volume 4b, Appendix A15.1: Table 1.1 Visual Sensitivity Criteria); and
- The magnitude of change of views due to the route options considers the degree, geographical extent, duration and the change to the view that is likely to arise. The magnitude of change has been categorised using a four-point scale of high, medium, low and negligible. Where no change is assessed, this is also stated (refer to Volume 4b, Appendix A15.1: Table 1.3 Degree of Visual Change).

15.2.12 The assessment of overall significance or level of visual effect on visual receptors has been categorised using a four-point scale of major, moderate, minor and negligible. Where there is no change, it is stated as no change. The level of effect has been assessed by combining all the considerations and criteria set out above.

This is described by GLVIA3 as an 'overall profile' approach to combining judgements and requires that all the judgements against each of the identified criteria (i.e. susceptibility, value, degree of change, extent of change, duration of change, and reversibility of change) are utilised to allow an informed professional assessment of the overall level of effect. The relative weight attributed to each consideration is a matter of professional judgement and varies depending on the specific landscape or visual receptor being assessed.

Visual Receptors Significance of Impact Criteria

15.2.13 Visual effects have been assessed as significant or not significant based on the following categories:

- Major and moderate levels of significance of impact are considered significant; and
- Minor and negligible levels of significance of impact are not considered significant.

Assumptions and Limitations

15.2.14 The scope of the assessment includes the permanent visual effects of the route options during construction and operation. It also describes proposed mitigation which is designed to minimise or reduce the overall impacts of the scheme upon receptors. Temporary visual effects during construction have been scoped out as the visual effects during the construction phase are predicted to be similar for all route options and therefore would not contribute to a comparative assessment of differences in visual effects between the route options. Appropriate mitigation proposals are included in Volume 4b, Appendix A15.2: Visual receptors: Baseline Description and Assessment of Effects.

15.2.15 IAN 135/10⁹⁴ states 'the level of visual effects and whether beneficial or adverse, for each of the scenarios should be prepared (i.e. for construction, winter year 1 and summer year 15)'. Neither the New Guidance nor GLVIA3 guidance are prescriptive and both refer to the requirement for professional judgement from a competent professionally skilled practitioner. The DMRB Stage 2 assessment is carried out to ascertain the Preferred Option so the level of detail of assessment for winter year 1 and summer year 15 was not required. This will be included in the DMRB Stage 3 assessment of the Preferred Option.

New Guidance

15.2.16 An update to the Visual assessment methodology outlined in the DMRB was released in September 2019 and updated further in February 2020 (hereafter referred to as the 'New Guidance'). The DMRB Stage 2 environmental assessment for this scheme had commenced prior to the release of the New Guidance and this followed a structure outlined in the previous published DMRB guidance, (hereafter referred to as the 'Withdrawn Guidance'). It has been agreed with Transport Scotland and SNH that the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.

⁹⁴ DMRB. *Interim Advice Note 135/10 Landscape and Visual Effects Assessment. Section 3.5 p43.* November 2010.

- 15.2.17 The following Paragraphs 15.2.18 to 15.2.29 outline the key differences between the Withdrawn Guidance and New Guidance and describe how this chapter meets the objectives of the New Guidance.
- 15.2.18 The New Guidance is entitled LA 104 and LA 107 and incorporates IAN 135/10 and more fully reflects the requirements of GLVIA3.
- 15.2.19 LA 107 guides assessments from baseline through to determining the magnitude of effect for landscape and visual receptors.
- 15.2.20 LA 104 then guides the assessment from the magnitude of effect to determining the significance of effect for both the landscape and visual receptors.

Effects of the New Guidance

- 15.2.21 Whilst it is widely acknowledged that GLVIA3 is the primary guidance for undertaking LVIA for development requiring EIA, this has evolved from the two previous editions of GLVIA and through general LVIA practice and precedent. The assessment methodology also meets the requirements of DMRB and IAN 135/10 (Withdrawn Guidance) and LA 104/LA 107 (New Guidance). Guidelines for DMRB and GLVIA vary slightly in their detail for different steps of the assessment process and given the different subject areas for which they were originally written and the dates they were published (GLVIA was first published in 1995 and more recently a third edition was published in 2013 and DMRB was published in 1993). GLVIA3 is considered to be the industry 'standard' guidance.
- 15.2.22 However, although IAN135/10 was the methodology generally adopted by Transport Scotland at the time the assessment was undertaken, along with GLVIA3, both the New Guidance and Withdrawn Guidance contain guidance that is specific to highways development and which has informed the assessment methodology and the overall approach to the LVIA. The DMRB Stage 2 Visual assessment is, therefore, based on GLVIA3 with reference to DMRB and its specific guidance on the assessment of trunk road schemes.
- 15.2.23 It should be noted that neither the New Guidance nor GLVIA3 guidance are prescriptive, they provide guidance only. Both refer to the requirement for professional judgement from a competent professionally skilled practitioner.
- 15.2.24 The New Guidance requires an almost identical assessment of resource value as the Withdrawn Guidance; i.e.: (i) Data collection, primarily in the field but also through desk studies from statutory consultees and other appropriate bodies; (ii) description of the baseline for both landscape and visual; (iii) landscape classification and classification of receptor sensitivity; (iv) identification of the potential, positive and negative (landscape and visual) impacts of the scheme; (v) assessment of the significance of the impacts identified on both landscape and visual receptors.
- 15.2.25 There is no change to the impact magnitude ('no change' through to 'major') assigned to visual receptors or the Significance of Effects ('no change' through to 'very large') in the New Guidance.
- 15.2.26 The New Guidance includes a significance matrix to be used to determine the significance effect appropriate for a particular level of impact on a resource of a given value. This was previously also provided in the Withdrawn Guidance (IAN 135/10). The DMRB Stage 2 Scheme Assessment Report assigns significance of impact using information from the literature, baseline assessment and professional judgement.

- 15.2.27 There would be no material change to the DMRB Stage 2 Visual Assessment resulting from the New Guidance.
- 15.2.28 The Preferred Option will be assessed using the New Guidance in DMRB Stage 3.
- 15.2.29 The landscape design objectives will be advanced further during DMRB Stage 3 informed by more detailed LVIA and input to the ongoing design development.

Other Assumptions and Limitations

- 15.2.30 Due to the level of design detail, appropriate for DMRB Stage 2, a precautionary principle approach has been taken with regards to the sensitivity of visual receptors, with a worst-case scenario assumed in the assessment. This precautionary approach has also been taken when considering mitigation measures.
- 15.2.31 Following the approach recommended by 'Fitting Landscapes: Securing More Sustainable Landscapes: 2014'⁷⁷, initial landscape design objectives were established for the scheme. Following consultation with Transport Scotland's landscape advisor in February 2018 and based on the findings of the DMRB Stage 2 LVIA baseline assessment, these were progressed in more detail. The landscape objectives were informed by identification of the sensitivities and opportunities offered by the baseline conditions and, in turn, informed the identification of primary and secondary mitigation measures during the DMRB Stage 2 LVIA. These will be refined further during DMRB Stage 3, informed by a more detailed LVIA and to input to the ongoing design development.
- 15.2.32 The predicted visual effects of road lighting at junctions have been considered in general by the LVIA. Given the level of design development at DMRB Stage 2, the lighting has been described specifically where it has been judged to have an influence on the predicted visual effects (for example, where this is the only element of the route option that would be seen or where the baseline conditions do not include lighting). Otherwise, the effects of junction lighting are included within the overall description of visual effects at junctions. The LVIA at this stage has not assessed the predicted effects of lights from vehicles travelling along the route options although this will be considered at DMRB Stage 3.
- 15.2.33 Site surveys of private properties within the ZTV were carried out from the nearest available publicly accessible location, supplemented by desk-based data analysis to make an informed assumption of the view from the property. In line with guidance and industry recognised practice for a DMRB Stage 2 visual assessment, access to private properties was not requested as part of the visual assessment of effects.

15.3 Baseline

Study Area Context

- 15.3.1 The study area runs approximately north-west to south-east in a broad corridor from the East of Huntly to Kintore. Much of the area is farmed and there are distinctive pockets of deciduous woodland and coniferous plantations. To the north and west the landform becomes more pronounced as the corridor runs into the outlying hills and ridges. To the south and east the topography gradually becomes more gentle and undulating.
- 15.3.2 The study area is largely rural with a regular distribution of settlements including small villages and individual dwellings and a network of roads. Within the study

area there are individual wind turbines as well as a network of pylons and high voltage power lines and the Aberdeen to Inverness Railway Line. The existing A96 runs through the study area. There is a notable presence of traffic.

- 15.3.3 The main settlement within the study area is Inverurie which lies to the eastern end of the scheme. Inverurie is located at the confluence of the River Urie and the River Don. The town sits in the Urie and Don valleys between farmland to the north-east and hills and woodland to the south-west. There are limited views of the existing A96 due to embankments and vegetation protecting the nearest properties.
- 15.3.4 There are a number of major and minor settlements within close proximity to the route options and these include (but are not limited to); Huntly, Insch, Old Rayne, Oyne, Meikle Wartle, Inverurie, Kintore, Hatton of Fintray and Oldmeldrum. Otherwise the overall study area is a predominantly rural agricultural landscape with gently rolling agricultural plains and distinctive topography of regional importance.
- 15.3.5 Smaller settlements in the study area include Thainstone, Chapel of Garioch, Pitcaple, Durno and Daviot, however, the overall study area is predominantly rural and residential receptors generally comprise isolated farmsteads or small clusters of properties throughout the areas.
- 15.3.6 There are limited large areas of built development so the main screens to existing views are: variations in the landform and tree cover.
- 15.3.7 The Bennachie Special Landscape Area lies to the west of the study area, and views of the existing A96 are possible from the Bennachie range including Mither Tap and Oxen Craig. The Bennachie SLA is a popular area for recreational users including hill walkers and mountain bikers.
- 15.3.8 The area also contains a number of historic sites and historic and designed landscapes. The most significant of these are Harlaw Battle Site, Keith Hall, Balbithan House, East Aquhorthies Stone Circle, Loanhead of Daviot Stone Circle and Kinkell Church. Further details on historic features can be found in Chapter 16, Cultural Heritage. Additionally, these have been identified and assessed in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects.
- 15.3.9 Visual receptors have been identified within the study area of each geographical section and are included in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects which provides their visual baseline description. The visual baseline is the description of the existing qualities of the views and visual amenity for the individual visual receptors against which any future changes can be assessed against or visual effects predicted and assessed.
- 15.3.10 Whilst the study area extends to 1km from the centreline of each route option, within which the majority of significant effects occur, GVLIA3 and DMRB⁶⁵ do not require this to be defined. The inclusion of the 1km buffer helps to indicate an area, beyond which effects are considered to be 'not significant' in the majority of cases. However, given the nature of the varied topography throughout the study area, a number of visual receptors have been identified outside this area where they may have increased visibility. The use of a 1km buffer zone helps to identify additional receptors that may require closer analysis (particularly those with a higher elevation and/or an increased visibility). These 'long-range' receptors outwith the 1km buffer, identified as having potential for significant adverse visual effects are indicated in Volume 5, Figures 15.14 to 15.20 Visual Receptors (Long

Range) and are assessed in Volume 4b, Appendix A15.2: Tables 1.2-1.6 Visual Receptors – Tables of Predicted Visual Effects.

- 15.3.11 Recreational receptors predominantly comprise users of access routes, ranging from national or regional long-distance Non-Motorised User (NMU) routes, e.g. Core Paths, Public Rights of Way (PRoW) and existing local routes around Inverurie and Bennachie that may have more close range direct views. Refer to Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects.
- 15.3.12 The study area is primarily rural although key elements of the built infrastructure are visible in many views such as the existing A96 which runs north-west to south-east through the study area. Other visual detractors include pylons and overhead lines, the Aberdeen to Inverness Railway and a number of small-scale wind farms.
- 15.3.13 Distant views are possible from elevated areas although typically the low-lying elevation of the study area and the adjacent topography combines to limit extensive views. There are a large number of intervening features which provide screening to low-lying receptors resulting in contained medium distance views.
- 15.3.14 With regard to scenic value, the study area includes two regionally important landscapes (Deveron Valley and Bennachie Special Landscape Areas⁸³) and nationally important landscapes i.e. Inventory Gardens and Designed Landscapes (GDLs). These designated areas add significant quality to the visual amenity experienced by visual receptors. Where such designations form part of the view experienced by the visual receptor, they are referred to in the baseline of each receptor in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects and are illustrated in Volume 5, Figures 17.1 to 17.13: Landscape Designations.
- 15.3.15 In the following Paragraphs 15.3.17 to 15.3.19 a summary is provided for each geographical sections of the scheme. The full information can be found in the visual baseline descriptions in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects.
- 15.3.16 The individual route options are described in more detail in Volume 1, Part 2, Chapters 5 to 7, Engineering Assessment.

East of Huntly to Colpy

- 15.3.17 A summary is provided below of the visual baseline for the study areas covering the East of Huntly to Colpy geographical section, with information taken from the visual receptor baseline descriptions in Volume 4b, Appendix A15.2: Visual Receptors: Baseline Description and Assessment of Effects. Reference is made here to identified differences between the Cyan and Red route options. A summary of identified 'long-range' receptors identified as having potential for adverse visual effects is provided:
- This area lies within a broad corridor along the Glens of Foudland (including notably the glens and quarries of Hill of Foudland (467m AOD)), through a narrow gap between Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD) before turning east to Colpy. These hills dominate the local landscape with their own characteristics, providing views and legibility within the area;
 - Receptors tend to be evenly dispersed along the full stretch of the study area following the existing A96 and the Glen Water river valley, on both north and south facing slopes. Those receptors on higher slopes tend to have greater visibility;

- Scattered settlements of farmsteads and isolated properties are dispersed across the landscape between the local village of Insch (south of Colpy) and the town of Huntly, with communities such as Thomastown (six receptors) and Bridgend (south of Huntly and consisting of 20 receptors) and more notably Colpy (27 receptors);
- Specialised sites and isolated structures such as the Greenmyres and Glens of Foudland wind farms, pylons and overhead cables are located close to both the Cyan and Red route options. The area includes Williamston House GDL close to Colpy;
- Farmed agricultural land is common alongside unimproved grassland but pockets of woodland, such as dense conifer plantations at the Deveron Valley, and wooded hillsides are also common;
- A high level of woodland cover is provided by coniferous woodland and commercial forestry plantations. This helps to limit views of the route options from receptors to the north of the existing A96 including Battle Hill (179m AOD), Ba' Hill (238m AOD), Hill of Stoneyfield (277m AOD) and Gartly Moor (314m AOD);
- Where the route options share the same pathway immediately east of Huntly, both have potential for visibility from Battle Hill (179m AOD), Ba' Hill (238m AOD) to the south, Cairn Hill and the Hill of Brunstane (190m AOD);
- The area contains a number of watercourses, notably the River Deveron to the west and River Urie to the east of the route options. The Cyan route option follows the valleys of the Glen Water/River Urie more closely;
- The Deveron Valley SLA⁸³ borders the area along the A97, although its boundaries follow ridge lines that define the valley. The SLA includes the Bin Forest and Kinnoir Wood (both outwith the area). The boundary is defined by Aberdeenshire Council as where the existing A96 forms the southern SLA boundary to the east of Huntly and the A97 forms the eastern SLA boundary shortly before the western tie-in of the scheme;
- The topography of the area provides views over long distances but can also restrict views of receptors to the route options. The Red route option deviates further south than the Cyan route option which passes to the north of Saddle Hill (294m AOD) and Cot Hill/Glenniaston (311m AOD). Both route options will be visible from Gartly Moor (highest point, Wishach Hill (422m AOD)), where the Red route option appears more prominent with a significant cutting into the hillside at Saddle and Cot Hill. However these hills also help to partially screen the Cyan route option from view, reducing visual intrusion further to the south;
- The Cyan route option travels around the Hill of Skares at the eastern most point on the route, before continuing south between the Hill of Skares and Hill of Tillymorgan along the line of the existing A96 and the valley of the River Urie, alongside the village of Colpy. Whilst the Hill of Skares provides screening for residential receptors in the south, Colpy residents will be able to see the Cyan route option adjacent to the village as well as the junction and associated access roads;
- The Red route option runs along the slopes of the Hill of Foudland before cutting through the gap between the Hill of Foudland and the Hill of Skares

requiring large-scale earthworks. This will physically detach The Hill of Foudland from the Hill of Skares as the new road runs through a cutting created in the shallow valley between the hills. It will create an adverse effect on residents on nearby lower slopes and on residents of Colpy where the route option passes west of the village on embankment with underbridges and access roads. Due to the scale and elevation, this route option will be visible from receptors some distance away.

- A number of notable landform features help to limit adverse visual effects on receptors. These include:
 - Cairn Hill (194m AOD), Battle Hill (179m AOD) and a ridgeline between Robins Height (195m AOD) and Smiddy Hill (183m AOD) and Newtongarry Hill (206m AOD). Also, to the north and east, Hill of Thomastown Hill (241m AOD) and Hill of Chapelton (296m AOD) both help restrict visibility to receptors to the north;
 - To the south of Huntly and east of River Bogie, the Hill of Dummuies (230m AOD) and Ordiesnaught (282m AOD) and Saddle Hill (294m AOD) provide screening for receptors to the south; and
 - A ridgeline exists from Huntly south-east to Gartly Moor including Ba' Hill (238m AOD) to Cot Hill-Glenniaston (311m AOD) which helps restrict visibility to receptors to the south.
- The main transport networks in the area include the road linkages between Colpy, Inch and Huntly in addition to the existing A96. Both the Red and Cyan route options are in close proximity to these transport networks. Two local connecting roads cross the existing A96 and the A920 joins the A96 at Colpy; and
- A total of 42 receptors have been identified within the Cyan route option and 46 within the Red route option, comprising residential and recreational receptors.

Colpy to Pitcaple

15.3.18 A summary is provided below of the study areas covering the visual baseline for Colpy to Pitcaple geographical section, with information taken from the visual receptor baseline descriptions in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects. Reference is made here to identified differences between the Pink and Brown route option study areas. A summary of 'long-range' receptors identified as having potential for adverse visual effects is provided:

- The Pink route option and the Brown route option contain similar levels of localised undulating landform and no major hills or ridges. Long distant views to the Bennachie Hill range are prominent as the surrounding flatter landscape enhances its character;
- The Brown route option lies to the south-west of the existing A96 corridor and its area primarily comprises a mix of undulating farmland and rough grazing on higher ground. The route option runs south-east from Colpy, closely following the alignment of the existing A96 corridor and the River Urie until Carden, where it runs north of the existing A96 in an easterly direction towards

Pitcaple. This area comprises a number of estate policies and coniferous plantations;

- The area of the Brown route option contains a varied landform as the route follows the course of the River Urie at the mid-section of the study area, and also passes by the hills around Candle Hill (126m AOD) south-east of Old Rayne;
- Both the areas have a similar level of woodland cover, consisting of sporadic clusters of shelter belts and some coniferous blocks, including Logie Woodland. Both study areas also contain a number of heritage assets, including Freefield House, Newton House and Logie House. There are significant areas of mature trees that lie within these heritage assets and their boundaries are also heavily tree lined. Landform undulations and localised woodland cover provide the main screen to views within both study areas;
- The Bennachie SLA lies to south of the Brown route option area, and views of both route options are possible from there. The Bennachie ridge is an iconic landform, visible from much of the wider landscape area. It is part of the Grampian outliers and comprises a series of rounded hills including Suie Hill, Mither Tap and Oxen Craig. The SLA is a popular area for recreational users;
- Regarding residential receptors, both areas largely comprise isolated rural residential receptors, including many agricultural properties and their associated farmsteads. These are located intermittently through the countryside within both areas. The residential areas of Colpy, Pitmachie, Old Rayne, Durno, Whiteford and Pitcaple are also located within both study areas. There are also a number of heritage assets along this section including Candle Hill stone circle (126m AOD), The Law cairn, Durno Roman Camp and Maiden Stone at Garioch;
- In terms of recreational receptors, both areas are broadly similar in that they include a range of path networks and there are no major differences in the number of designated trails. Pitcaple Castle, Loch Insch Fishery and a number of heritage assets are also recreational receptors present within the study area; and
- A total of 63 receptors have been identified within the Pink route option study area and 76 within the Brown route option area, each comprising residential and recreational receptors.

Pitcaple to Kintore

15.3.19 A summary is provided below of the visual baseline for the study areas covering the Pitcaple to Kintore geographical section, with information taken from the visual receptor baseline descriptions in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects. Reference is made here to identified differences between the Violet and Orange route option study areas. A summary of 'long-range' receptors identified as having potential for adverse visual effects is also provided:

- The area runs approximately north-west to south-east in a broad corridor from the north of Pitcaple to Kintore. Much of the area is agricultural and there are distinctive pockets of mature woodland. To the north and west the landform becomes more prominent as the corridor runs into the outlying hills and ridges.

To the south and east the topography gradually becomes more gentle and undulating;

- The area is largely rural but there is a network of roads and a regular distribution of settlements including small villages and individual dwellings. Within the area there are individual wind turbines as well as a network of pylons and high voltage power lines. The existing A96 runs through the area and there is a notable presence of traffic. The main settlement within the study area is the town of Inverurie which lies to the south-eastern end of the scheme. Inverurie is located to the north-west of the confluence of the River Urie and the River Don. The town sits in the Urie and Don valley between farmland to the north-east and hills and woodland to the south-west. There are limited views of the existing A96 due to embankments and vegetation protecting the nearest properties. The Orange and Violet route options pass either side of this town;
- Other main settlements in proximity to the route options include Kintore, Kemnay and Oldmeldrum. The smaller settlements in the study area include Thainstone, Chapel of Garioch, Pitcaple, Durno and Daviot. However, the overall area is predominantly rural and residential receptors generally comprise isolated farmsteads or small clusters of properties throughout the area;
- Recreational receptors predominantly comprise users of access routes, ranging from regional long-distance routes, e.g. The Gordon Way to existing local roads and recreational forest paths. The Bennachie SLA lies west of the study area, and views of both route options are likely from Mither Tap and Oxen Craig. The SLA is a popular area for recreational users. The area also contains several heritage assets. The most significant of these are Harlaw Battle Site, Keith Hall GDL, Balbithan House, Aquhorthies Stone Circle and Kinkell Church. Further details on historic features can be found in Chapter 16, Cultural Heritage;
- In terms of scenic value, there are some designated landscapes including GDLs, which indicate value attributed to views experienced by visual receptors. Where these designations form part of the visual context, they are referred to in the baseline of each receptor within Volume 4b, Appendix A15.2: Tables 1.2-1.6 and are illustrated in Volume 5, Figures 17.1 to 17.13: Landscape Designations;
- The area east of Inverurie is more open than the area to the west. The area to the west comprises a more intimate, undulating landscape with more woodland planting providing fewer long views. Both areas are overlooked by the Bennachie range. The Violet route runs through the more open landscape while the Orange route travels through the area of more pronounced topography and greater screening;
- The Violet route option consists of mainly arable fields and grazing pastures and with undulating landform, the majority of the receptors identified will have partial or angled views of the route option. Around Pitcaple, woodland in combination with an undulating landscape increases screening;
- The Orange route option contains more woodland cover than the Violet route option. Views tend to be more restricted in the Orange route option due to

screening from a more rugged topography and associated woodland cover. Typically, views are more localised and of a smaller scale and a more intimate landscape than the open, distant views within the Violet route option;

- The Daviot area includes a group of receptors located on elevated, north-western hill slopes, which look down onto either route option. Elevated receptors within the Orange route option include residents at the west end of Dillyhill and the Inverurie Golf Club; and
- A total of 115 receptors have been identified within the Violet route option and 130 receptors within the Orange route option, each comprising residential and recreational receptors.

15.4 Potential Impacts

15.4.1 In this section the impacts of the route options which have the potential to result in noticeable visual effects are presented. The following should be noted:

- Potential impacts are all identified as having the potential to result in significant visual effects; and
- Potential impact descriptions do not consider the sensitivity of the visual baseline conditions (unlike the subsequent assessment of visual effects which is strongly influenced by visual sensitivity, reported in detail in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects).

15.4.2 Potential impacts of the route options which may result in significant visual effects have been identified as including:

- The introduction of a dual carriageway, grade separated junctions and link roads and associated moving vehicles (visible and audible) to the landscape and to people's views;
- Changes to the existing road network and Non-Motorised User routes;
- Changes to the existing landform due to earthworks (embankment and cut);
- Loss of existing woodland, trees and hedgerows, as well as potential new woodland, trees and hedgerows as mitigation;
- Introduction of new built structures at bridge crossings and junctions;
- Introduction of new road furniture, including signs;
- Introduction of new lights and lighting at junctions; and
- Loss of stone boundary walls as well as potential new boundary walls as mitigation.

15.5 Mitigation

15.5.1 Possible mitigation measures are split between primary mitigation measures and secondary mitigation measures, as described in GLVIA3 Section 4.21. Primary mitigation measures have been incorporated in the scheme design. These measures include design of the road alignment in cutting and use of underbridges

rather than overbridges where possible, whereas the following secondary mitigation measures (M1 – M7) have been considered to mitigate adverse visual effects identified through the LVIA:

- M1: Trees, woodland and hedgerows removed during construction of the scheme will be replaced in suitable locations as part of the landscape design;
- M2: New hedgerow planting (trees and shrubs). New lengths of hedgerow will be established where appropriate to integrate the new works with the existing landscape character and/or to screen or filter views from visual receptors;
- M3: Small areas of new woodland planting. Small areas of new woodland will be planted to integrate the new road with the existing landscape character and/or to screen or filter views from visual receptors. The species and density will be selected to relate to the distinct qualities of the landscape;
- M4: Extensive woodland planting. Large areas of new woodland will be planted to integrate the new road with the existing landscape character and/or to screen views from visual receptors. The species and density will be selected to relate to the distinct qualities of the landscape;
- M5: Landform modification. Embankment and cutting slopes will be shaped to integrate the new road with the surrounding existing landscape character and/or to screen views from visual receptors. Earthwork features may include linear earth bunds, convex slopes, broad landform mounds and false cuttings. The intention of some earth shaping will be to reduce the steepness and sharp changes in gradient of embankments or cuttings;
- M6: Reinstatement of stone walls or new stone walls. Stone walls to integrate the new road with the existing landscape character and/or screen views from visual receptors; and
- M7: Low lighting levels at junctions. Design of lighting at junctions to integrate the new road with the existing landscape character and/or minimise artificial lights being seen within the surrounding landscape.

15.5.2 Potential mitigation measures were considered for all the predicted adverse visual effects identified during the LVIA. The mitigation measures listed above are considered to help in reducing the level of effects. This is shown in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects. At DMRB Stage 3 mitigation measures for the Preferred Option will be developed to address specific adverse effects.

15.6 Predicted Environmental Effects

15.6.1 This section presents the key predicted visual effects of the route options. Predicted visual effects have been assessed prior to mitigation and the residual effects then evaluated following assumed mitigation.

15.6.2 A summary of the key predicted residual effects for each route option, is provided below and describes the three geographical sections from west to east across the study areas. The descriptions record the key findings of the assessment, with more detailed supporting assessments (based on the receptor specific identifiers used in brackets, e.g. B1), provided in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects.

East of Huntly to Colpy

- 15.6.3 The predicted effects of the Cyan and Red route options are set out in Volume 4b, Appendix A15.2: Tables 1.1 and 1.2.
- 15.6.4 The following are the key summary findings of the assessment of visual effects of the East of Huntly to Colpy area: Cyan route option. Visual receptors are illustrated in Volume 5, Figures 15.1 and 15.2: Visual Receptors Cyan Route Option and Figure 15.14: Visual Receptors (Long Range) Cyan Route Option:
- There are few NMU routes in this area and they are less affected by visual intrusion primarily due to screening by a combination of screening vegetation, distance and topography. Where views are likely to be experienced, they will be long range, obscure, partial and not significant;
 - East of Huntly, Slioch (C6), Adamston (C8) and Thomastown, Howtown (C9) will experience views south-west to the Cyan route option and Leys of Dummies (C7) will experience views to the east and south-east. Huntly to Greenmyres (C43) (an existing local route) will experience significant effects particularly at the easternmost section, it's closest point to the proposed route. East of Rack Moss significant adverse effects occur in close proximity to the route option including (C11) and (C13).
 - The landscape forms a corridor between the Hill of Bainshole (318m AOD) and Glens of Foudland, through which the Cyan route option passes. This provides screening of the route option to the north and south. There are few receptors in this area with a high concentration of agricultural steadings, focussed along the Glen Water on lower slopes and also largely within 500m of the route option, such as Broomhill/Clinkstone/Stodfold (C16), Newton, Overtown, Kilden and Whinbrae (C17), Wedderburn (C18), Braehead (C19), Midtown (C20), Bainshole (C21), Mid-Bog/Bog (C22), West Skares (C23) and Rashieslack (C24);
 - Some of the receptors present have restricted views due to the elevation of existing embankments and the existing topography helps provide screening such as Lambhill/Carnbroe (C25), Skares (C26), Fordmouth (C27) and Woodside (C28);
 - Where the Cyan route option passes between the Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD) the route option turns south. Here, the landscape corridor narrows, and visibility is restricted further. Only two receptors are identified as having views of the route option in close proximity: Fordmouth (C27) and Woodside (C28) with Lambhill/Carnbroe (C25) to the north-west also having potential for views;
 - Once the route option passes the Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD), the topography becomes much less pronounced and more undulating with potential for longer distance views and a higher concentration of visual receptors than the more westerly part of the route option. Affected receptors include Woodside (C28), Waulkmill/Colpy Cottage (C30), east of the existing A96 and, to a lesser extent, Kirkton of Culsalmond (e.g. Gardensmill Bridge (C32), Kirkton of Culsalmond Old Parish Church (C31), The Glen and The School (C33) and at the settlement of Colpy (C34));

- South of the Hill of Skares (329m AOD) the route option includes the proposed junction at Colpy. Visual effects are localised due to the nature of the topography, the presence of woodland and buildings and the extent of screening. Consequently, some receptors in Colpy village situated on the east side do not have direct views of the route option due to screening to the west and/or views being oblique or at elevated angles. Those that will have direct views are situated on the west or north-west side of the proposed junction with views to the proposed access roads, cuttings, embankments and underbridge;
- Receptors along the Jordan Burn on the south facing slope of Hill of Foudland/Hill of Skares are slightly elevated and will have partial views towards Colpy Junction. The following receptors are likely to have views of SuDS basins, roundabouts, cuttings and embankments: Jericho (C29), St Sairs (C35) and Colpy (C34);
- Around Colpy a number of receptors in the area have localised screening from topography and existing buildings/woodland/shelterbelts that combine to reduce visual effects. These include Waulkmill/Colpy Cottage (C30) and The Glen and the School (C33). Kirkton of Culsalmond Parish Church (C31) will experience visual effects (views of cuttings and embankments) due to the elevation of the route option between Colpy and Fallow Hill (185m AOD);
- Other receptors in close proximity to Colpy Junction include Ritchies Garage/Old Wrangham/Boghead (C37) which will experience views of the junction. Some receptors have screening from existing farm buildings, reasonably extensive woodland shelterbelts or distance reducing the visual effect (for example Fallow Hill (185m AOD)). These receptors will be less affected by visual intrusion: Mains of Sheelagreen (C37), Williamston House (C38), Wrangham/West Wrangholm Cottage (C39), Old Inn Farmhouse (C40) and Mill Croft (C42);
- Of the 43 receptors affected by the Cyan route option, 18 are predicted to have major adverse visual effects. These are evenly dispersed along the route option and are either within close proximity to the route option (<0.5km) or occur on an elevated slope directly overlooking the route option;
- 15 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route option and tend to be within 0.5-1km from the route option;
- 10 receptors are predicted to have minor/negligible adverse or no change visual effects. These are evenly dispersed along the route option and tend to be within 0.5-1km from the route option; and
- The Cyan route option largely aligns with the current carriageway, reducing the visual effect of the route option in this geographical section.

15.6.5 The following are the key summary findings of the assessment of visual effects of the East of Huntly to Colpy area: Red route option. Visual receptors are illustrated in Volume 5, Figures 15.3 and 15.4: Visual Receptors Red Route Option and Figure 15.15: Visual Receptors (Long Range) Red Route Option:

- East of Huntly, Slioch (R6), Leys of Dummuies (R7), Adamston (R8) and Thomastown, Howtown (R9) will experience views west and south-west to the Red route option. At Rack Moss significant adverse effects begin to occur in

closer proximity to the route option including Greenmyres (R11), Hillhead / Newtongarry Inn / Croft of Broomhill (R13), Glennieston (R14);

- At Gartly Moor and Wishach Hill (including Ski Trail) – existing local route (R15) has an elevated view from a north facing slope at Gartly Moor;
- The Red route option turns south at Hill of Dummuies over Ordiesnaught. Receptors to the north including Adamston (R8), Thomastown (R9), Hillhead (R13), Broomhill (R16) and Wedderburn (R18) are affected by large cuttings although distance reduces the visual effect. The Greenmyres to Huntly existing local route (R47) also has elevated views north towards the proposed route, particularly at the easternmost section, however there is more intervening screening from topography to the north i.e. (Ordiesnaught (282m AOD));
- Increased elevation accentuates the visibility of the Red route option to receptors further east including Newton/Overtown/Whinbrae (R17), Braehead (R19), Midtown (R20), Bainshole (R21) and Bog/Mid-Bog (R23);
- Where the Red route option traverses the Hill of Foudland (467m AOD) and Hill of Kilmidden (268m AOD), a pronounced cutting across the north facing slope increases the visual effect on visual receptors to the north at Rashieslack (R24), Lambhill (R25), Skares (R26), West Skares (R22) and also adjacent to the Glens of Foudland and the existing A96, all of which will experience significant effects;
- There are few NMU routes in this route option and they are less affected by visual intrusion primarily due to screening by vegetation, distance and topography. Where significant views are likely, they will be intermittent and long range. Those experiencing significant adverse effects are Gartly Moor and Wishach Hill (including Ski Trail) – existing local route (R15). The south facing slope of the Skirts of Foudland/Hill of Killmidden, Upper Scotstown (R27) and Jericho (R28) are affected as well as Woodside (R29), Colpy Cottage (R30) and Waulkmill (R31). Woodland on Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD) helps to screen the visual effects from receptors;
- South of Hill of Skares (329m AOD) the Red route option includes a proposed junction at Colpy. Here effects are localised depending on the nature of the topography at or near the receptor, the presence of woodland and the extent of any screening, either separately or in combination e.g. Fallow Hill (185m AOD);
- Visual effects are accentuated where the elevated landform increases visibility of the route option for receptors such as at Colpy (R34) and at Kirkton of Culsalmond Old Parish Church, Kirkton Farm, The Old Manse, Lower Braeside (R36);
- Around Colpy, a number of receptors in the area have localised screening from topography and existing woodland/shelterbelts that combine to reduce the likelihood of significant visual effects including receptors within the village itself. Others include Waulkmill (R31), The Glen and the School (R33) and Kirkton of Culsalmond Parish Church, Kirkton Farm, The Old Manse, Lower Braeside (R36). They will experience visual effects due to the elevation of the route option and its lack of screening at this locality;

- A number of receptors in Colpy village do not have direct views of the route option or the Colpy Junction due to screening to the west and/or views being at oblique or elevated angles i.e. those situated on the east side. Those receptors in the west will have views from the rear of their property which include embankments and access roads. Those to the south-west will also have views to the underbridge;
- Views towards the proposed Colpy Junction include receptors on the south facing slope of Hill of Foudland/Hill of Skares; Upper Scotstown (R27) and Jericho (R28) as well as St Sairs (R32) and Colpy (R34) where receptors have a south facing view from a south facing slope. Receptors along the Jordan Burn may have some screening from buildings, topography and vegetation;
- Other receptors in close proximity to Colpy Junction include Ritchies Garage/Old Wrangham/Boghead (R37), Williamston House (R40), Wrangham/West Wrangholm Cottage (R41), Old Inn Farmhouse (R42), and Mill Croft (R43). They will experience views of the junction; however, some receptors have screening from existing farm buildings and reasonably extensive woodland shelterbelts and are not affected by visual intrusion to the same extent e.g. Mains of Sheelagreen (R39);
- Higher elevation enables increased visibility of the route option over a longer distance, particularly where receptors are also elevated. For example, Hill of Dunnideer (R46) (268m AOD), a hilltop fort west of Inch with views to the Hill of Foudland and the Hill of Skares will experience minor adverse visual effects as illustrated in Volume 5, Figure 15.14;
- Of the receptors identified outwith the 1km buffer zone, Lambhill/Carnbroe (R25) is identified as having the potential for significant adverse visual effects, as indicated in Volume 5, Figures 15.3 and 15.4 and on Figure 15.14;
- Of the 47 receptors affected by the Red route option; 16 receptors are predicted to have major adverse visual effects. These are evenly dispersed along the route option and the majority tend to be within close proximity to the route option (<0.5km) or where they occur on an elevated slope directly overlooking the route option;
- 19 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route option and are largely within 0.5-1km of the route option or where they occur on an elevated slope directly overlooking the route option; and
- 12 receptors are predicted to have minor/negligible adverse or no change visual effects. The frequency of these receptors is centred at the start of the route option to the west or at the end of the route option in the east. Most are within 0.5-1km or just outwith the 1km buffer zone, however, where the distance is > 1km away the visual effect is considerably reduced.

Colpy to Pitcaple

- 15.6.6 The predicted effects of the Pink and Brown route options are set out in Volume 4b, Appendix A15.2: Tables 1.3 and 1.4.
- 15.6.7 The following are the key summary findings of the assessment of visual effects of the Colpy to Pitcaple area: Pink route option. Visual receptors are illustrated in

Volume 5, Figures 15.5 and 15.6: Visual Receptors Pink Route Option and Figure 15.16: Visual Receptors (Long Range) Pink Route Option:

- The majority of receptors that will experience significant adverse visual effects are located within close proximity to the route option (approximately 0.5km) and are distributed along the length of the area;
- In the north-west of the area, there are a number of residential properties within the surrounding countryside near Colpy that will experience significant adverse visual effects. These include Old Wrangham/Boghead (P2), Wrangham and West Wrangham Cottage (P4), Williamston House (P5), Old Inn Farmhouse (P7) and Old Mill House/Mill Croft (P9). These receptors will experience partially screened views of the route option with the potential for significant adverse visual effects. Fallow Hill (185m AOD) lies in the north-western section of the Pink route option study area and helps screen views of the route option for some receptors at this location, including residential properties located at Ritchies Garage/Aronde and Bardstrean (P1) and Old Wrangham/Boghead (P2);
- Between Colpy and the central section of this study area, there are a number of residential receptors which will experience significant visual effects. These include; Colrayne House, Darcy Lodge, Caravan Site and Loch Inch Fishery (P8), Mains of Williamston/Mains of Williamston Cottage (P11), Mellenside (P12), Little Lediken, Kellockbank Country Emporium, Mill of Newton and West Lodge (P13), Brankanentum, Strathalmond Cottage, Newton Cottages, Eastgate, Glenniston Croft (P17), Little Newton (P21) and Bonnyton (P22);
- In the centre of this study area, the Pink route option intersects three recreational routes resulting in significant visual impacts for users of these routes; existing local route - Oldmeldrum to Old Rayne (P27), Core Path - Burnside to Old Rayne (P29) and Core Path - Jenny's Trees via Urie Riverside (P38). Westerton of New Rayne, Braehead Cottage, Ploughman's Hall, Easterton of New Rayne and Thorpville (P26) will also experience significant adverse visual effects;
- Within the south-eastern part of this study area, there is potential for significant adverse visual effects for residential properties where there is a lack of screening from woodland or topography such as East Law (P48) and Easterton (P49). The route option is within cuttings for part of this section which helps reduce visual intrusion;
- Woodland cover within this study area is mixed, with the western and eastern sections of the study area containing a higher level of woodland cover in comparison to the central section. The south-eastern section in particular, has a high level of woodland cover, limiting the number of receptors with direct views of the Pink route option. A number of residential receptors located within this section will not experience significant visual effects due to the presence of woodland and the topography. These receptors include; Drumore (P50), Old Logie Cottages (P51), Logie Durno Farm (P52), Kemmels of Durno (including Birchfield, Craighead and Woodlands) (P53), Durno (including Knowes of Durno) and Howes of Durno, Durno House and Loanside Cottages (P55) and Ferniebrae and Stonebrae (P56);
- In the eastern section of this study area, the nature of the topography becomes elevated where the Pink route option ascends to Pitscurry Moss.

There is a cluster of residential properties located near Whiteford which will experience significant adverse visual effects where the route option becomes more visible to include views of cuttings and embankments. These include Woodend Cottage, Hawthorn House, North Woodend, Cairnton and Stonefield Cottage (P57), Logie Durno School – village hall and playing fields (P58), Gatehouse, Highbury Grove and Burnside of Pitcaple (P59), Glenlogie (P60) and Bridgend (Burn of Durno) (P62). Receptors on the edge of the 1km buffer area i.e. North of Whiteford (P61), Ar-dachaidh/Bridgend (Pitcaple) (P63) and Core Path - Logie woods to Durno (P54) will experience significant visual effects;

- The proposed Kellockbank junction on the Pink route option will have significant adverse visual effects. In addition, there are proposed structures close to Mains of Williamston (P11) including on/off slips and other nearby receptors have the potential to experience adverse visual effects due to proximity of the River Urie underbridge and associated embankments at close range restricting views to the south;
- None of the receptors outwith the 1km buffer zone have been identified as having significant effects. They are indicated in Volume 5, Figures 15.5 and 15.6;
- Of the 63 receptors affected by the Pink route option, 26 receptors are predicted to have major adverse visual effects. These are evenly dispersed along the route option and the majority tend to be within close proximity to the route option (<0.5km), or where they occur on an elevated slope directly overlooking the route option;
- 12 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route and are largely within 0.5-1km of the route option, or where they occur on an elevated slope directly overlooking the route option; and
- 25 receptors are predicted to have minor/negligible adverse or no change visual effects. These tend to be >0.5km from the route option and their frequency tends to be evenly dispersed along the route option.

15.6.8 The following are the key summary findings of the assessment of visual effects of the Colpy to Pitcaple area: Brown route option. Visual receptors are illustrated in Volume 5, Figures 15.7 and 15.8: Visual Receptors Brown Route Option and Figure 15.17: Visual Receptors (Long Range) Brown Route Option:

- A large number of receptors located within the Brown route option study area will experience significant adverse visual effects. The majority are located within close proximity of the route option (within approximately 0.5km) and are evenly dispersed along the route option;
- Receptors with potential for significant visual effects located >0.5km from the route option include Wrangham and West Wrangham Cottage (Br4), Williamston House (Br5), Mellenside (Br10), Waterton/Downie House (Br12), Westgate Cottage (Br22), Brecken (Br34), Longcroft and Mains of Petmathen (Br40), Waterside (Br43), Core Path - Jenny's Trees via Urie Riverside (Br49), Westerton (Br50), Whiteford (Br64) and North of Whiteford (Br69);

- The eastern section of the study area contains the greatest number of receptors which will not experience significant adverse effects. This is because receptor views in this section will be screened more than other sections by existing features such as; agricultural buildings, vegetation, mature woodland (including Logie woodland) and topography (including Candle Hill (126m AOD) east of Old Rayne and Gallows Hill (135m AOD)) south-east of Durno;
- A large number of receptors are predicted to experience significant adverse visual effects in the western section of this study area. Specifically, surrounding Colpy in the open farmland, there are small groups of residential properties and isolated agricultural properties and steadings. A number of these lie within close proximity of the route option, including Old Wrangham/Boghead (Br2) (screened slightly by Fallow Hill), Wrangham/West Wrangholm Cottage (Br4), Old Inn Farmhouse (Br7), Old Mill House/Mill Croft (Br8) and Colrayne House, Darcy Lodge, Caravan Site and Loch Insch Fishery (Br9);
- Between Colpy and Old Rayne, the majority of receptors are residential and located sporadically throughout the countryside. Those with significant effects are located within 0.75km of the route option and due to the topography and elevation they will experience significant adverse visual effects. They include Mellenside (Br10), Mains of Williamston and Mains of Williamston Cottage (Br11), Waterton/Downie House (Br12) and Little Lediken (Br19). Freefield House (Br24) has potential to experience partial long-distance views of this route option, however, woodland screening helps to reduce the visual effect and significant views are extremely unlikely;
- Towards the central section of the area, the Brown route option runs close to the existing A96, and there are groups of residential properties close to the settlement of Old Rayne. These include East Lediken (Br25), Wester Shevock (Br29), Pitmachie/Bridge of Shevock (Br33), Brecken (Br34) and Broombrae (Br38). These receptors will experience different views of the route option with adverse visual effects;
- To the south-east of Old Rayne, the Brown route option intersects one NMU route; existing local route - Insch to Oyne via Archaeolink (Br51) and also runs within close proximity to several other recreational routes, including: existing local route - Oldmeldrum to Old Rayne (Br62), Core Path - Whiteford to Old Rayne (Br39) and Logie Woods to Durno (Br60). Users of these recreational routes will experience significant adverse visual effects, however, users of Core Path - Burnside, Old Rayne (Br35) will not experience significant adverse visual effects;
- Between Old Rayne and Pitcaple, the majority of receptors are residential properties which are spread throughout the countryside. The receptors which lie closest to the route option that will experience significant adverse visual effects include: Broombrae (Br38), Core Path - Whiteford to Old Rayne (Br39), Mill of Pitmedden (Br42), Strathhorn (Br44), Carden Farm (Br47), Urie Riverside Walk (Br48), Core Path - Jenny's Trees via Urie Riverside (Br49), Westerton (Br50), Insch to Oyne via Archaeolink (Br51), North Lodge (Br52), Easterton (Br56), Old Logie cottages (Br57), Logie Durno Farm (Br59), Core Path - Logie Woods to Durno (Br60), Benlogie (Br61), existing local route - Oldmeldrum to Old Rayne (Br62) and Ferniebrae (Br63);

- In the eastern section of this study area, the nature of the topography becomes elevated where the route option ascends to Pitscurry Moss. There is a cluster of residential properties located near Whiteford which will experience views of cuttings and embankments and the route option becomes more visible. These include: Whiteford (Br 64), Cottage, Cairnton, North Woodend, Hawthorn House and Woodend Cottage (Br67), Bridgend (Burn of Durno) (Br68), North of Whiteford (Br 69), Logie Durno Hall/School (Br70), Glenlogie (Br72), Gatehouse (Br73) and Burnside of Pitcaple (Br74);
- There are two road junctions proposed along the Brown route option; Kellockbank Junction and Carden Junction. While each junction is located close to existing minor road infrastructure, the junctions lie offline and result in adverse visual effects for residential properties within close proximity. Those close to Kellockbank Junction include: Waterton (Br12), Toll House (Br15), West Lediken (Br16), Little Lediken, Kellockbank Country Emporium, Mill of Newton and West Lodge (Br19), North Lediken Croft (Br20), and Westgate Cottage (Br22). Those close to Carden Junction include: Waterside (Br43), Strathorn (Br44), Carden Farm (Br47), and Westerton (Br50).
- A number of long-range receptors have been identified outwith the 1km buffer. These include: Mill of Knockenbaird (Br6), Minor road junction (Br13), Greenhall (Br14), Westgate Cottage (Br22), Freefield House and South Lodge, Saint Cloud, Combscauseway (Br24), Little Newton (Br26), Bonnyton (Br28), Oxenloan and Sontley (Br30), Mains of New Rayne (Br31), Kirkton of Oyne (Br45), Craigmill (Br54), Oxen Craig National Forest Recreation Routes (Br75) and Mither Tap National Forest Recreation Routes (Br76). These are indicated in Volume 5, Figures 15.7 and 15.8: Visual Receptors Brown route option and on Figure 15.17: Visual Receptors (Long Range) Brown route option. None of the receptors outwith the 1km buffer zone have significant adverse visual effects;
- Of the 76 receptors affected by the Brown route option, 30 receptors are predicted to have major adverse visual effects. These are evenly dispersed along the route option and the majority tend to be within close proximity to the route option(<0.5km);
- 19 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route option and are largely within 0.5-1km of the route option, where they occur on an elevated slope directly overlooking the route option; and
- 27 receptors are predicted to have minor/negligible adverse or no change visual effects. The frequency of these receptors tends to be evenly dispersed along the route option, but some occur outwith the 1km buffer.

Pitcaple to Kintore

- 15.6.9 The predicted visual effects of the Violet and Orange route options are set out in Volume 4b, Appendix A15.2: Tables 1.5 and 1.6.
- 15.6.10 The following are the key summary findings of the assessment of visual effects of the Pitcaple to Kintore study area: Violet route option. Visual receptors are illustrated in Volume 5, Figures 15.9 to 15.11: Visual Receptors Violet Route Option and Figures 15.18: Visual Receptors (Long Range) Violet Route Option:

- Receptors with the potential for significant adverse visual effects are evenly dispersed throughout the Violet route option study area and tend to be in close proximity (approximately up to 0.5km) of the Violet route option;
- The Violet route option alternates between being partially raised above the surrounding landscape on embankment, increasing its potential visibility to surrounding receptors, and being in cutting where the views of the route option will be partially or fully screened. The southern extent of the area, which is located to the north of Kintore, is situated on the existing A96. This visual connection with existing linear infrastructure helps limit visual change on receptors;
- The area east and south-east of Inverurie has a higher level of woodland cover, limiting the number of receptors with direct views of the route option. This area also has a significantly higher level of built environment that screens views from Kintore;
- The low number of significant visual effects identified within the southern part of the area is due mainly to the undulating topography, taller and denser boundary vegetation and woodland cover, the existing A96 and the built environment;
- A large number of residential receptors are predicted to experience significant adverse visual effects in the central and eastern parts of this study area, specifically the cluster of residencies at Hillbrae, Ben View, Hillbrae Cottage and Bennachie View (V54), Little Hillbrae (V56), Orcadia (V66), Alderlea, Hillcrest, The Brambles, Hillhead, East Hill and Hillhead House (V67). Also north-west of Kinmuck, Isaacstown (V73), Whitelums Farm (V74), Ashlea Grange and Coldwell (V75), The Ha's, Houlmalees, Craigandhu, Vaila, Craigpark, Wellhillock Croft, Hill View, Newplane Lodge and Newplace Farm Steading (V76), Burnside (V77), Altons/Fawells - now Altons and Altons Cottage (V78), Craigforthie Cottages (V84), Oakleacraig (V86), Heatherwick, Laginda and Heatherwick Farm Cottages (V88), the recreational users of Hogholm Farmhouse and Hogholm Stables (V89), Balcraig (V90), Spy Far (V93), West Balbithan, West Balbithan Cottages and East Balbithan (V97), Cairnhall (V100), and Tavelty Farm, Whinstone and Overdon Care Home (V101) are located in close proximity to the Violet route option, and the topography allows direct views towards it. Similarly, the PRoW (V29), the existing local route (V24), and existing local route: A96 Inverurie to Kintore: Foot/Cycleway (V116) will be significantly affected;
- Although one of the proposed road junctions (Tavelty Junction) would be located adjacent to the existing A96 and would visually associate with existing road infrastructure limiting the visual effect, the other two junctions (Daviot and Uryside Junctions) are within a more open setting with arable fields being a dominant element, which in contrast, tends to magnify the visual effect on receptors in this area. Significant adverse visual effects partly attributed to the new junctions are predicted for the following receptors:
 - In the vicinity of Daviot Junction: Mossfield (V9), Mackstead Farm, Mackstead Farmhouse and the Steading (V16), Broadplace (V17), Hill of Den/Reservoir (V18), Broadward/Stewart Agricultural (V19), Skellarts Croft and Garage (Gordon Smith's Car Repairs) (V20),

Hillhead and Mullions (V21), Resthivet (V22) and the existing local route (V24);

- In the vicinity of Uryside Junction: East Balhalgardy and Highfield (V41), Collyhill (V42), proposed Core Path - Howford Bridge Link Meldrum Meg Way (V43), Hillcrest (V44), Tullochmor (V45), Carpenter's cottage and Aurora (V47) and Roundhaugh (V49); and
- In the vicinity of Tavelty Junction: West Balbithan, West Balbithan Cottages and East Balbithan (V97), Cairnhall (V100), Tavelty Farm, Whinstone and Overdon Care Home (V101), Core Path - Inverurie to Kintore (V102), Kintore Cemetery (V103), Balbithan Island (V104), existing local route - Inverurie to Kintore (V105) and existing local route: A96 Inverurie to Kintore: Foot/Cycleway (V116).
- A key bridge structure is proposed across the River Don, directly to the east of Kintore Business Park. Given the lack of existing bridges and the limited tree cover together with relatively open surroundings, adverse visual effects will be experienced by receptors that have open views and these tend to be east and west of the proposed River Don crossing e.g. West Balbithan, West Balbithan Cottages and East Balbithan (V97), Cairnhall (V100), Core Path - Inverurie to Kintore (V102), Kintore Cemetery (V103), Balbithan Island (V104), existing local route - Inverurie to Kintore (V105) and existing local route: A96 Inverurie to Kintore: Foot/Cycleway (V116). There are a comparatively low number of receptors in this area with direct views of the proposed crossing and receptors to the south are not expected to experience significant adverse effects due to screening by the existing built environment, the oblique angle of view and the distance limiting the extent of visual intrusion. Further away from the proposed crossing adverse visual effects are expected to be minor for residents of Ardmurdo (V94), at Kinkell Church Area (V95) at Fullerton or Murrayfield / Edlerton (V96), Kintore Business Park (V98) and at Oakleigh, Braeriach and Glen Nevis Cottage (V99);
- A number of long-range receptors have been identified outwith the 1km buffer. Those that have potential for significant adverse visual effects are; Govals (V12), Battle of Harlaw (V36) and Keith Hall Inventory Garden and Designed Landscape (V60), these are shown in Volume 5, Figures 15.9 to 15.11;
- Of the 117 receptors affected by the Violet route option, 33 receptors are predicted to have major adverse visual effects. These are evenly dispersed along the route and the majority tend to be within close proximity to the route option (<0.5km);
- 25 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route option and are largely within 0.5-1km of the route option, where they occur on an elevated slope directly overlooking the route option; and
- 59 receptors are predicted to have minor/negligible adverse or no change visual effects. The frequency of these receptors tends to be evenly dispersed along the route option.

15.6.11 The following are the key summary findings of the assessment of the visual effects of the Pitcaple to Kintore study area: Orange route option. Visual receptors are illustrated in Volume 5, Figures 15.12 and 15.13: Visual Receptors Orange Route

Option and Figures 15.19 and 15.20: Visual Receptors (Long Range) Orange Route Option:

- The majority of receptors with the potential for significant adverse visual effects are located within close proximity (<0.5km) to the route option and within the central and northern area of the route. The smaller number of significant effects identified elsewhere within the area, including in Inverurie and Port Elphinstone is due mainly to the presence of built form, screening from vegetation and the Orange route option largely aligning with the current carriageway, reducing the visual effect;
- Receptors in the north-western extents of the area will experience limited views of the route option due to the screening effect of the undulating landform. The central extent of the study area is more predisposed to longer range views from surrounding hills and the prominence of this section of the route option;
- Near the settlements of Daviot and Durno, the proposed Pitscurry Junction is located in a prominent elevated location giving rise to significant visual effects due to 10m embankments and the overbridge structure;
- In the vicinity of Pitscurry Junction significant adverse effects are predicted for the following receptors: Woodend and Cairnton (O6), Logie/ Durno School/Hall (O8), Southside and Whiteley (O9), Bridgend (Burn of Durno) (O10), Gatehouse (O12), Glenlogie (O13), Ar-dachaidh / Bridgend (Pitcaple) (O15), Whiteley (O16), Edinmore Drive (O18), Mossfield (O20) and Mackstead (O21). This is primarily because of the height of embankments and overbridge structure, together with the elevated position of the junction increasing its visibility;
- Between Inveramsay and Pitcaple, a significant number of mainly residential receptors close to the route option would experience major adverse visual effects, including at Hill of Den (O25), Pitcaple Castle (O27), Mill of Pitcaple (O29), Legatesden Farm (O34), Inveramsay Cottages (O40) and Mill of Inveramsay (O45). Recreational receptors with significant adverse visual effects include the existing local route (O28) and the users of the PRoW (O30);
- A large number of residential receptors are predicted to experience significant adverse visual effects around the central area of the Orange route option study area.
 - In the vicinity of Drimmies junction, the route option is concealed by hills to the east and west, thereby reducing visual effects. Affected residential receptors include: Milton of Inveramsay (O42), Mill of Inveramsay and Mill Croft (O45), Balquhain Mains and Cottages (O49), Balquhain Castle (O50), Netherton Smithy / Balquhain Smithy/ Croft of Netherton (O51), Drimmies Cottages (O52), Netherton of Balquhain (O53) will experience views of the route option in conjunction with the existing A96 at this location, the cumulative effect of which will increase visual intrusion.
 - In the vicinity of Blackhall junction significant visual effects partly attributed to the new junction are predicted for the following receptors: Brockhill View (O60), Starrmuir and Dubston (O61), Alton (O65),

Newseat of Manar (O67), Backhill of Davah (O70), Burnside of Manar (O71) and Newseat (O73) and the users of the path to East Aquhorthies (O64, O66 and O68) and the existing local route (O54); and

- Also, Haughton (O83), Coldwells (O81) and Ardtannes (O87) which are located in close proximity to the Orange route option are affected on account of the topography giving direct views to this route option (see River Don crossing below).
- Two key structures are proposed: across the River Urie, north of Inveramsay and across the River Don, directly to the south of St. Apollinaris' Chapel. Given the lack of existing bridges and limited tree cover, the structures can be expected to have significant adverse visual effects. These crossings would give rise to a significant localised visual effect on the following receptors:
 - River Urie crossing: users of PRoW (O30), residents of Legatesden House (O34), Inveramsay Cottages (O40), Mill of Inveramsay (O45) and Milton of Inveramsay (O42); and
 - River Don crossing: Proposed Core Path - Old Kemnay Road (Kemnay - Inverurie) (O82) and (O86) as well as visitors to the Chapel and burial grounds of St. Apollinaris (O80), residents of Backhill of Davah (O70), Burnside of Manar (O71), Newseat of Mains (O73), Braeside (O77), Coldwells Cottage (O78), Waterside Cottages (O79), Coldwells (O81) and Haughton (O83).
- The Orange route option alternates along its length between being partially raised above the surrounding landscape on embankment (increasing its potential visibility to surrounding receptors) and in cutting (where the views will be partially or fully screened).
- The southern extent of the area near Inverurie has a greater proportion of woodland cover than the north and eastern extents, limiting the number of receptors with direct views of the route option. It also coincides with the existing A96 and this visual connection with existing linear infrastructure limits adverse visual effect;
- Although Thainstone Junction will be located adjacent to the existing A96, whilst it will be visually associated with the existing road infrastructure, it will have a significant effect on the following receptors:
 - Crichtie Cottages and agricultural steading (O92), Bruce's Camp, Hillfort (O93), Thainstone House (O97), Crichtie Business Centre, Mill Road, Mill Lane (O99), Core Path: Inverurie to Kintore (O101), North Lodge (O102), Thainstone Agricultural Centre (O103), Porterhouse Restaurant and Coffee Shop (O104) and existing local route: A96 Inverurie to Kintore: Foot/Cycleway (O131) will experience significant adverse visual effects;
 - Kintore Business Park (O109), Cairnhall and Cemetery (O111) and Overdon Care Home and Tavelty Farm (O114) will also experience significant adverse visual effects;
- Visual receptors with a higher elevation have longer distance views and may have greater visibility of the route option. A number of long-range receptors

have been identified outwith the 1km buffer as having potential for significant adverse visual effects. These are illustrated on Figures 15.19 and 15.20: Visual Receptors (Long Range) Orange route option. Of these, only Southside (O9) will experience significant adverse visual effects;

- Of the 131 receptors affected by the Orange route option, 44 receptors are predicted to have major adverse visual effects. These are evenly dispersed along the route option and the majority tend to be within close proximity to the route option (<0.5km);
- 25 receptors are predicted to have moderate adverse visual effects. These are evenly dispersed along the route option and are largely within 0.5-1km of the route option, where they occur on an elevated slope directly overlooking the route option; and
- 62 receptors are predicted to have minor/negligible adverse or no change visual effects. The frequency of these receptors tends to be evenly dispersed along the route option, but some occur outwith the 1km buffer where there is potential for long range views e.g. Bennachie or Daviot.

15.7 Cumulative Effects

- 15.7.1 GLVIA3 highlights that 'cumulative landscape and visual effects must be considered in LVIA' and highlights that 'the emphasis is on likely significant effects. Careful thought should be given to what significant cumulative landscape and visual effects are likely to be generated. This should allow a sensible decision to be reached at the scoping stage so that the task is reasonable and in proportion to the nature of the project under consideration'⁹⁵.
- 15.7.2 This chapter reviews the significant known other developments within the study areas and beyond, that could have a significant cumulative effect on visual receptors.
- 15.7.3 The Aberdeenshire Council planning website⁹⁶ provides a list of other known developments in this area that might affect receptors alongside the dualling of the A96 including the following:

Clashindarroch II Wind Farm

- Vattenfall Wind Power Ltd is seeking consent under Section 36 of the Electricity Act 1989 to install and operate a wind farm comprising up to 14 wind turbines and associated infrastructure. The Clashindarroch II Wind Farm proposal is located on land north-east to the existing operational Clashindarroch Wind Farm, approximately 6km to the south - west of Huntly with an approximate capacity of 56-84 MW. The turbines would be 180m tip height and 4-6MW each and these can be viewed from a distance. Access to the 1,234Ha site would be from the A920 to the west of Huntly;
- There will be a cumulative visual effect on receptors within the East of Huntly to Colpy area, when the wind turbine blade tips and hubs are viewed in

⁹⁵ Landscape Institute and Institute of Environmental Management and Assessment. *Guidelines for Landscape and Visual Impact Assessment*. Third revised edition. Routledge. 2013. Page 132-133

⁹⁶ Aberdeenshire Council planning website (<https://www.aberdeenshire.gov.uk/planning/masterplans/>)

conjunction with either the Cyan or the Red route option. Within a 10-20km radius of the proposed wind farm development site, 13-14 wind turbine blade tips may be visible as indicated on the submitted wind farm planning application drawing (Figure 7.5a 'Blade Tip Zones of Theoretical Visibility'⁹⁷ and Figure 7.6 'Blade Tip vs Hub Height Zones of Theoretical Visibility'⁹⁸). The higher elevation of the Red route option increases the potential for cumulative adverse effects when the new dual carriageway and the wind farm can be seen in the same view. The Cyan route option has less potential for cumulative effects when both road and the wind farm can be seen in the same view because it follows the existing A96 on land at lower elevation. Figure Viewpoint 16: A96, Leys of Dummuies of the EIA Report for Clashindarroch Wind Farm II illustrates the predicted effect from the existing A96 at Leys of Dummuies⁹⁹;

- There will also be a cumulative visual effect on receptors within the Colpy to Pitcaple area. Where vegetation and angle of views allow and within a 20-30km radius of the proposed Clashindarroch II Wind Farm, 13-14 wind turbine blade tips are likely to be visible to receptors in conjunction with views of the Pink and Brown route options. Only receptors on high ground will experience visual effects of blade tips in conjunction with views of the new dual carriageway (e.g. the Bennachie Range). Views of blade tips in conjunction with views of the route options will only be possible where lack of screening and angle of view allow;
- There will be a cumulative visual effect on receptors within the Pitcaple to Kintore section. To the north of Inverurie there are potential cumulative visual effects with the Violet route option, where vegetation and angle of views allow. Within a 30-40km radius of the proposed Clashindarroch II Wind Farm, 13-14 wind turbine blade tips are likely to be visible to receptors in conjunction with views of the new dual carriageway but distance is likely to reduce the significance of effect to minor adverse/negligible. Only receptors on high ground will experience visual effects of blade tips in conjunction with views of the route option (e.g. the Bennachie Range). Views of blade tips in conjunction with views of the route options will only be possible where lack of screening and angle of view allow.

Masterplans

- The following masterplans will result in cumulative visual effects on receptors in conjunction with the route options:
 - Crichton Developments Ltd, Inverurie South Development Framework¹⁰⁰;

⁹⁷ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement, Prepared for: Vattenfall Wind Power Ltd.* November 2019. Figure 7.5a 'Blade Tip Zones of Theoretical Visibility'.

⁹⁸ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement, Prepared for: Vattenfall Wind Power Ltd.* November 2019. Figure 7.6 'Blade Tip vs Hub Height Zones of Theoretical Visibility'.

⁹⁹ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement, Prepared for: Vattenfall Wind Power Ltd.* November 2019. Figure 7.37; 'Viewpoint 16: A96, Leys of Dummuies'.

¹⁰⁰ Crichton Developments Ltd, *Inverurie South Development Framework*, November 2012, Prepared by Wardell Armstrong. Available at: <https://www.aberdeenshire.gov.uk/media/8709/inveruriesouthdevelopmentframework.pdf>

- Kintore East Development Framework¹⁰¹;
 - Midmill South East (Phase 2), Kintore Masterplan¹⁰².
 - Kintore East Masterplan¹⁰³; and
 - Kemnay Masterplan¹⁰⁴.
- Cumulative visual effects are only likely with the Orange and Violet route options due to the location of these potential developments.

Other Local Developments

15.7.4 The developments listed in Table 15.1 may also result in cumulative visual effects on adjacent receptors. Again, these are located within close proximity of the Orange and Violet route options. There are currently no other significant developments likely to result in cumulative effects with the remaining route options.

Table 15.1 Other Local Developments

Application	Type and Status	Description	Location
APP/2013/0267	Major-Approved in principle	Erection of 737 Dwellinghouses, Business and Industrial Development, Community Facilities including Primary School and Associated Infrastructure	Site at Crichtie, Inverurie, Aberdeenshire
APP/2016/1027	Local-Approved	Erection of 25 Dwellinghouses (Change of House Types and Layout)	Uryside, Phase 2A-4, Inverurie
APP/2017/1381	Major-Approved	Erection of 125 Dwellinghouses (Change of House Types) and Associated Infrastructure and Landscaping	Site to north-east of Boynds Farm, Uryside, Phase 2B2-2B4, Inverurie, Aberdeenshire

¹⁰¹ *Kintore East Development Framework*, Prepared by Knight Frank LLP on behalf of the Kintore Consortium October 2013. Available at: <https://www.aberdeenshire.gov.uk/media/10722/approvedkintoreeastdevelopmentframeworkoctober2013.pdf>.

¹⁰² *Midmill South East (Phase 2), Kintore Masterplan: D124 Midmill SE Masterplan Draft H Document 11 10 2013*. Draft October 2013. Available at: <https://www.aberdeenshire.gov.uk/media/10806/d124midmillsemasterplandraftdocument30102013.pdf>.

¹⁰³ Barratt North Scotland Kirkwood Homes Limited, Malcolm Allan Housebuilders, June 2014. *Kintore East Masterplan* Available at: <https://www.aberdeenshire.gov.uk/media/10982/kintoreeastapprovedmasterplanjune2014.pdf>.

¹⁰⁴ Barratt North Scotland, *Kemnay Masterplan*, September 2014, Prepared by Halliday Fraser Munro. Available at <https://www.aberdeenshire.gov.uk/media/10716/a4412kemnaymasterplandocument.pdf> and Mixed Use Development at *The Glebe, Oldmeldrum (Site M1) Masterplan Document* September 2015. Prepared by Halliday Fraser Munro on behalf of Cala Homes. Revision B—17 May February 2016. Available at <https://www.aberdeenshire.gov.uk/media/15900/site-m1-the-glebe-oldmeldrum.pdf>.

APP/2017/1367	Major-Approved	Erection of 416 Dwellinghouses and 4 Commercial Units	Phases 1 And 2, Portstown, Inverurie, Aberdeenshire
APP/2019/0232	Major-Approved	Erection of 40 Dwellinghouses with Associated Parking and Infrastructure	Boynds Farm, Uryside, Inverurie, Aberdeenshire
APP/2019/1649	Awaiting decision	Erection of 25 Dwellinghouses (Change of House Types to 18 Units, 7 Additional Units, and Amended Layout of Planning Permission ref. APP/2017/1367)	Plots 120-134 and 139-141 Portstown, Inverurie

15.7.5 On completion, these developments to the north-east of Inverurie and the Crichton development to west would form a new settlement edge to Inverurie. Although there would be a cumulative effect, it would not alter the overall findings of this visual assessment.

15.8 Summary of Effects

15.8.1 This section sets out a summary of the key findings of the route options assessment, based on the predicted significant residual effects. The summaries are presented in Tables 15.2 to 15.4. All residual effects are adverse.

Table 15.2 Summary of Predicted Residual Visual Effects: East of Huntly to Colpy

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
<ul style="list-style-type: none"> The route option would be located within a rural area and would give rise to few significant adverse effects due mainly to woodland screening, the influence of existing topography and the low frequency of receptors. Notable landform features also restrict the visual effect on receptors along the route option such as Hill of Foudland (467m AOD), Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD). The frequency of visual receptors tends to be evenly dispersed along the route option except where the route option turns south to the north of Colpy, where the topography becomes more level. 	<ul style="list-style-type: none"> The route option would be located within a rural area, giving rise to significant effects over a longer distance, mainly due to the elevation of the route option, the influence of existing topography and the increased frequency of visual receptors. Notable landform features restrict the effect on visual receptors such as Cot Hill (245m AOD), Gartly Moor and Winds Eye (314m AOD), Cot Hill (311m AOD) to the west of this route option. The Red route option has increased visibility and a greater visual influence on visual receptors on adjacent south facing slopes where it traverses Hill of Foudland (467m AOD) because of the increased elevation. Hill of Dunnideer (R46), Braehead (R19), Midtown (R20), Bainshole (R21), West Skares (R22), Mid-Bog/Bog (R23), Rashieslack (R24).

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
<ul style="list-style-type: none"> • The key significant adverse visual effects predicted from the Cyan route option include: • Slioch (C6), Leys of Dummuies (C7), Adamston (C8), Thomastown (C9), Huntly to Greenmyres (C43), Greenmyres (C11), Hillhead/Newtongarry Inn and Croft of Broomhill (C13), Broomhill, Clinkstone and Stodfold (C16), Newton and Overton (C17), Wedderburn (C18), Braehead (C19), Midtown (C20), Bainshole (C21), Mid-Bog/Bog (C22), West Skares (C23), Rashieslack (C24), Lambhill/Carnbroe (C25), Skares (C26), Fordmouth (C27), Woodside (C28), Jericho (C29), Waulkmill (C30), Kirkton of Culsalmond Parish Church (C31), The Glen and The School (C33), Colpy (C34), St Sairs (C35), Ritchies Garage/Old Wrangham/Boghead (C36), Mains of Sheelagreen (C37), Williamston House and Home Farm (C38), Wrangham/West Wrangholm Cottage (C39), Old Inn Farmhouse (C40), Mill Croft/Old Millhouse (C42). • The majority of significant effects are predicted within 0.5km of the route option. They are evenly spread along the north and south facing slopes of the Glen Water valley with views to the existing A96. • There is an increased frequency of visual receptors where topography becomes more level south of Hill of Skares where there are significant adverse effects on a greater number of receptors. • Less significant adverse effects occur where there is woodland vegetation combining with distance and/or topography to reduce the visual effect on receptors, and where the receptor is >1km away (i.e. outwith the buffer zone). 	<ul style="list-style-type: none"> Lambhill/Carnbroe (R25), Skares (R26), and also visual receptors to the east of the route option; Woodside (R29), Colpy cottage (R30), Waulkmill (R31), The Glen and the School (R33), Colpy (R34) and Huntly to Greenmyres (R47) are affected. • Where the Red route option traverses Hill of Foudland (467m AOD) and Hill of Skares (329m AOD) there are large cuttings and embankments that increase the effect on visual receptors for example; Rashieslack (R24), Lambhill/Carnbroe (R25), Mid-Bog/Bog (R23). Some receptors have restricted views due to the elevation of existing embankments and topography such as Skares (R26). • Where the Red route option has a higher elevation - visual effects occur over a greater distance, particularly where receptors are also elevated, such as Hill of Dunnideer (R46) (268m AOD) which has views to Hill of Skares (329m AOD) and Hill of Foudland (467m AOD). • There is an increased frequency of visual receptors where topography becomes more level south of Hill of Skares where significant effects influence on a greater number of receptors. • The key individuals or groups where significant visual effects are predicted due to the Red route option include: <ul style="list-style-type: none"> ○ Craigenseat (R4), Whiteleys (R5), Slioch (R6), Leys of Dummuies (R7), Adamston (R8), Thomastown (R9), Huntly to Greenmyres (R47), Greenmyres (R11), Hillhead/Newtongarry Inn/Croft of Broomhill (R13), Glennieston (R14), Gartly Moor (R15), Broomhill/Clinkstone/Stodfold (R16), Newton/Overtown/Kilden/Whinbrae (R17), Wedderburn (R18), Braehead (R19), Midtown (R20), Bainshole (R21), West Skares (R22), Mid-Bog/Bog (R23), Rashieslack (R24), Lambhill/Carnbroe (R25), Skares

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
	<p>(R26), Upper Scotstown (R27), Jericho (R28), Woodside (R29), Colpy Cottage (R30), Waulkmill (R31), St Sairs (R32), The Glen and the School (R33), Colpy (R34), Kirkton of Culsalmond (R36), Ritchies Garage/Old Wrangham/Boghead (R37), Braeside (R38), Mains of Sheelagreen (R39), Williamston House (R40), Wrangham/West Wrangholm Cottage (R41), Old Inn Farmhouse (R42), Mill Croft (R43).</p> <ul style="list-style-type: none"> • Less significant effects occur where there is woodland vegetation combining with distance and/or topography to reduce the visual effect on receptors, and where the receptor is >1km away (i.e. outwith the buffer zone).

Summary: East of Huntly to Colpy

- 15.8.2 Between East of Huntly and Colpy, the Red route option has significant adverse visual effects particularly where it crosses Hill of Foudland (467m AOD) resulting in a pronounced cutting across the north and south facing slopes, increasing the effect on receptors.
- 15.8.3 The Cyan route option follows the existing A96 more closely and its visual effect is reduced by screening to the north and south by Hill of Bainshole (318m AOD) and Glens of Foudland, both of which restrict views for receptors. Here the landform begins to form a corridor following the Glen Water, through which the Cyan route option passes. The corridor narrows as it continues between Hill of Skares (329m AOD) and Hill of Tillymorgan (381m AOD), limiting the adverse visual effect on receptors.
- 15.8.4 South of the Hill of Skares (329m AOD) the topography opens out and becomes more level with more receptors and similar visual effects for both route options.
- 15.8.5 Overall, the Cyan route option is predicted to have fewer adverse visual effects.

Table 15.3 Summary of Predicted Residual Visual Effects - Colpy to Pitcaple

Predicted Residual Effects for Pink Route Option	Predicted Residual Effects for Brown Route Option
<ul style="list-style-type: none"> • The Pink route option runs through a predominantly rural area and would give rise to a large number of significant visual effects throughout the study area. The majority of the receptors that would experience significant adverse effects are individual residential properties, and groups of residential properties, which lie in the countryside adjacent to the Pink route option. • Significant effects on receptors including: <ul style="list-style-type: none"> ○ Old Wrangham/Boghead (P2), Mains of Sheelagreen (P3), Wrangham and West Wrangham Cottage (P4), Williamston House, Home Farm and Michael Fold (P5), Old Inn Farmhouse (P7), Colrayne House/Darcy Lodge/Caravan Site and Loch Inch Fishery (P8), Old Mill House/Mill Croft (P9), Mains of Williamston and Mains of Williamston Cottage/Aristocats Cattery (P11), Mellenside (P12), Little Lediken/Kellockbank Country Emporium/Mill of Newton and West Lodge (P13), Old Gateside (P16), Brankanenum/Strathalmond Cottage/Newton Cottages/Eastgate/Glenniston Croft (P17), Middle Gateside (P18), South Lodge/Sain Cloud and Combscauseway (P20), Little Newton (P21), Bonnyton (P22), Mains of New Rayne (P24), Oxenloan and Sontley (P25), Westerton of New Rayne (P26), Cycle Route GA3 – Oldmeldrum to Old Rayne (P27), Core Path Burnside (P29), Mill of Bonnyton (P30), Drumfold (P32), Rosehall (P34), Core Path Old Rayne (P35), Longside (P36), Bishopston (P37), Core Path – Jenny’s 	<ul style="list-style-type: none"> • The Brown route option runs through a predominantly rural area and would give rise to a large number of significant visual effects. The receptors which would experience significant visual effects are distributed evenly throughout the study area, with no receptor clusters in any one area. The receptors located closest to the route option will experience the largest adverse effects. • Significant effects on receptors including: <ul style="list-style-type: none"> ○ Old Wrangham/Boghead (Br2), Wrangham and West Wrangham Cottage (Br4), Williamston House (Br5), Old Inn Farmhouse (Br7), Old Mill House/Mill Croft (Br8), Colrayne House/Darcy Lodge/Caravan Site and Loch Inch Fishery (Br9), Mellenside (Br10), Mains of Williamston and Mains of Williamston Cottage/Aristocats Cattery (Br11), Waterton/Downie House (Br12), Toll House (Br15), West Lediken (Br16), Little Lediken (Br19) North Lediken Croft (Br20), South Lediken (Br21), Westgate Cottage (Br22), Newton House (Br23), East Lediken (Br25), Mausoleum/Rothney’s Well (Br27), Wester Shevock (Br29), Westerton of New Rayne (Br32), Pitmachie/Bridge of Shevock (Br33), Brecken (Br34), Broombrae (Br38), Core Path – Whiteford to Old Rayne (Br39), Longcroft and Mains of Petmathen (Br40), Mill of Pitmedden (Br42), Strathorn (Br44), Core Path – Oyne Woodland (Br46), Carden Farm (Br47), Urie Riverside Walk (Br48), Core Path – Jenny’s trees via Urie Riverside (Br49), Westerton (Br50), Cycle Route GA1 – Inch to Oyne (Br51), North

Predicted Residual Effects for Pink Route Option	Predicted Residual Effects for Brown Route Option
<p>Trees via Urie Riverside (P38), Auchentarph Croft and Lewesk (P40), Newton of Lewesk (P41), Lawfolds Farm (P43), Lawfolds Cottage (P44), East Law (P48), Easterton (P49), Core Path – Logie Woods to Durno (P54), Woodend Cottage/Hawthorn House/North Woodend/Cairnton/Stonefield Cottage (P57), Logie Durno School (P58), Gatehouse/Highbury Grove/Burnside of Pitcaple (P59), Glenlogie (P60) and Bridgend (Burn of Durno) (P62).</p> <ul style="list-style-type: none"> • The eastern section of the study area has a higher level of woodland cover in comparison to the western section, and as a result there are a number of receptors in this location that will not experience a significant effect. • Lawrence Road Junction results in significant adverse visual effects for receptors located within close proximity. These include; Mellenside (P12) Brankanentum, Strathalmond Cottage, Newton Cottages, Eastgate, Glenniston Croft and Glenniston Croft (P17). 	<p>Lodge (Br52), Easterton (Br56), Old Logie Cottages (Br57), Logie Durno Farm (Br59), Core Path – Logie Woods to Durno (Br60), Benlogie (Br61), Cycle Route GA3 – Oldmeldrum to Old Rayne (Br62), Ferniebrae (Br63), Whiteford (Br64), Woodend and Cairnton (Br67), Bridgend (Burn of Durno) (Br68), North of Whiteford (Br69), Logie Durno Hall/School (Br70), Glenlogie (Br72), Gatehouse (Br73) and Burnside of Pitcaple (Br74).</p> <ul style="list-style-type: none"> • Given the open nature of views in the western and central sections of the study area, there are also a number of receptors which will experience long distance views of the route option and will experience a significant visual effect. • The eastern section of the Brown route option study area has a higher level of woodland cover, particularly surrounding Pitcaple and Durno, and as a result the route option is screened slightly for the receptors which do not lie within close proximity to the route option. • Two road junctions are proposed along the Brown route option; Kellockbank Junction and Carden Junction. Significant adverse effects are predicted for receptors located within close proximity to each of the junctions. These include; Toll House (Br15), West Lediken (Br16), Little Lediken (Br 19), North Lediken Croft (Br20), South Lediken (Br21), Mill of Pitmedden (Br42), Waterside (Br43), Strathorn (Br44), Core Path - Oyne woodland paths (Br 46), Carden Farm (Br47) and Urie Riverside Walk (Br 48).

Summary: Colpy to Pitcaple

- 15.8.6 Between Colpy and Pitcaple, the Brown route option has a greater number of significant adverse visual effects than the Pink route option due to a greater number of receptors.
- 15.8.7 The Pink route option runs north-east of the existing A96 and is more elevated in comparison to the Brown route option, which runs close to the existing A96 and the River Urie. There are open spaces in the western and central parts of this area which would result in significant visual effects on receptors located within both route options.
- 15.8.8 At the eastern end of this geographical section, there is more woodland cover which acts as screening for receptors which are not located within the immediate proximity of the route options.
- 15.8.9 Overall, the Pink route option is better screened and is predicted to have fewer visual effects.

Table 15.4 Summary of Predicted Residual Visual Effects: Pitcaple to Kintore

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<ul style="list-style-type: none"> • The Violet route option would be located within a largely rural area with open, mid and long-range views and would give rise to many significant effects along both sides of the route option, east of the River Don and for most of the area. Significant effects on the receptors including: <ul style="list-style-type: none"> ○ Durno to Gatehouse (V1), Cottage/Cairnton/North Woodend/Hawthorn House and Woodend Cottage (V2), Burnside of Pitcaple and Highbury Grove (V4), Gatehouse (V5), Bennachie House/The Mains of Glack (V7), Mossfield (V9), Mackstead Farm (V16), Broadplace (V17), Hill of Den/Reservoir (V18), Broadward/Stewart Agricultural (V19), Skellarts Croft and Garage (V20), Hillhead and Mullions (V21), Resthivet (V22), GA3 - Old Meldrum to Old Rayne (V24), Mains of Inveramsay/Gunhill (V25), Sandwood and Hill of Cuttlecraig (V26), Cuttlecraigs Farm/Cuttlecraigs Cottages and Auchencleith (V27), Alfresco (V26), PRoW (V29), Romar (V30), East Harlaw/Wilsonville 	<ul style="list-style-type: none"> • The Orange route option would be located within a largely rural area with open mid and long-range views. This route option would give rise to many significant effects within the central-eastern and northern parts of the area, due to the proximity of receptors to the route option, limited woodland screening and the undulating landscape where the receptors are often located at a higher level above the route option. Significant effects on the receptors including: <ul style="list-style-type: none"> ○ Woodend and Cairnton (O6), Logie Durno Hall/School (O8), Southside and Whiteleys (O9), Bridgend (Burn of Durno) (O10), Gatehouse (O12), Glenlogie (O13), Ardachaidh/Bridgend(Pitcaple) (O15), Whiteley (O16), Bennachie House and Glack Farm (O17), Properties at B9001/Edinmore Drive (O18), Mossfield (O20), Mackstead (O21), Skellarts Croft (O22), Broadward (O23), Damhead (O24), Hill of Den (O25), Mill Wood (O26), Pitcaple Castle (O27), Old Meldrum to Old Rayne

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>and the Lodge (V31), Hillhead of Lethenty/The Bungalow/Mill View (V32), Parkview (V33), Battle of Harlaw (V36), West Cottage Lethenty/East Cottage Lethenty/Burnside/Station House/Lethenty Mill and Loch Hart Station House (V38), Ardair House and Old Mill House (V39), East Balhalgardy (V41), Collyhill Cottage/Collyhill and Birchbrae (V42), Proposed Core Path – Howford Bridge Link Meldrum Meg Way (V43), Hillcrest (V44), Tullochmor (V45), Carpenters Cottage and Aurora (ex-Smithy Cottages) (V47), Roundhaugh (V49), Bourtie House and The Lodge (V51), Shadowside (V52), Moore Park and Smithycroft (V52), Hillbrae/Ben View/Hillbrae Cottage and Bennachie View (V54), Little Hillbrae (V56), Hill of Selbie (V59), Keith Hall Garden and Designed Landscape (V60), Orcadia (V66), Alderlea/Hillcrest/The Brambles/Hillhead/East Hill and Hillhead House (V67), Newmill/Little Newmill/Newmill Bungalow and Newmill Farm (V69), Eastfield (V70), Keith Hall and Kinkell Parish Manse including the Beeches/Woodlands/Cottages /Birchbrae and Beechfield (V71), Isaacstown (V73), Whitelums Farm (V74), Ashlea Grange and Coldwell (V75), The Ha's/Houlmalees /Craigandhu, Vaila, Craigpark, Welhillock Croft, Hill View, Newplane Lodge and Newplace Farm Steading (V76), Burnside (V77), Altons (V78), The Millhouse (V80), Craigforthie Cottages (V84), Oakleacraig (V86), Heatherwick/Laginda and Heatherwick Farm Cottages (V88), Hogholm Farmhouse and Hogholm Stables (V89), Balcraig</p>	<p>(O28), Mill of Pitcaple (O29), PRoW (O30), Legatesden Farm/Legatesden House and Resthivet Croft (O34), Govals (O36), Inveramsay Cottages (O40), Milton of Inveramsay (O42), Mill of Inveramsay and Mill Croft (O45), Balquhain Mains and Cottages (O49), Balquhain Castle (O50), Netherton Smithy/Balquhain Smithy/Croft of Netherton (O51), Drimmies Cottages (O52), Netherton of Balquhain (O53), Great Inverurie Bike Ride Route – (O54), Middleton of Balquhain (O55), Conglas Farm (O56), Bruntwood Tap (O57), Cairn Wynd (O58), Core Path – Inverurie to Dillyhill (O59), Brockhill View (O60), Starrmuir and Dubston (O61), Core Path – Inverurie to East Aquhorthies (O64), Alton (O65), Road Link – Inverurie to East Aquhorthies (O66), Newseat of Manar (O67), Backhill of Davah (O70), Burnside of Manar (O71), Core Path – Davah Hill Loop (O72), Newseat of Mains (O73), Braeside (O77), Coldwells Cottage (O78), Waterside Cottages (O79), St Apollinaris Chapel and Burial Ground (O80), Coldwells (O81), Proposed Core Path : Old Kemnay Road (O82), Haughton (O83), PRoW (O86), Ardtannes (O87), Crichtie Cottages and agricultural steading (O92), Bruce's Camp Hillfort (O93), Thainstone House (O97), Crichtie Business Centre, Mill Road, Mill Lane (O99), North Lodge (O102), Porterhouse Restaurant and Coffee Shop (O104), existing local route: A96 Inverurie to Kintore: Foot/Cycleway (O131), Ardlogie and Newton (O105), Fullerton/Murrayfield (O106), Oakleigh/Braeriach (O107),</p>

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>(V90), Spy Far (V93), Kinkell Church Area (V95), West Balbithan /West Balbithan Cottages and East Balbithan (V97), Cairnhall (V100), Tavelty Farm/Whinstone and Overdon Care Home (V101), Core Path – Inverurie to Kintore (V102), Kintore Cemetery (V103), Balbithan island (V104), existing local route – Inverurie to Kintore (V105) and existing local route: A96 Inverurie to Kintore: Foot/Cycleway (V116).</p> <ul style="list-style-type: none"> • Less significant effects are predicted west of the River Don and north of Kintore, due to the influence of existing infrastructure and urban environment. Significant effects within this area are on the residents of West and East Balbithan (V97) and the users of the Balbithan island (V104). • Tavelty Junction would be located adjacent to the existing A96 and thus associated with existing infrastructure but would also be screened by existing dense vegetation generally limiting adverse visual effects. • Significant effects are predicted for Daviot junction fort; Broadplace (V17), Hill of Den / Reservoir (V18), Broadward / Stewart Agricultural (V19), Skellarts Croft and Garage (Gordon Smith’s Car Repairs) (V20), Hillhead and Mullions (V21), Resthivet (V22), Old Meldrum to Old Rayne – Route (V24) and Mains of Inveramsay / Gunhill (V25). • Significant effects are also predicted for the Uryside West junction; West Cottage Lethenty, East Cottage Lethenty, Burnside, Station House, Lethenty Mill and Loch hart, Station House (V38), Ardair House and Old Mill House (V39), East Balhalgardy 	<p>Kintore Business Park (O109), Cairnhall and Cemetery (O111), Overdon Care Home and Tavelty Farm (O114).</p> <ul style="list-style-type: none"> • Less significant effects are predicted, north of Kintore, due to screening by woodland and the influence of existing infrastructure. Significant effects within this area on Thainstone House (O97). • Although the Thainstone Junction will be located adjacent to the existing A96 and will be visually associated with the existing road infrastructure, a further junction (Drimmies) will be also be viewed adjacent to existing road infrastructure increasing the level of visual intrusion of the route options these locations. • Two key structures are proposed across the River Don and across the River Urie, north of Inveramsay. These crossings would give rise to a significant localised visual effect on users of paths (O30) and (O86). Also affected are visitors to St. Apolinaris’ chapel and burial grounds (O80), Legatesden House (O34), Inveramsay Cottages (O40) Mill of Inveramsay (O45) and Milton of Inveramsay (O42).

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>and Highfield (V41), Collyhill Cottage, Collyhill and Birchbrae (V42) and Proposed Core Path: Howford Bridge Link Meldrum Meg Way (V43). For Uryside East Junction; Hillcrest (V44), Tullochmor (V45), Carpenters Cottage and Aurora (ex- Smithy Cottages) (V47) and Roundhaugh (V49).</p>	

Summary: Kintore to Pitcaple

- 15.8.10 Between Pitcaple and Kintore, the topographical setting of the Orange route option allows a greater degree of integration of the route option into the landscape. This is due to the woodland cover and the existing rolling topography.
- 15.8.11 The Violet route option runs through an area of broad and level topography with a higher number of visual receptors with long-range views than the orange route option, notably at and adjacent to Kintore and Inverurie. The Violet route option would be located within a largely rural area with open, mid- and long-range views and less screening, giving rise to many significant adverse effects.
- 15.8.12 The Violet route option has less significant adverse effects, west of the River Don, due to the influence of existing infrastructure, woodland screening and urban environment at Kintore.
- 15.8.13 Overall, the Orange route option is predicted to have fewer visual effects due to its screening from woodland and topography.

15.9 Scope of DMRB Stage 3 Assessment

- 15.9.1 A more detailed assessment of visual effects will be undertaken at DMRB Stage 3 in accordance with GLVIA3 and LA 107 Landscape and visual effects.
- 15.9.2 The following will be key aspects of the DMRB Stage 3 visual assessment process:
 - A review of the suitability of a 1km wide study area around the Preferred Option to ensure all significant effects are identified – this may require extending the study area;
 - A Zone of Theoretical Visibility will be produced and will be updated during design development;
 - Extensive site work will be carried out to identify all visual receptors within the chosen study area, carried out from publicly accessible locations. It will include all residential properties, roads, public buildings, workplaces, recreational buildings and outdoor locations to which the public can gain access;
 - Visual effects will be assessed for both construction and operational phases. For the operational stage the assessment of effects will be for year 1 (winter) and year 15 (summer) unless otherwise agreed with consultees;
 - An assessment of effects will be undertaken to inform the development of mitigation and this will be carried out in conjunction with the assessment of

landscape effects. The development of landscape and visual mitigation proposals will be carried out to ensure an integrated approach with the scheme design across disciplines;

- Particular consideration will be given during DMRB Stage 3 to visual receptors for which significant effects have already been identified during DMRB Stage 2; and
- Ongoing consultation with SNH and Aberdeenshire Council will be undertaken during the DMRB Stage 3 assessment to input into the scope of the assessment.

15.9.3 Following the approach recommended by 'Fitting Landscapes: Securing More Sustainable Landscapes', initial landscape design objectives for the scheme were drafted by AmeyArup in February 2018. It is intended that these objectives will be further refined during DMRB Stage 3, informed by a more detailed LVIA of the Preferred Option linked to design development.

16 Cultural Heritage

16.1 Introduction

16.1.1 This chapter assesses the predicted effects on cultural heritage assets and historic landscapes arising from the route options for the A96 Dualling East of Huntly to Aberdeen scheme.

16.1.2 The assessment was undertaken and conducted in accordance with the Chartered Institute for Archaeologists (CIfA) 'Code of Conduct' (2014¹⁰⁵) and 'Standard and Guidance for Historic Environment Desk-based Assessment (2017¹⁰⁶)', using information provided by Historic Environment Scotland (HES) and Aberdeenshire Council Archaeological Service (ACAS).

16.1.3 A description of the route options that form the basis of this assessment are provided in Volume 1, Part 2, Engineering Assessment.

16.1.4 This chapter is supported by:

- Volume 4b, Appendix A16.1: Gazetteer of Cultural Heritage Assets;
- Volume 4b, Appendix A16.2: Summary of the Number of Cultural Heritage Assets Identified within each Study Area, by Route Option;
- Volume 4b, Appendix A16.3: Potential Impacts on Cultural Heritage Assets; and
- Volume 5, Figures 16.1 to 16.13: Cultural Heritage Assets.

Policy Context

16.1.5 The assessment follows the guidance outlined in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2, HA 208/07 Cultural Heritage (referred to as HA 208/07) and with reference to the relevant statutory and planning framework for cultural heritage.

16.1.6 Legislation relevant to cultural heritage and relevant in the context of the assessment includes:

- Ancient Monuments and Archaeological Areas Act 1979;
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended by Town and Country Planning (Historic Environment Scotland) Amendment Regulations 2015);
- Town and Country Planning (Development Management Procedure) (Scotland) regulations 2013; and
- The primary planning policy and advice at the national level comprises:
 - National Planning Framework (NPF3) (2014);
 - Scottish Planning Policy (SPP) (2014);

¹⁰⁵Chartered Institute for Archaeologists (CIfA), 2014, *By-Laws: Code of Conduct*.

¹⁰⁶ Chartered Institute for Archaeologists (CIfA), 2017, *Standard and guidance for historic environment desk-based assessment*.

- Historic Environment Policy for Scotland (HEPS) (2019); and
 - Planning Advice Note 2/2011: Planning and Archaeology (PAN 2/2011) (2011).
- 16.1.7 At the local level, planning policy and guidance is set out in the Aberdeenshire Local Development Plan (LDP) (2017). Relevant policies for cultural heritage interest are summarised in Chapter 7, Section 7.2 Policy Context of the LDP.
- 16.1.8 Relevant guidance for cultural heritage interests and considered in the assessment includes:
- Historic Environment Scotland (2016) 'Managing Change in the Historic Environment: Setting';
 - Historic Environment Scotland (2016) 'Managing Change in the Historic Environment: Gardens and Designed Landscapes'; and
 - Historic Environment Scotland (2016) 'Managing Change in the Historic Environment: Historic Battlefields'.

16.2 Approach to Assessment

Consultation

- 16.2.1 Consultation to inform this assessment has been undertaken with HES and ACAS. Comments were sought from the above consultees on potential impacts on cultural heritage assets arising from the route options.
- 16.2.2 HES provided advice in respect of cultural heritage assets within their remit that are protected by statutory legislation: Scheduled Monuments (reference number commencing SM); Category A Listed Buildings (LB); and, sites included in the Inventory of Gardens and Designed Landscapes (GDL) and the Inventory of Historic Battlefields (BTL) (refer to Volume 5, Figures 16.1 to 16.13).
- 16.2.3 During consultation, HES raised particular concerns regarding the potential for a direct impact on Colpy Cottages Palisaded Enclosure (SM11511).
- 16.2.4 HES also highlighted a number of cultural heritage assets with statutory and non-statutory designations that they consider to be sensitive assets in relation to potential impacts on their 'settings' from the route options. Those relevant to the route options are listed below:
- Scheduled Monuments:
 - Colpy Cottages Palisaded Enclosure (SM11511);
 - Durno Roman Temporary Camp (SM4123);
 - Newton of Lewesk Enclosure (SM12137);
 - The Law Cairn (SM12113);
 - Drimmies Symbol Stone (SM70);
 - Deers Den Roundhouses (SM12465);
 - Wester Shevock Cairn (SM12115);

- Brownhills Cairn (SM12116);
- St Apolinaris' Chapel and Burial Ground (SM12118);
- Dillyhill Enclosure (SM12195);
- Bruce's Camp Hillfort (SM12523);
- Pitscurry Cairn (SM12302);
- Hill of Selbie Cairn (SM12434);
- Mains of Balquhain Stone Circle (SM3961);
- Balquhain Castle (SM90);
- Kinkell Church and Burial Ground (SM90188); and
- Fullerton Ring Ditches and Cairn Circle (SM7920).
- Category A Listed Buildings:
 - Bourtie House (LB2819).
- Inventory Gardens and Designed Landscapes (GDL):
 - Williamston House GDL (GDL386);
 - Newton House GDL (GDL300); and
 - Keith Hall GDL (GDL232).
- Inventory Historic Battlefields:
 - Battle of Harlaw (BTL11).

16.2.5 HES requested that two Scheduled Monuments located outwith the 1km study area (see Paragraph 16.2.12), East Aquhorthies Stone Circle (SM90126) and Maiden Stone Cross Slab (SM90210), be considered in the assessment.

16.2.6 HES requested that the potential impact of the Violet route option on Kinkell Church and Burial Ground (SM90188), which lies just outside the 1km study area, should also be considered in the assessment.

16.2.7 ACAS provided up-to-date Historic Environment Record (HER) data for the study area.

16.2.8 Within their initial route options consultation response, ACAS raised particular concern regarding the potential for direct impacts on two Scheduled Monuments: Colpy Cottages Palisaded Enclosure (SM11511); and Pitscurry Cairn (SM12302).

16.2.9 ACAS also highlighted a number of cultural heritage assets that they consider to be sensitive assets in relation to the potential impact of the route options on their 'settings' including:

- Scheduled Monuments;
 - Colpy Cottages Palisaded Enclosure (SM11511);
 - Woodside Hut Circles (SM11513); and
 - St Apolinaris' Chapel and Burial Ground (SM1218).

- Category A Listed Buildings
 - Balbithan House (LB9140);
 - Bourtie House (LB2819); and
 - Westhall House (LB16134).
- Category B Listed Buildings:
 - Fingask House (LB2797);
 - Williamston House (LB2964);
 - Newton House (LB2962);
 - Logie House (LB2857); and
 - Mill of Bonnyton (LB16002).
- Inventory Garden and Designed Landscapes (GDL):
 - Keith Hall GDL (GDL232);
 - Williamston House GDL (GDL386); and
 - Newton House GDL (GDL300).
- Inventory Historic Battlefields:
 - Battle of Harlaw (BTL11).

Study Area

- 16.2.10 The Stage 2 Assessment is based on DMRB (HA 208/07 Cultural Heritage), 'Simple Assessment' methodology. Simple Assessment was considered suitable to reach an appropriate understanding of the potential effects of the route options.
- 16.2.11 The assessment considers cultural heritage assets (archaeological remains, listed buildings) and historic landscapes protected by statutory and non-statutory designations as well as archaeological assets with a 'Regionally Significant' classification in the Council's Historic Environment Record (HER) and Non-Inventory Designed Landscapes in order to identify any potential significant impacts on cultural heritage assets that would require mitigation. Categories of cultural heritage assets considered in the assessment therefore include:
- Scheduled Monuments;
 - Listed Buildings;
 - Inventory Gardens and Designed Landscapes (GDL);
 - Inventory Historic Battlefields;
 - Conservation Areas;
 - 'Regionally Significant' archaeological sites; and
 - Non-Inventory Designed Landscapes.

16.2.12 Two study areas have been used for the assessment:

- **Detailed study area:** a study area extending 300m from the footprint of each route option (outer edge of earthworks including the maintenance strip) has been used for the identification of cultural heritage assets and historic landscape features that could be directly affected by the route options. Following the guidance provided by DMRB HA208/08 (Paragraph 5.4.1), the detailed study area was considered appropriate to cover the route options, any new land take, plus an area extending either side where potential direct impacts on cultural heritage were considered likely. Figures 16.1 to 16.13: Cultural Heritage Assets (Volume 5), show each route option and the locations of the cultural heritage assets identified within this study area, which are described in Volume 4b, Appendix A16.1: Gazetteer of Cultural Heritage Assets; and
- **Wider study area:** a study area extending up to 1km from the footprint of each route option (outer edge of earthworks including the maintenance strip) defines the study area used for the identification of cultural heritage assets whose settings may be affected by the route options. The wider study area took into consideration the guidance provided by DMRB HA208/08 (Paragraphs 5.4.1-5.4.2), the sensitivity of the receiving environment and the distribution and concentration of high sensitivity receptors (i.e. Scheduled Monuments, Inventory Gardens and Designed Landscapes and Category A Listed Buildings) within the landscape surrounding the route options. A list of these cultural heritage assets is provided in Volume 4b, Appendix A16.1: Gazetteer of Cultural Heritage Assets and their locations and extents are shown on Figures 16.1 to 16.13: Cultural Heritage Assets (Volume 5). At the request of HES, two cultural heritage assets (East Aquhorthies Stone Circle (SM90126) and Maiden Stone Cross Slab (SM90210) which are located outside the 1km study area have been considered within the assessment.

Desk-Based Assessment

16.2.13 The following sources were used as part of the desk-based assessment:

- Historic Environment Scotland's GIS spatial data warehouse¹⁰⁷: provided up-to-date information on the locations and extents of Scheduled Monuments, Listed Buildings, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields and Conservation Areas;
- The Aberdeenshire Historic Environment Record (HER¹⁰⁸): provided information on 'Regionally Significant' cultural heritage assets and Non-Inventory Designed Landscapes within the study areas;
- The National Record of the Historic Environment (NRHE¹⁰⁹): for any information additional to that provided in the HERs;

¹⁰⁷ Historic Environment Scotland GIS download [online]. Available from <http://portal.historicenvironment.scot/spatialdownloads>

¹⁰⁸ Aberdeenshire Historic Environment Record (HER). Digital GIS data extract

¹⁰⁹ Historic Environment Scotland National Record of the Historic Environment Database (Canmore) [online]. Available from: <http://jura.rcahms.gov.uk/PASTMAP/start.jsp>

- The Historic Land-use Assessment Data for Scotland (HLAmap¹¹⁰): for information on current and historic land-use; and
- Historic Gardens and Designed Landscapes in Gordon District¹¹¹ for additional information on Non-Inventory Designed Landscapes to that provided in the HER.

Site Visits

16.2.14 Site visits were undertaken in July 2018 and February 2019 to cultural heritage assets in the wider study area to assess their baseline settings and to identify those where there is potential for adverse effects on their settings from the route options. Factors considered were those set out in guidance 'Managing Change in the Historic Environment Scotland' (HES 2016), including:

- Current landscape or townscape context;
- Views to, from and across or beyond the historic asset or place;
- Key vistas;
- The prominence of the historic asset or place in views throughout the surrounding area;
- Aesthetic qualities;
- Character of the surrounding landscape;
- General and specific views including foregrounds and backdrops;
- Views from within an asset outward over key elements in the surrounding landscape (such as the view from the principal room of a house, or from a roof terrace);
- Relationships with other features, both built and natural;
- Non-visual factors such as historical, artistic, literary, place name or scenic associates, intellectual relationships (e.g. to a theory, plan or design), or sensory factors; and
- 'Sense of Place': the overall experience of an asset which may combine some of the above factors.

Assessment Methodology

16.2.15 The impacts of the route options on cultural heritage assets were assessed on their type (direct impacts and impacts on setting) and nature (beneficial or adverse):

- Beneficial effects arise from changes that preserve, enhance or better reveal cultural significance or special interest; and

¹¹⁰ Historic Land-Use Assessment Data for Scotland HLAmap [online]. Available from: <http://hlapmap.org.uk/>

¹¹¹ Brogden, W.A, Blanch, T., Carruthers, A and Woodward, E, 1995, *Historic Gardens & Designed Landscapes in Gordon District. Report of research undertaken for Gordon District* by Robert Gordon University Architectural Heritage Society Grampian Region.

- Adverse effects arise from changes that detract from or reduce cultural significance or special interest.

Relative Value of Cultural Heritage Assets

- 16.2.16 In line with guidance for DMRB Stage 2, cultural heritage assets have been assigned a level of value/sensitivity. The magnitude of impact on the asset has then been assessed, and correlated with the assigned value, to provide the predicted significance of effect.
- 16.2.17 This process is informed by a series of tables which have been collated following accepted practice and guidance. The tables presented in DMRB (HA 208/07 Cultural Heritage) for Archaeological Remains, Historic Buildings and Historic Landscapes have been modified and combined to accurately reflect the cultural heritage assets covered by the methodology.
- 16.2.18 The asset values/sensitivities used in this assessment are presented in Table 16.1. Those criteria in the DMRB standard example which were either not present in the respective study areas or not considered at DMRB Stage 2, have been removed from the table.

Table 16.1 The Value/Sensitivity of Cultural Heritage Assets (Based on DMRB HA208/07)

Value Sensitivity	Asset Type
High	Scheduled Monuments and sites proposed for scheduling Undesignated assets of schedulable quality Category A Listed Buildings Inventory Gardens and Designed Landscapes Inventory Historic Battlefields Well preserved historic landscapes, exhibiting considerable coherence, time depth or other critical factors
Medium	Archaeological sites and historic landscapes of regional importance Category B Listed Buildings Conservation Areas containing buildings that contribute significantly to its historic character Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s)
Low	Category C Listed Buildings

Magnitude of Impact

- 16.2.19 Magnitude of impact is the degree of change that would be experienced by an asset as a result of adoption of a route option, in comparison to the baseline conditions (a 'do nothing' situation). The magnitude of impact has been assessed independent of the assessment of the value/sensitivity of the cultural heritage asset, including physical impacts on the asset (direct impacts) and/or impacts on its setting or amenity value.

16.2.20 Magnitude of impact has been assessed in the categories major, moderate, minor, negligible and no change (in line with the directive in DMRB HA 208/07) and according to the criteria described in Table 16.2.

Table 16.2 Magnitude of Impact on Cultural Heritage Assets

Magnitude	Criteria
Major	<p>Change to most or all key archaeological materials, such that the resource is totally altered.</p> <p>Change to key historic building elements, such that the resource is totally altered.</p> <p>Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access: resulting in total change to historic landscape character unit.</p> <p>Comprehensive changes to setting.</p>
Moderate	<p>Changes to many key archaeological materials, such that the resource is clearly modified.</p> <p>Change to many key historic building elements, such that resource is significantly modified.</p> <p>Change to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access: resulting in moderate changes to historic landscape character.</p> <p>Considerable changes to setting that affect the character of the asset.</p> <p>Changes to setting of an historic building, such that it is noticeably changed.</p>
Minor	<p>Changes to key archaeological materials, such that the asset is slightly altered.</p> <p>Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.</p> <p>Slight changes to setting.</p> <p>Slight changes to historic buildings elements or setting that hardly affect it.</p>
Negligible	<p>Very minor changes to archaeological materials or setting.</p> <p>Slight changes to historic buildings elements of setting that hardly affect it.</p> <p>Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access: resulting in a very small change to historic landscape character.</p>
No change	<p>No change to elements, parcels or components; no change to fabric or setting; no visual or audible changes; no changes arising from amenity or community factors.</p>

Assessing Significance of Effect

- 16.2.21 The significance of an effect has been defined by correlating the value/sensitivity of a cultural heritage asset with the magnitude of the potential impact and is informed by the criteria in Table 16.3. In this assessment, effects of 'moderate' significance and above are 'significant' and therefore most likely to inform selection of a Preferred Option. Where two alternatives are provided in the table (e.g. Moderate/Major significance), professional judgement has been used to define a single significance rating.
- 16.2.22 The terminology for Significance of Effect (set out in Table 16.3) utilises the terminology, as far as possible, set out in the DMRB Stage 2 Scheme Assessment Report for the A96 Hardmuir to Fochabers Cultural Heritage Assessment (December 2018), and agreed with HES (further details are provided below in Paragraph 16.2.34).

Table 16.3 Significance of Effect

		Value/Sensitivity of Cultural Heritage Asset		
		High	Medium	Low
Magnitude of Impact	Major	Major	Moderate/ Major	Minor/ Moderate
	Moderate	Moderate/ Major	Moderate	Minor
	Minor	Minor/ Moderate	Minor	Negligible/ Minor
	Negligible	Minor	Negligible/ Minor	Negligible/ Minor
	No change	Neutral	Neutral	Neutral

Assumptions and Limitations

New Guidance

- 16.2.23 An update to the Cultural Heritage assessment methodology, now referred to as LA 106 Cultural Heritage Assessment (hereafter referred to as the 'New Guidance') outlined in the DMRB was released in January 2020.
- 16.2.24 The DMRB Stage 2 environmental assessment for this scheme had commenced at the time of the release of the New Guidance and followed a structure outlined in the previous published DMRB guidance, Volume 11, Section 3, Part 2, HA 208/07, Cultural Heritage, (hereafter referred to as the 'Withdrawn Guidance').
- 16.2.25 It has been agreed with Transport Scotland (TS) and Historic Environment Scotland (HES) that following a review of the New Guidance, the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.
- 16.2.26 The following Paragraphs 16.2.27 to 16.2.36 outline the key difference between the Withdrawn Guidance and the New Guidance in regard to cultural heritage assessment and describe how this chapter meets the objectives of the New Guidance.

- 16.2.27 The relevant parts of the New Guidance are LA 104 Environmental assessment and monitoring and LA 106 Cultural heritage assessment as follows:
- LA 106 outlines the assessment process from baseline through to determining the significance criteria for the cultural heritage resource.
 - LA 104 then guides the assessment from the magnitude of effect to determining the significance of effect for the cultural heritage resource.

16.2.28 There is no change to the focus of the assessment.

Effects of the New Guidance

16.2.29 Unlike the Withdrawn Guidance, which explicitly sets out specific study areas to be used within an assessment (specifically “the footprint of the scheme or within 300m” (Vol 11, Section 3, Part 2 HA 208/07, p5/11), the New Guidance does not set specific study areas, but now recommends that study areas be determined according to the sensitivity of the receiving environment and the potential impacts of the project. The New Guidance states that the study area should “include the footprint of the scheme plus any land outside the footprint which includes any cultural heritage assets which could be physically affected and include the settings of designated or other cultural heritage resource on the footprint of the scheme or within the zone of visual influence or potentially affected by noise”.

16.2.30 The cultural heritage assessment conducted as part of the DMRB Stage 2 Scheme Assessment Report for this project has employed two study areas: a 300m Detailed Study Area extending from the limits of the footprint (i.e. from the outer edge of the maintenance strip and including proposed junctions, side roads/connecting roads, slip roads, bridges, suds ponds, etc) of each route option to identify cultural heritage assets that could be directly affected by the route options, and a Wider Study Area extending 1km from the limits of the footprint (as above) of each of the route options for the identification of cultural heritage assets whose settings may be affected by the proposed route options. Additional cultural heritage assets that lie outwith the 1km Wider Study Area have also been included in the assessment where they have been specifically raised by HES as being potentially sensitive to the proposed scheme. The employed study areas for the DMRB Stage 2 Scheme Assessment Report are therefore appropriate for and compliant with the New Guidance.

16.2.31 The New Guidance no longer separates cultural heritage assets into sub-topics (i.e. Archaeological Remains, Historic Landscapes and Historic Buildings), but rather specifies that all landscapes of historic, cultural or archaeological significance are to be assessed as a cultural heritage resource. These are defined as being “a building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest” (LA 106 Cultural Heritage Assessment, p6).

16.2.32 The cultural heritage assets identified and assessed within the DMRB Stage 2 Scheme Assessment Report for this project have been separated into the sub-topics set out in the Withdrawn Guidance. Nevertheless, the assessment has identified all of the designated and non-designated cultural heritage assets applicable to the DMRB Stage 2 assessment within the defined study areas. It has then assessed the impact of each route option on the cultural heritage resource as defined in the New Guidance. It is, therefore, considered that the DMRB Stage 2 assessment for this project is compliant with the New Guidance.

- 16.2.33 The assessment criteria as set out in the New Guidance have not changed from those specified in the Withdrawn Guidance. However, the tabulated assessment/matrix process has been streamlined and the assessment criteria have been simplified (i.e. the removal of Cultural Heritage sub-topic guidance). In addition, the New Guidance now defines significant categories (i.e. 'Very Large', 'Large', etc) and provides typical descriptions (Sustainability & Environment Appraisal, Environmental Assessment LA 104, Table 3.7, p14), which were not previously provided in the Withdrawn Guidance.
- 16.2.34 This DMRB Stage 2 Scheme Assessment Report utilises as far as is possible, and agreed with by TS, the terminology set out in the DMRB Stage 2 Scheme Assessment Report for the A96 Hardmuir to Fochabers Cultural Heritage Assessment (December 2018) in order to keep the DMRB Stage 2 assessments consistent. As the New Guidance now defines the significance criteria, the terminology utilised in the DMRB Stage 2 assessment for this project is not compliant with that set out in the New Guidance (i.e. 'Very Large' and 'Large' has been amalgamated to 'Major' in the DMRB Stage 2 assessment for this project). However, it is considered that employment of the significance categories set out in the New Guidance would not result in a material change to the assessment conducted as part of the DMRB Stage 2 Scheme Assessment Report for this project and that the conclusions reached are valid under the New Guidance.
- 16.2.35 The Preferred Option will be assessed using the New Guidance in DMRB Stage3, A more detailed assessment will give further consideration to potential impacts on the cultural heritage resource.
- 16.2.36 As outlined in the New Guidance, cultural heritage design objectives shall be developed for the project and mitigation measures shall be identified.

Other Assumptions and Limitations

- 16.2.37 While cultural heritage assets within the study areas have been visited during site visits, none of the route options have been subject to a full archaeological walkover survey or any archaeological investigation designed to identify previously unrecorded archaeological sites. The assessment therefore relies on baseline information previously recorded in databases and documentary sources. This methodology is in accordance with DMRB (Volume 11, Section 3, Part 2 HA 208/07 Cultural Heritage) Simple Assessment and a level of investigation expected for DMRB Stage 2 assessment.
- 16.2.38 The desk-based assessment relies in part on data contained in the Aberdeenshire Council HER. The data was acquired in August 2020 and is assumed to have been up to date at that time.
- 16.2.39 Final details of structure design, associated landscape design and final land take are not available at this stage and have therefore not been used to inform this assessment; although key design information set out in Volume 1, Part 2, Engineering Assessment has informed the assessment.
- 16.2.40 This assessment focusses on the permanent effects predicted from the route options. At this stage of the design and assessment process, the exact nature, location and scale of construction activities have not yet been established and it is not possible to assess the impact of these on cultural heritage assets. The cultural heritage baseline will be considered again when planning the detail of construction activities and infrastructure.

16.3 Baseline

- 16.3.1 A summary of the current baseline conditions of each route option is provided in this section.
- 16.3.2 The baseline summaries presented are designed to provide an indication of the nature of the historic landscape and the types of cultural heritage assets found within the respective study areas. The cultural heritage assets discussed are not exhaustive, but the summaries are intended to highlight the key assets within the study areas of each route option.
- 16.3.3 Full lists of cultural heritage assets recorded within the study areas of each route option and the assessment of the predicted effects from the route options are set out in Volume 4b, Appendices A16.1 and A16.3.
- 16.3.4 Numbers in brackets in the following text refer to cultural heritage asset numbers shown on Figures 16.1 to 16.13: Cultural Heritage Assets within 1km (Volume 5) and listed in Volume 4b, Appendix A16.1.

East of Huntly to Colpy

- 16.3.5 The historic landscape character of this area comprises principally of 18th to 19th century enclosed improved farmland with small pockets of rough grazing and occasional areas of modern commercial forestry plantation on higher slopes. Settlement consists principally of scattered farmsteads and villages with the main urban centre being at Huntly.

Cyan Route Option (refer to Appendix A16.1 (Volume 4b) and Figures 16.1 and 16.2: Cultural Heritage Assets within 1km of Cyan Route Option (Volume 5))

- 16.3.6 Within the wider study area (within 1km) for this route option there are 12 cultural heritage assets (summarised in Table 16.4); the majority of these are located at the southern end of the route option, around Colpy:
- Two Scheduled Monuments (SM11511, SM11513);
 - Five Listed Buildings (LB30, LB2960, LB2961, LB2964, LB2965);
 - One Inventory Garden and Designed Landscape (GDL386); and
 - Four Regionally Significant archaeological sites (NJ53NE0009, NJ53NE0012, NJ63SE0022, NJ63SW0045).
- 16.3.7 Four of these cultural heritage assets lie within the detailed study area (within 300m of the route option):
- Scheduled Monument Colpy Palisaded Enclosure (SM11511);
 - Williamston House GDL (GDL386);
 - Regionally Significant Slioch Cropmark Site (NJ53NE0012); and
 - Hill of Tillymorgan, Slate Quarries (NJ63SE0022).
- 16.3.8 Prehistoric settlement is attested by the presence of two Scheduled Monuments: the remains of several hut circles and associated field banks (SM11513) which survive on the south-east facing slope of Hill of Skares; and, the remains of a probable prehistoric enclosure at Colpy (SM11511), to the west of the River Urie.

No upstanding remains of the enclosure survive today, and it is only visible as cropmarks on oblique aerial photographs. These remains indicate that the River Urie valley was a focus for prehistoric activity.

- 16.3.9 Cropmarks of a Regionally Significant archaeological site (NJ53NW0012) have been identified within 300m of the western end of the route option close to Slioch Farm. Little detail is provided in the HER, but this cropmark site is potentially of prehistoric date, and further evidence of prehistoric activity in the area.
- 16.3.10 The Aberdeenshire Council HER records the presence of two Regionally Significant quarries on the Hill of Foudland (NJ63SW0045) and Hill of Tillymorgan (NJ63SE0022). These were established in the 18th century and continued to operate until the late 19th century, reaching their peak output in the mid 18th century. Well-preserved remains of the former slate quarries, including quarry pits, trackways and workers bothies (or shelters) are found, spread across the summit of each hill.
- 16.3.11 Post-medieval settlements along the Glen Water and River Urie valleys are depicted on Gen. W. Roy's 'Military Survey of Scotland' (1747-55) map including 'Colpy' and 'Kirk of Culsamon' (Culsalmond), showing that the area was well settled by the mid 18th century. Category A Listed Culsalmond Church (LB2960), dating to the late 18th century but incorporating an earlier 17th century belfry, stands in a small graveyard to the east of Kirkton of Culsalmond Farm. To the east of the church, at the north-east corner of the graveyard is the 19th century Category C Listed Mort House (LB2961).
- 16.3.12 Williamston House GDL lies east of Colpy and the existing A96 trunk road. The designed garden was originally created in the 1830s by Charles Fraser who constructed Williamston House in 1825. The gardens were inherited by the artist Theodore Haughton in the 1920s and the GDL is designated in recognition of its importance as a rare example of the artist's garden design. The GDL forms the setting of Category B Listed Williamston House (LB2965), Category B Listed Williamston Main Farm (LB2965) and Category C Listed Mill (LB30).

Table 16.4 Number of Cultural Heritage Assets within the Study Areas – Cyan Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	1	2
Category A Listed Building	0	1
Category B Listed Building	0	2
Category C Listed Building	0	2
Inventory Garden and Designed Landscapes	1	1
Inventory Historic Battlefield	0	0
Conservation Area	0	0
Regionally Significant archaeological site	2	4
Non-Inventory Designed Landscapes	0	0

Red Route Option (refer to Appendix A16.1 (Volume 4b) and Figures 16.3 and 16.4: Cultural Heritage Assets within 1km of the Red Route Option (Volume 5))

- 16.3.13 Within the wider study area for this route option (within 1km) there are 11 cultural heritage assets (summarised in Table 16.5); the majority of these are located at the southern end of the route option, around Colpy:
- Two Scheduled Monuments (SM11511, SM11513);
 - Five Listed Buildings (LB30, LB2960, LB2961, LB2964, LB2965);
 - One Inventory Garden and Designed Landscape (GDL386); and
 - Three Regionally Significant archaeological sites (NJ53NE0009 NJ53NE0012, NJ63SW0045).
- 16.3.14 Four of these cultural heritage assets lie within the detailed study area (within 300m of the route option):
- Scheduled Monuments: Colpy Palisaded Enclosure (SM11511);
 - Williamston House GDL (GDL386); and
 - Regionally Significant archaeological sites: Hill of Foudland Slate Quarry (NJ63SW0045) and Slioch Cropmark Site (NJ53NE0012).
- 16.3.15 Prehistoric settlement is attested by the presence of two Scheduled Monuments: Colpy Cottage Palisaded Enclosure (SM11511) and Woodside Hut Circles (SM11513), as previously described in Paragraph 16.3.8.
- 16.3.16 Cropmarks of a Regionally Significant archaeological site (NJ53NW0012), as previously described in Paragraph 16.3.9, have been identified within 300m of the western end of the route option close to Slioch Farm.
- 16.3.17 The Aberdeenshire Council HER records the presence of one Regionally Significant quarry on the Hill of Foudland (NJ63SW0045), as previously described in Paragraph 16.3.10.
- 16.3.18 Post-medieval settlements along the Glen Water and River Urie valleys are described on Gen. W. Roy's 'Military Survey of Scotland' (1747-55) map including 'Colpy' and 'Kirk Of Culsamon' (Culsalmond), showing the study area was well settled by the mid 18th century, including Category A Listed Culsalmond Church (LB2960) and associated Category C Listed Mort House (LB2961), as previously described in Paragraph 16.3.11.
- 16.3.19 Williamston House GDL, as previously described in Paragraph 16.3.12, lies east of Colpy and the existing A96 trunk road.

Table 16.5 Number of Cultural Heritage Assets within the Study Areas - Red Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	1	2
Category A Listed Building	0	1
Category B Listed Building	0	3

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Category C Listed Building	0	1
Inventory Garden and Designed Landscapes	1	1
Inventory Historic Battlefield	0	0
Conservation Area	0	0
Regionally Significant archaeological site	2	3
Non-Inventory Designed Landscapes	0	0

Colpy to Pitcaple

16.3.20 The historic landscape character of this area comprises principally of 18th to 19th century enclosed improved farmland with small pockets of rough grazing, managed woodland (deciduous trees) and 20th century coniferous plantation. Settlement consists principally of scattered farmsteads and small villages/towns, including Inch, Old Rayne, Daviot, Durno and Whitford. Both Inch and Old Rayne have origins in the medieval period, with surviving medieval street plans. Several 17th-20th century designed landscapes, associated with country houses, including Williamston House, Newton House, Freefield House, Logie House and Pitcaple Castle, are present along the lower slopes of the River Urie valley. These comprise formal gardens, parkland and woodland policies which provide some scenic value to the Urie valley. Modern quarry works are present at the eastern end of this area, at Pitscurry.

Pink Route Option (refer to Appendix A16.1 (Volume 4b) and Figures 16.5 and 16.6: Cultural Heritage Assets within 1km of Pink Route Option (Volume 5))

16.3.21 Within the wider study area for this route option (within 1km) there are 25 cultural heritage assets (summarised in Table 16.6); these are principally spread along the eastern slopes and hills of the River Urie valley:

- Seven Scheduled Monuments (SM13, SM83, SM4123, SM12113, SM12137, SM12302, SM12924);
- Nine Listed Buildings (LB30, LB2825, LB16019, LB2962-LB2965, LB16002, LB16003);
- Two Inventory Gardens and Designed Landscapes (GDL300, GDL386);
- Four Regionally Significant archaeological sites (NJ62NE0025, NJ72NW0010, NJ72NW0055, NJ72NW0162); and
- Three Non-Inventory Designed Landscapes (NJ63SE0059, NJ72NW0102, NJ72NW0106).

- 16.3.22 Thirteen of these cultural heritage assets lie within the detailed study area (within 300m of the route option):
- Scheduled Monuments: Durno Roman Camp (SM4123), The Law Cairn (SM12113), Newton of Lewesk Enclosure (SM12137) and Pitscurry Cairn (SM12302);
 - Category B Listed Mill of Bonnyton (LB16002) and The Ploughman's Society Hall (LB16003);
 - Category C Listed Mill House of Williamston (LB30);
 - Newton House GDL (GDL300) and Williamston House GDL (GDL386);
 - The Regionally Significant archaeological sites: Lawfolds Cropmark Site (NJ62NE0025), Glenlogie Cropmark Site (NJ72NW0055) and Ferniebrae, Gilmore Stone (NJ72NW0162); and
 - Freefield House Non-Inventory Designed Landscape (NJ63SE0059).
- 16.3.23 Three prehistoric Scheduled Monuments are present in the study area. These comprise the remains of two burial cairns (SM12302, SM12113), probably dating to the Bronze Age period, and a recumbent stone circle (SM13), potentially of Neolithic date. These monuments are located on the higher hill slopes and summits to the east of the River Urie. Possible prehistoric settlement in this area is also indicated by two cropmark sites (SM12137, NJ62NE0025), visible on aerial photographs west of Durno, and within improved arable farmland to the west of The Law Cairn (SM12113). The first, Newton of Lewesk Enclosure (SM12137), appears to be the buried remains of two rectilinear enclosures; the second, Lawfolds Cropmark Site (NJ62NE0025), is the cropmarks of a third possible enclosure and considered to be Regionally Significant. These heritage sites indicate that the River Urie valley was a focus for prehistoric activity and settlement.
- 16.3.24 Roman activity in the area is indicated by the remains of a Scheduled Monument Roman temporary camp (SM4123), of which no upstanding remains survive, although substantial remains of the camp's defences are visible as cropmarks on aerial photographs to the south-west of Durno, across three small hills on the east bank of the River Urie. Previous excavations of the site have revealed the well-preserved remains of the camp's ditch. It is widely believed that this camp is associated with the site of the battle of Mons Graupius; one of the most significant battles in Scottish and British history, fought around AD83 between the northern British tribes and Agricola's army (HES Scheduled Monument Inventory). Further Roman activity may be indicated by the remains of a Regionally Significant enclosure (NJ72NW0055), visible as cropmarks to the east at Glenlogie, immediately west of the Burn of Durno.
- 16.3.25 Two symbol stones (SM83) now stand within the designed landscape for Newton House (GDL300). Both stones bear early Pictish symbols, including a mirror symbol, notched double-disc over a serpent and a Z-rod. The stones originally stood near to Shevock toll bar and have lost their original landscape setting. Their presence is indicative of Pictish activity in the area. A later inscribed stone (NJ72NW0162) dated to the 19th century is recorded at Ferniebrae. This stone dedicated to Alexander Gilmore, who previously farmed at Ferniebrae, is inscribed with Gilmore's name, the date of '1893' and a bow and arrow symbol associated with a masonic order (Order of the Secret Monitor).

- 16.3.26 Gen. W. Roy's 'Military Survey of Scotland' (1747-55) map depicts villages at 'Inch' (Insch) and 'Old Rain' (Old Rayne) along with several other townships spread along the banks of the River Urie and its tributaries, indicating that the area was well settled by the mid 18th century. The Historic Land-Use map (HLAmap) records that both Insch and Old Rayne have medieval origins and the Aberdeenshire HER records that Old Raynes market cross (Category A Listed, LB16019), dated to the 17th century, still stands within the village.
- 16.3.27 Early medieval settlement at Old Rayne is attested to by the remains of a moated Episcopal manor house (SM12924), which survives as low-relief earthworks, located around 30m east of Old Rayne School. The manor house dates to the later medieval period, with occupation possible from the mid 12th to mid 16th centuries.
- 16.3.28 A second Regionally Significant medieval moated enclosure (NJ72NW0010), at Whiteford, is recorded in the Aberdeenshire HER. Little remains upstanding of this moated site, with the foundations of the building and a portion of the moat having been removed some time before 1867; although fragments of the moat ditch are still visible. While an additional ecclesiastical site, likely to date to the medieval period, is recorded at Logie Durno, just west of Whiteford, where the foundations of a church (Category C Listed, LB2825) stand within a small graveyard. The church is recorded as having been abandoned in 1599.
- 16.3.29 Gen. Roy's 'Military Survey of Scotland' (1747-55) map also shows several small designed landscapes at Newton, Freefield, Pitcaple and Logie. A later (late 18th/19th century) designed landscape is depicted on the Ordnance Survey 1st Edition map (1867) at Williamston. These designed landscapes are associated with castles (Pitcaple Castle) or 17th to 19th century country houses (Newton, Freefield, Logie and Williamston). Two of the designed landscapes, Newton House GDL (GDL300) and Williamston House GDL (GDL386), are included in the Inventory of Gardens and Designed Landscapes and are of national importance.
- Williamston House GDL is designated in recognition of its importance as a rare example of the artist Theodore Haughton's garden design and forms the setting for Category B Listed Williamston House (LB2965), Category B Listed Williamston Main Farm (LB2965) and Category C Listed Mill (LB30).
 - Newton House GDL forms the setting for Category B Listed Newton House (LB2962) and Newton House Walled Garden (LB2963), the walled gardens were laid out by the artist Alec Parkin, which give the designed landscape outstanding value as a Work of Art (Inventory of Gardens and Designed Landscape).
- 16.3.30 The other Non-Inventory Designed Landscapes (Freefield House, Pitcaple Castle and Logie House) are all Regionally Significant assets. They survive in a more fragmentary state than the designed landscapes at Newton and Williamston, but remains of parkland, woodland policies and avenues associated with Category A Listed Pitcaple Castle and Category B Listed Logie House and Freefield House, do survive and provide some scenic value to the surrounding landscape.

Table 16.6 Number of Cultural Heritage Assets within the Study Areas – Pink Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	4	7
Category A Listed Building	0	1
Category B Listed Building	2	6
Category C Listed Building	1	2
Inventory Garden and Designed Landscapes	2	2
Inventory Historic Battlefield	0	0
Conservation Area	0	0
Regionally Significant archaeological site	3	4
Non-Inventory Designed Landscapes	1	3

Brown Route Option (refer to Appendix A16.1 (Volume 4b) and Figures 16.7 and 16.8: Cultural Heritage Assets within 1km of Brown Route Option (Volume 5))

16.3.31 Within the wider study area for this route option (within 1km) there are 38 cultural heritage assets (summarised in Table 16.7); these are principally spread along the eastern slopes and hills of the River Urie valley:

- Eight Scheduled Monuments (SM13, SM66, SM83, SM4123, SM12115, SM12116, SM12302, SM12924);
- 17 Listed Buildings (LB30, LB2825-LB2827, LB2829, LB2856, LB2857, LB2859, LB2860, LB2962-LB2965, LB16019, LB16134, LB16135, LB18983);
- Two Inventory Garden and Designed Landscapes (GDL300, GDL386);
- Six Regionally Significant archaeological sites (NJ62NE0026, NJ72NW0010, NJ72NW0055, NJ72NW0053, NJ72NW0056, NJ72NW0162); and
- Five Non-Inventory Designed Landscapes (NJ62SE0044, NJ62NE0132, NJ62NE0133, NJ72NW0106, NJ72NW0102).

16.3.32 Thirteen of these cultural heritage assets lie within the detailed study area (within 300m of the route option):

- Scheduled Monuments Durno Roman Camp (SM4123) and Pitscurry Cairn (SM12302);
- Category B Listed Logie Durno Churchyard and Burial Enclosure (LB2826) and Pitmachie Farmhouse (LB16135);
- Category C Listed Mill House of Williamston (LB30), Logie Durno Church and Churchyard (LB2825) and Westhall House East Lodge (LB18983);
- Newton House GDL (GDL300) and Williamston House GDL (GDL386);

- Two Regionally Significant archaeological sites: Glenlogie Cropmark Site (NJ72NW0055) and Ferniebrae, Gilmore Stone (NJ72NW0162); and
- Westhall Non-Inventory Designed Landscape (NJ62NE0132) and Logie House Non-Inventory Designed Landscape (NJ72NW0106).

- 16.3.33 Four prehistoric Scheduled Monuments are recorded within the study area, comprising three Bronze Age burial cairns (SM12115, SM12116 and SM12302), all of which stand at the summit of hills overlooking the Urie River valley, and the remains of a recumbent stone circle (SM13), sited within cultivated land just east of Old Rayne. A Regionally Significant prehistoric burial cairn (NJ62NE0026), in the garden of a residential house at Kirkton of Oyne, is also recorded in the Aberdeenshire HER. In addition, a Regionally Significant prehistoric barrow (NJ72NW0053), identified as cropmarks of a ring ditch on aerial photographs, is sited on a north-facing river terrace overlooking the River Urie. These cultural heritage assets indicate that the River Urie valley was a focus for prehistoric activity and settlement.
- 16.3.34 Roman activity in the area is indicated by the remains of a Scheduled Roman temporary camp (SM4123), as previously described in Paragraph 16.3.24. Further Roman activity may be indicated by the remains of a Regionally Significant enclosure (NJ72NW0055), as previously described in Paragraph 16.3.24.
- 16.3.35 Three carved Pictish stones (SM66) now stand within the garden of Logie House. The stones originally stood near to one another on the Moor of Carden, to the east, but were subsequently built into a plantation wall and then eventually moved to their present position. They are inscribed with Pictish symbol stones, including a V-rod symbol, double disc, and crescent with V-rod. Their presence is indicative of Pictish activity in the area. A later inscribed stone (NJ72NW0162) as described previously in Paragraph 16.3.25 is recorded at Ferniebrae.
- 16.3.36 Settlements have been present at Insch and Old Rayne since at least the medieval period (HLAmap) and the Aberdeenshire HER records that Old Raynes market cross (Category A Listed, LB16019), dated to the 17th century, still stands within the village. Earlier settlement at Old Rayne is attested to by the remains of a moated Episcopal manor house (SM12924), as described previously in Paragraph 16.3.27.
- 16.3.37 Further evidence for medieval settlement is recorded at Whiteford, where the low-relief earthworks of a Regionally Significant moated enclosure (NJ72NW0010) survive along with potentially associated cropmarks (NJ72NW0056). Additionally, an ecclesiastical site (LB2825), likely to date to the medieval period, is recorded at Logie Durno just west of Whiteford, as previously described in Paragraph 16.3.28.
- 16.3.38 Gen. Roy's 'Military Survey of Scotland' (1747-55) map shows several small designed landscapes: at Newton, Westhall, Pittodrie, Pitcaple and Logie. While later (late 18th/19th century) designed landscapes are depicted on the Ordnance Survey 1st Edition map (1867) at Williamston and Petmathen. These designed landscapes are associated with castles (Pitcaple Castle) or 17th to 19th century country houses (Newton, Freefield, Westhall, Pittodrie, Logie and Williamston). Two of the designed landscapes, Newton House GDL (GDL300) and Williamston House GDL (GDL386), as previously described in Paragraph 16.3.29, are included in the Inventory of Gardens and Designed Landscapes and are of national importance.
- 16.3.39 The Non-Inventory Designed Landscapes, including Freefield House, Pitcaple Castle, Westhall, Petmathen House, Pittodrie House and Logie House, are all Regionally Significant assets. They survive in a more fragmentary state than the

designed landscapes at Newton and Williamston, but remains of parkland, woodland policies and avenues associated with Category A Listed Pitcaple Castle and Westhall House (LB16134), Category B Listed Logie House (LB2857) and Freefield House, do survive and provide some scenic value to the surrounding landscape.

- 16.3.40 The estate policies at Logie (NJ72NW0053) form the setting not only for Logie House but also for several associated listed buildings, including a Category B Listed 18th century dovecot (LB2860) and walled gardens (LB2859), and a Category C Listed lodge (LB2856). The former country house at Petmathen (NJ62NE0133) was demolished in 1955 and only the designed landscape, that once formed the setting for the house, now survives.

Table 16.7 Number of Cultural Heritage Assets within the Study Areas – Brown Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	2	8
Category A Listed Building	0	2
Category B Listed Building	2	10
Category C Listed Building	3	5
Inventory Garden and Designed Landscapes	2	2
Inventory Historic Battlefield	0	0
Conservation Area	0	0
Regionally Significant archaeological site	2	6
Non-Inventory Designed Landscapes	2	5

Pitcaple to Kintore

- 16.3.41 The historic landscape character of this area comprises principally of 18th to 19th century enclosed rectilinear fields with small pockets of modern commercial forestry plantation located on hill slopes. The main urban centres are at Inverurie and Kintore, concentrated around the River Don, with farmsteads and hamlets spread throughout the surrounding area. The designed landscape of Keith Hall lies to the east of Inverurie and the extensive woodland policies of the designed landscape, contrasting with the surrounding arable farmland, contribute to the character of the local scenery.

Violet Route Option (Appendix A16.1 (Volume 4b) and Figures 16.9 to 16.11: Cultural Heritage Assets within 1km of Violet Route Option (Volume 5))

- 16.3.42 Within the wider study area for this route option (within 1km) there are 54 cultural heritage assets (summarised in Table 16.8); these are principally located in and around Inverurie and Kintore:
- 11 Scheduled Monuments (SM18, SM76, SM92, SM6448, SM7920, SM12302, SM12434, SM12443, SM12465, SM12483, SM90188);

- 20 Listed Buildings (LB2819, LB2820, LB2832, LB6708, LB9135, LB9140, LB9141, LB9152, LB9153, LB13470, LB36310-LB36313, LB36316, LB45610, LB45611, LB45613, LB45614, LB49868);
- One Inventory Garden and Designed Landscape (GDL232);
- Two Inventory Historic Battlefield (BTL11, BTL18);
- 15 Regionally Significant archaeological sites (NJ71NE0014, NJ71NE0055, NJ71NE0059, NJ71NE0061, NJ71NE0070, NJ71NE0110, NJ71NE0112, NJ72NW0052, NJ72NW0055, NJ72SE0001, NJ72SE0003, NJ72SE0042, NJ72SE0043, NJ72SE0045, NJSE0115); and
- Five Non-Inventory Designed Landscapes (NJ71NE0161, NJ72NW0101, NJ72NW0102, NJ72NW0107, NJ72SE0213).

16.3.43 Sixteen of these cultural heritage assets lie within the detailed study area (within 300m of the route option):

- Four Scheduled Monuments: Fullerton Ring Ditches and Cairn Circle (SM7920), Pitscurry Cairn (SM12302), Hill of Selbie Cairn (SM12434) and Deer's Den, Roundhouses (SM12465);
- Category B Listed Cairnhill Hangar (LB13470);
- Category C Listed Road Bridge over Lochter Burn (LB6708) and Bridgend (LB49868);
- Keith Hall GDL (GDL232);
- Battle of Harlaw (BTL11) Inventory Historic Battlefield;
- Five Regionally Significant Sites: Cairnhill Stone Circle (NJ71NE0014), Deers Den Cropmark Site (NJ71NE0055), Fullerton Cottage Cropmark Site (NJ71NE0059), Fullerton Cropmark Site (NJ71NE0070) and Bridgend House Milestone (NJ71NE0112); and
- Legatesden (NJ72NW0107) and Bourtie House (NJ72SE0213) Non-Inventory Designed Landscapes.

16.3.44 Eight prehistoric Scheduled Monuments are recorded within the study area, these comprise both funerary and settlement remains including:

- The earthwork remains of several prehistoric funerary sites, including two burial cairns (SM12302, SM12434), and a cairn circle and cropmarks of several ring ditches (SM7920);
- The earthwork remains of several hut circles at Ratch-hill (SM6448), Hogholm Cottage (SM12443) and Greenlands (SM12483), along with the remains of associated field systems (field banks, clearance cairns) and the remains of at least seven roundhouses (SM12465) at Kintore, visible as cropmarks on aerial photographs; and
- The remains of a Neolithic henge (a ring-shaped bank and ditch possibly associated with rituals or astronomical observations) with associated avenue of stones (SM18) at Broomend.

- 16.3.45 Several Regionally Significant prehistoric remains are recorded in the Aberdeenshire HER. These are principally crop mark sites of likely prehistoric ring ditches or hut circles (NJ71NE0059, NJ71NE0061, NJ71NE0070, NJ71NW0052 and NJ72SE0115), and the remains of a prehistoric stone circle (NJ72SE0001) at West Balhalgardy.
- 16.3.46 These prehistoric remains date from the Neolithic through to the Iron Age period and indicate extensive early to later prehistoric activity and settlement throughout the River Don and River Urie valleys.
- 16.3.47 Roman activity in the study area is indicated by the cropmark remains of a Regionally Significant Roman Camp at Deer's Den (NJ71NE0055), Kintore. Previous excavation at Deer's Den has shown that the camp dates to the Severan period (193-235 AD). Further activity during the Roman period may be indicated by the remains of a Regionally Significant enclosure (NJ72NW0055), thought possibly to be of Roman date, to the east of Glenlogie and immediately west of the Burn of Durno, visible as cropmarks on aerial photographs.
- 16.3.48 One scheduled and one Regionally Significant Pictish symbol stone have been found in the study area: at Kintore (SM76) and East Balhalgardy (NJ72SE0003), respectively. The stone at Kintore (SM76) was dug up in Kintore churchyard in the 19th century and now stands at its entrance. The second stone (NJ72SE0003) has been reused as a window lintel in an old farmhouse at East Balhalgardy Farm. Their presence is indicative of Pictish activity within the area.
- 16.3.49 Recorded settlement at Inverurie dates to the early medieval period, with a motte and bailey castle (now known as The Bass of Inverurie and Little Bass) being constructed sometime in the 11th or 12th century, at the confluence of the River Don and River Urie, just outside the study area. Other medieval buildings in the study area include: a medieval church at Kinkell (SM90188), which has early 13th century origins, but was remodelled in the 16th century and a 14th century tower house (SM92) at Castle Farm, to the south-west of Inverurie. The tower house is believed to have been built by 1361 and relates to the Keith family who were granted land around Kintore in 1309.
- 16.3.50 Two Regionally Significant former medieval settlements (villages) (NJ72SE0043, NJ72SE0045), within the designed landscape of Keith Hall (GDL232), to the west of the River Don, are recorded in the Aberdeenshire HER. The former village at 'Englistoun' is depicted on Gen. Roy's 'Military Survey of Scotland' (1747-55) map, but no trace of the village is visible today. The other village 'Kirkton' is recorded as surrounding an early church (NJ72SE0042); although again, no trace of the church or the village now survive.
- 16.3.51 Two Inventory Historic Battlefields, Battle of Harlaw (BTL11) and Battle of Barra (BTL18) lie within the study area.
- The Battle of Harlaw (BTL11) was fought on 24 July 1411, between the Stewart dynasty, rulers of lowland Scotland, and the Lords of the Isles, the major power in northern Scotland, and is significant as one of the bloodiest medieval battles to take place in Scotland. The general location of the battle, on a relatively flat area of high ground to the north of Inverurie, is well established and the landscape of the battle site is almost unaltered from the time of the battle so that the landscape context of the battle can still be easily understood.
 - The Battle of Barra (BTL18) was fought on the 23 May 1307 between King Robert I (the Bruce) and Comyn, Earl of Buchan. The battle is significant as it

marks the end of any coordinated opposition to King Robert I in Scotland. Accounts of the battle are sparse and offer little detail about the fighting, but the landscape in which the battle took place is still reasonably well-preserved, although there has been a wholesale change in land boundaries and Oldmeldrum has increased in size since the 14th century. Despite the obvious changes, the key characteristics of the terrain at the time of the battle can still be identified enabling events to be understood and interpreted in their landscape context.

- 16.3.52 The village of Kintore expanded in the 18th to 19th century following the introduction of the Aberdeen to Inverurie Canal in the 18th century and the railway in the 19th century. Several 18th and 19th century buildings are present within the study area, located within the built-up area of Kintore, including Category A Listed Kintore Town House (LB36312), Kintore Church (LB36310), Goosecroft House (LB36311), Kintore Arms (LB36313), and Category C Listed Bridgend (LB49868) and Kintore Bridge (LB36316). Two regionally significant milestones (NJNE0110, NJ71NE0112) are also recorded, associated with the Aberdeen to Inverurie Canal.
- 16.3.53 To the east of Inverurie stands Keith Hall, formally Caskieben Castle, which was bought in the 17th century by Sir John Keith. Today Keith Hall stands in a large and extensive designed landscape included in the Inventory of Gardens and Designed Landscapes and is of national importance. The gardens were originally laid out in the 18th century and modified and expanded during the 19th century. The gardens form the setting for Category A Keith Hall, which stands just outside the study area, and several Category B and C Listed buildings, including Farm Cottages (LB45613), North Lodge (LB45610), East Lodge (LB45611), North Drive Road Bridge (LB45614) and Kinkell Parish Church (LB9135). The designed landscape comprises areas of parkland surrounded by woodland policies, walled gardens and an avenue running south from Keith Hall.
- 16.3.54 Other 17th to 19th century country houses recorded in the study area include: Category A Listed Bourtie House (LB2819); and Balbithan House (LB9140), both situated in farmland to the west of Inverurie. Bourtie House stands in a small Non-Inventory Designed Landscape (NJ72SE0213), comprising of small areas of parkland and woodland policies which forms the setting for the house and its Category B Listed garden cottage (LB2820). In addition to the designed landscape at Bourtie, four other Non-Inventory Designed Landscapes within the study area are recorded in the Aberdeenshire HER. These are associated with Thainstone House (NJ71NE0161), House of Daviot (NJ72NW0101), Pitcaple Castle (NJ72NW0102) and Legatesden (NJ72NW01017). These designed landscapes survive in a more fragmentary state than the Inventory Garden and Designed Landscape at Keith Hall, but remains of parkland, woodland policies and avenues do survive and provide some scenic value to the surrounding landscape.

Table 16.8 Number of Cultural Heritage Assets within the Study Areas – Violet Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	4	11
Category A Listed Building	0	3
Category B Listed Building	1	11
Category C Listed Building	2	6

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Inventory Garden and Designed Landscapes	1	1
Inventory Historic Battlefield	1	2
Conservation Area	0	0
Regionally Significant archaeological site	5	15
Non-Inventory Designed Landscapes	2	5

Orange Route Option (refer to Appendix A16.1 (Volume 4b) and Figures 16.12 and 16.13: Cultural Heritage Assets within 1km of Orange Route Option (Volume 5))

16.3.55 Within the wider study area for this route option (within 1km) there are 56 cultural heritage assets (summarised in Table 16.9); these are principally located in and around Inverurie and Kintore:

- 15 Scheduled Monuments (SM18, SM70, SM74, SM76, SM90, SM99, SM3961, SM6448, SM7920, SM12110, SM12118, SM12195, SM12302, SM12523, SM90188);
- 19 Listed Buildings (LB2788-LB2792, LB2830, LB2850, LB2851, LB9075, LB9076, LB9152, LB9153, LB13470, LB35408, LB36310-LB36313, LB49868);
- One Inventory Garden and Designed Landscape (GDL232);
- One Inventory Historic Battlefield (BTL11);
- 15 Regionally Significant archaeological sites (NJ71NE0014, NJ71NE0055, NJ71NE0059, NJ71NE0070, NJ71NE0112, NJ72NW0052, NJ72NW0055, NJ72NW0056, NJ72SE020, NJ72SE0038, NJ72SE0048, NJ72SE0100, NJ72SE0101, NJ72SW008, NJ72SW0040); and,
- Five Non-Inventory Designed Landscapes (NJ71NE0161, NJ71NW0205, NJ72NW0101, NJ72NW0102, NJ72NW0107).

16.3.56 Twenty-six of these cultural heritage assets lie within the detailed study area (within 300m of the route option):

- Nine Scheduled Monuments: Broomend Henge (SM18), Drimmies Symbol Stone (SM70), Balquhain Castle (SM90), Mains of Balquhain Stone Circle (SM3961), Fullerton Ring Ditches and Cairn Circle (SM7920), St Apolinaris' Chapel (SM12118), Dillyhill Enclosure (SM12195), Pitcurry Cairn (SM12302) and Bruce's Camp (SM12523);
- Four Category B Listed Buildings: Inveramsay Bridge (LB2850), Thainstone House (LB9152), Thainstone Lodge (LB9153), Cairnhall Hangar (LB13470);
- Battle of Harlaw (BTL11) Inventory Historic Battlefield;
- Seven Regionally Significant archaeological sites: Cairnhill Stone Circle (NJ71NE0014), Fullerton Cottage Cropmark Site (NJ71NE0059), Fullerton Cropmark Site (NJ71NE0070), Mill of Pitcaple, Cropmark Site (NJ72NW0052),

Dillyhill, Cairn (NJ72SE0020), Old Hall of Ardtannes (NJ72SE0038), Dilly Hill Cropmark Site (NJ72SW0040); and,

- Thainstone House (NJ71NE0161), Manar House (NJ71NW205), House of Daviot (NJ72NW0101), Pitcaple Castle (NJ72NW0102) and Legatesden (NJ72NW0107) Non-Inventory Designed Landscapes.

16.3.57 Eight prehistoric Scheduled Monuments are recorded within the study area, these comprise both funerary and settlement remains including:

- The remains of a recumbent stone circle at Mains of Balquhain (SM3961), a single standing stone (SM12110) at East Blairbowie, a prehistoric burial cairn (SM12302) at Pitscurry, standing on the summit of a unnamed hill, the remains of a Neolithic henge (a ring shaped bank and ditch possibly associated with rituals or astronomical observations) with associated avenue of stones (SM18) at Broomend, and the earthwork remains of a cairn circle along with cropmarks of several potentially associated ring ditches (SM7920) at Fullerton; and
- The earthwork remains of a large hillfort (Bruce's Camp) (SM12523) at the summit of Shaw Hill to the south of Inverurie and several hut circles at Ratch-hill (SM6448), and a prehistoric circular enclosure visible as a cropmark at Dillyhill (SM12195).

16.3.58 Several Regionally Significant prehistoric remains are recorded in the Aberdeenshire HER. Most of these are cropmark sites of likely prehistoric ring ditches or hut circles (NJ71NE0059, NJ71NE0070, NJ72SE0100, NJ72SW0040), although the upstanding remains of a stone circle (NJ71NE0014) and the remains of a possible cairn (NJ72SE0020) are also recorded. Little of the stone circle remains apart from one stone standing in a contractor's yard and the prehistoric cairn is now overlain by a modern memorial cairn.

16.3.59 These prehistoric remains date from the Neolithic through to the Iron Age and indicate extensive early to later prehistoric activity and settlement throughout the River Don and River Urie valleys.

16.3.60 Earlier (Mesolithic) prehistoric activity in the study area is also suggested by the discovery of a Regionally Significant flint knapping site (NJ72SE0048) at Ardtannes, just north of the River Don.

16.3.61 Roman activity in the study area is indicated by the cropmark remains of a Regionally Significant Roman Camp at Deer's Den (NJ71NE0055), Kintore, as previously described in Paragraph 16.3.47. Further activity during the Roman period may be indicated by the remains of a Regionally Significant enclosure (NJ72NW0055), as previously described in Paragraph 16.3.47.

16.3.62 Three scheduled Pictish symbol stone sites are recorded in the study area: at Drimmies (SM70), Inverurie Cemetery (SM74) and Kintore Church (SM76). The symbol stone at Drimmies is built into a garden wall of the farm, while the symbol stones that now stand in Inverurie Cemetery were once built into the wall of the former church, and the symbol stone at Kintore was recovered from the churchyard in 1854 and now stands just inside the gateway to the churchyard. Their presence is indicative of Pictish activity within the area. Further Pictish activity within the River Urie valley is indicated by a Regionally Significant cropmark site of a possible medieval barrow cemetery (NJ72SE0101), recorded in the Aberdeenshire HER at West Balhalgady.

- 16.3.63 Recorded settlement at Inverurie dates to the early medieval period with a motte and bailey castle (now known as The Bass of Inverurie and Little Bass) (SM99), being constructed sometime in the 11th or 12th century, at the confluence of the River Don and River Urie. Other medieval buildings recorded in the study area include: a medieval church at Kinkell (SM90188), which has early 13th century origins, but was remodelled in the 16th century; the remains of an early medieval (pre-13th century) St Apolinaris' Chapel (SM12118), sited on the bank of the River Don; the remains of a later medieval tower house at Balquhain (SM90); and a Category A Listed late 15th century castle at Pitcaple (LB2830).
- 16.3.64 The site of a Regionally Significant medieval hall at Ardtannes (NJ72SE0038), sited in a pasture field just north of the River Don, is recorded in the Aberdeenshire HER. No earthwork remains of the hall now survive, but the remains of a draw well, which may have been associated with the hall, were found underneath a platform of black oak logs during ground works in the area.
- 16.3.65 One Inventory Historic Battlefield, Battle of Harlaw (BTL11) lies within the study area, as previously described in Paragraph 16.3.51.
- 16.3.66 During the 18th and 19th centuries Inverurie and Kintore expanded following the introduction of the Aberdeen to Inverurie Canal in the 18th century and the railway in the 19th century. Several 18th and 19th century buildings and other structures of this period are present within the study area, including two Category B Listed bridges (LB2850, LB35407), Harlaw House (LB2851), and canal infrastructure features (LB35408, NJ71NE0122). Those located within the built-up area of Kintore itself, including Category A Listed Kintore Town House (LB36312), Kintore Church (LB36310), Goosecroft House (LB36311) and Kintore Arms (LB36313).
- 16.3.67 To the east of Inverurie stands Keith Hall, formally Caskieben Castle, as previously described in Paragraph 16.3.53. The gardens form the setting for Category A Keith Hall, which stands just outside the study area, and several Category B and C Listed buildings, including the South Lodge (LB35407). The designed landscape comprises areas of parkland surrounded by woodland policies, walled gardens and an avenue running south from Keith Hall.
- 16.3.68 Other Non-Inventory Designed Landscapes are recorded in the study area, including Thainstone House (NJ71NE0161), Manar House (NJ71NW205), House of Daviot (NJ72NW0101), Pitcaple Castle (NJ72NW0102) and Legatesden (NJ72NW0107). These date from the 17th century to the 19th century and include areas of parkland, woodland policies and avenues, providing some scenic value to the surrounding landscape. Associated listed buildings that form part of these designed landscapes are also present in the study area, including Category B Listed Old House of Glack (LB2790) and associated House of Daviot (LB2792), Category B Listed Manar Home Farm (LB9075) and associated lodge (LB9076), and Category B Listed Thainstone House (LB9152) and its associated lodge (LB9153).

Table 16.9 Number of Cultural Heritage Assets within the Study Areas - Orange Route Option

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Scheduled Monuments	9	15
Category A Listed Building	0	2
Category B Listed Building	4	11

Cultural Heritage Assets	Number within Study Area	
	300m study area	1km study area
Category C Listed Building	0	6
Inventory Garden and Designed Landscapes	0	1
Inventory Historic Battlefield	1	1
Conservation Area	0	0
Regionally Significant archaeological site	7	15
Non-Inventory Designed Landscapes	5	5

Summary

- 16.3.69 Appendix A16.2, Summary of the Number of Cultural Heritage Assets Identified within Each Route Option (Volume 4b) provides a summary of the number of cultural heritage assets identified within the respective study areas for each route option.

16.4 Potential Impacts

- 16.4.1 The assessments of potential construction (direct) impacts and impacts on settings have been carried out with reference to the route options layouts and the cultural heritage assets shown on Figures 16.1 to 16.13 (Volume 5).

Direct Impacts

- 16.4.2 Direct impacts on cultural heritage assets are most likely to arise from any ground disturbing activities associated with the route options that could potentially damage, and possibly destroy, cultural heritage assets, including buried archaeological remains. The route options have the potential to directly affect archaeological sites and historic landscape features where construction work or activities are to take place within the known and demarcated extents of sites.

Impacts on Setting

- 16.4.3 The construction and presence of the route options may adversely affect the setting of cultural heritage assets in their vicinity. Impacts affecting the settings of cultural heritage assets can occur both during the construction phase (short term and temporary) and throughout the operational phase (permanent impacts). Short term and temporary effects arising from construction works would have no lasting, permanent impact on the settings of cultural heritage assets and are not assessed further.
- 16.4.4 Final details of structure design, associated landscape design and final land take are not available at this stage and have therefore not been assessed.
- 16.4.5 Tabulated summaries of the potential impacts on individual cultural heritage assets from the route options are provided in Volume 4b, Appendix A16.3: Potential Impacts on Cultural Heritage Assets and summarised in Tables 16.10-16.12. Effects that are 'significant' (effects of moderate or major significance) are highlighted in bold in Volume 4b, Appendix A16.3: Potential Impacts on Cultural Heritage Assets.

East of Huntly to Colpy

Cyan Route Option (refer to Appendix A16.3 (Volume 4b); Figures 16.1-16.2 (Volume 5) and Table 16.10)

Direct Impacts

16.4.6 There are no predicted direct impacts from the Cyan route option.

Impacts on Setting

16.4.7 It is considered that the introduction of the Cyan route option would potentially result in impacts on the setting of 11 cultural heritage assets:

- Two Scheduled Monuments (SM11511, SM11513);
- One Category A Listed Building (LB2960);
- One Category B Listed Building (LB2964);
- Two Category C Listed Buildings (LB30, LB2961);
- One Inventory Garden and Designed Landscape (GDL386); and
- Four Regionally Significant HER Sites (NJ53NE0009, NJ53NE0012, NJSE0022, NJ63SW0045).

16.4.8 A potential significant effect has been predicted on the setting of Colpy Cottage Palisaded Enclosure (SM11511), an asset of high sensitivity; an impact of moderate magnitude resulting in an effect of major significance. The impact on the setting of this monument would result from the proximity of the route option to the Scheduled Monument, with infrastructure encircling the monument and separating it from its surroundings.

16.4.9 All the other impacts are of no more than minor magnitude and not significant.

Red Route Option (refer to Appendix A16.3 (Volume 4b); Figures 16.3-16.4 (Volume 5) and Table 16.10)

Direct Impacts

16.4.10 One potential direct impact is predicted on Regionally Significant Foudland Slate Quarries (NJ63SW0045), an asset of medium sensitivity, from the Red route option.

16.4.11 The route option clips the eastern edge of Foudland Slate Quarries (NJ63SW0045), the site comprises the remains of 18th century slate quarries including small quarry pits, associated trackways and several small bothies (or shelters). Construction works along the route option would potentially result in the loss of a part of the slate quarry workings and the predicted impact on the quarry site is one of moderate magnitude resulting in an effect of moderate significance.

Impacts on Setting

16.4.12 It is considered that the introduction of the Red route option would potentially result in impacts on the setting of ten cultural heritage assets:

- Two Scheduled Monuments (SM11511, SM11513);

- One Category A Listed Building (LB2960);
- One Category B Listed Building (LB2964);
- Two Category C Listed Buildings (LB30, LB2961);
- One Inventory Garden and Designed Landscape (GDL386); and
- Three Regionally Significant HER Sites (NJ53NE0009, NJ53NE0012, NJ63SW0045).

16.4.13 A potential significant effect has been predicted on the setting of Regionally Significant Foudland Slate Quarries (NJ63SW0045), an asset of medium sensitivity; an impact of moderate magnitude resulting in an effect of moderate significance. The route option would potentially result in the loss of part of the quarry workings, affecting the overall character and integrity of the site.

16.4.14 All the other impacts are considered to be of no more than minor magnitude and not significant.

Table 16.10 Potential Impacts: East of Huntly to Colpy (Cyan and Red Route Options)

Potential Impacts	Adverse/ Beneficial	Impact Magnitude		Potentially Significant	
		Cyan Route Option	Red Route Option	Cyan Route Option	Red Route Option
Potential impacts on the setting of High sensitivity Scheduled Monuments	Adverse	Minor – Major	Minor	✓	x
Potential impacts on the setting of High sensitivity Category A Listed Buildings	Adverse	Minor	Minor	x	x
Potential impacts on the setting of Medium sensitivity Category B Listed Buildings	Adverse	No change – Minor	No change – Minor	x	x
Potential impacts on the setting of Low sensitivity Category C Listed Buildings	Adverse	Minor	Minor	x	x
Potential impacts on the setting of High sensitivity Inventory Gardens and Designed Landscapes	Adverse	Minor	Minor	x	x
Potential direct impacts on Medium sensitivity Regionally Significant SMR Sites	Adverse	n/a	Moderate	x	✓
Potential impacts on the setting of Medium sensitivity Regionally Significant SMR Sites	Adverse	Negligible - Minor	Negligible - Moderate	x	✓

Colpy to Pitcaple

Pink Route Option (refer to Appendix A16.3 (Volume 4b); Figures 16.5-16.6 (Volume 5) and Table 16.11)

Direct Impacts

- 16.4.15 One potential direct impact is predicted on Regionally Significant Lawfolds Cropmark Site (NJ62NE0025), an asset of medium sensitivity, from the Pink route option. The route option crosses the cropmark site which comprises the remains of a prehistoric ring ditch visible as cropmarks on aerial photographs. Construction works along the route option would result in the loss of the ring ditch and the predicted impact on the cropmark site is one of major magnitude resulting in an effect of major significance.

Impacts on Setting

- 16.4.16 It is considered that the introduction of the Pink route option would potentially result in impacts on the setting of 15 cultural heritage assets:
- Six Scheduled Monuments (SM13, SM4123, SM12113, SM12137, SM12302, SM12924);
 - Four Category B Listed Buildings (LB2962, LB2964, LB16002, LB16003);
 - One Category C Listed Building (LB30);
 - Two Inventory Garden and Designed Landscape (GDL300, GDL386);
 - One Regionally Significant HER Sites (NJ72NW0055); and
 - One Non-Inventory Designed Landscape (NJ63SE0059).
- 16.4.17 Potential significant effects have been predicted on the setting of four Scheduled Monuments, of high sensitivity:
- Durno Roman Camp (SM4123);
 - The Law Cairn (SM12113);
 - Newton of Lewesk Enclosure (SM12137); and
 - Pitscurry Cairn (SM12302).
- 16.4.18 Each impact is of moderate magnitude, resulting in effects of moderate significance. The impact on the settings of these monuments is a result of the proximity of the route option to the monuments and the impact of the route option on key views to and from each monument.
- 16.4.19 All other impacts are of no more than minor magnitude and not significant.

Brown Route Option (refer to Appendix A16.3 (Volume 4b); Figures 16.7-16.8 (Volume 5) and Table 16.11)

Direct Impacts

- 16.4.20 One potential direct impact is predicted on Logie House Non-inventory Designed Landscape (NJ72NW0106), an asset of medium sensitivity, from the Brown route option.
- 16.4.21 The route option crosses the northern edge of Logie House Non-Inventory Designed Landscape (NJ72NW0106), truncating the northern end of the designed landscape and affecting the integrity of the designed landscape. On this basis, it is considered that the impact of the route option on the Non-Inventory Designed Landscape would result in an effect of moderate significance.

Impacts on Setting

- 16.4.22 It is considered that the introduction of the Brown route option would potentially result in impacts on the setting of 16 cultural heritage assets:
- Three Scheduled Monuments (SM4123, SM12115, SM12302);
 - Four Category B Listed Buildings (LB2862, LB2962, LB2964, LB16135);
 - Three Category C Listed Buildings (LB30, LB2825, LB18983);
 - Two Inventory Gardens and Designed Landscapes (GDL300, GDL386);
 - Two Regionally Significant sites (NJ72NW0055, NJ72NW0162); and
 - Two Non-Inventory Designed Landscapes, Westhall (NJ72NE0132) and Logie House (NJ72NW106).
- 16.4.23 Potential significant effects have been predicted on the settings of:
- Two Scheduled Monuments: Durno Roman Camp (SM4123) and Pitscurry Cairn (SM12302), assets of high sensitivity; and
 - One Non-Inventory Designed Landscape, Logie House (NJ72NW106); an asset of medium sensitivity.
- 16.4.24 Each impact is of moderate magnitude, resulting in effects of moderate significance. The impact on the settings of Durno Roman Camp (SM4123) and Pitscurry Cairn (SM12302) is a result of the proximity of the route option to the monuments and the impact of the route option on key views to and from each monument. The impact on Non-inventory Designed Landscape Logie House (NJ72NW106) would result from the route option bisecting the woodland and the farmland that make up the northern part of the site, thereby affecting its overall character and integrity.
- 16.4.25 All other impacts are no more than of minor magnitude and not significant.

Table 16.11 Potential Impacts: Colpy to Pitcapple (Pink and Brown Route Options)

Potential Impacts	Adverse/ Beneficial	Impact Magnitude		Potentially Significant	
		Pink Route Option	Brown Route Option	Pink Route Option	Brown Route Option
Potential impacts on the setting of High sensitivity Scheduled Monuments	Adverse	No change – Moderate	No change - Moderate	✓	✓
Potential impacts on the setting of High sensitivity Category A Listed Building	Adverse	No change	No change	x	x
Potential impacts on the setting of Medium sensitivity Category B Listed Buildings	Adverse	No change – Minor	No change – Minor	x	x
Potential impacts on the setting of Low sensitivity Category C Listed Buildings	Adverse	No change - Minor	No change - Minor	x	x
Potential impacts on the setting of High sensitivity Inventory Gardens and Designed Landscapes	Adverse	Minor	Minor	x	x
Potential direct impacts on Medium sensitivity Regionally Significant HER Sites	Adverse	Major	n/a	✓	x
Potential impacts on the setting of Medium sensitivity Regionally Significant HER Sites	Adverse	No change – Minor	No change - Minor	x	x
Potential direct impacts on Medium sensitivity Non-Inventory Designed Landscapes	Adverse	n/a	Moderate	x	✓
Potential impacts on the setting of Medium sensitivity Non-Inventory Designed Landscapes	Adverse	No change - Minor	No change - Moderate	x	✓

Pitcaple to Kintore

Violet Route Option (refer to Appendix A16. 3 (Volume 4b); Figures 16.9-16.11 (Volume 5) and Table 16.12)

Direct Impacts

16.4.26 There are no predicted direct impacts from the Violet route option.

Impacts on Setting

16.4.27 It is considered that the introduction of the Violet route option would potentially result in impacts on the setting of 30 cultural heritage assets:

- Five Scheduled Monuments (SM7920, SM12302, SM12434, SM12443, SM90188);
- Two Category A Listed Buildings (LB2819, LB9140);
- Five Category B Listed Buildings (LB2832, LB9135, LB9141, LB13470, LB36316);
- Six Category C Listed Buildings (LB6708, LB45610-LB45611, LB45613-LB45614, LB49868);
- One Inventory Garden and Designed Landscape (GDL232);
- Two Inventory Historic Battlefield (BTL11, BTL18),
- Seven Regionally Significant sites (NJ71NE0014, NJ71NE0055, NJ71NE0061, NJ72NW0055, NJ72SE0001, NJ72SE0045, NJ72SE0115); and
- Two Non-Inventory Designed Landscape (NJ72SE0213, NJ72NW0107).

16.4.28 Potential significant effects have been predicted on the settings of:

- One Scheduled Monument Pitscurry Cairn (SM12302), an asset of high sensitivity;
- One Category A Listed Building, Bourtie House (LB2819), an asset of high sensitivity; and
- One Non-Inventory Designed Landscape, Bourtie House (NJ72SE0213), an asset of medium sensitivity.

16.4.29 Each impact is of moderate magnitude resulting in effects of moderate significance. The impact on the setting of the Scheduled Monument (SM12302) would result from the proximity of the route option to the monument. The impact on the setting of Category A Listed Bourtie House (LB2819) and associated Non-Inventory Designed Landscape (NJ72SE0213) would result from the route option (embankment) being visible in key views to the south-west from Bourtie House and from within the designed landscape.

16.4.30 All other impacts are of no more than minor magnitude and not significant.

Orange Route Option (refer to Appendix A16.3 (Volume 4b); Figures 16.12-16.13 (Volume 5) and Table 16.12)

Direct Impacts

- 16.4.31 Two potential direct impacts are predicted on Regionally Significant Mill of Pitcaple Cropmark Site (NJ72NW0052) and Thainstone House Non-Inventory Designed Landscape (NJ71NE0161), both assets of medium sensitivity.
- 16.4.32 The Orange route option crosses Regionally Significant Mill of Pitcaple Cropmark Site (NJ72NW0052); this site comprises the remains of a possible prehistoric enclosure visible as cropmarks on aerial photographs. Construction works for the route option would result in the loss of the enclosure and any associated buried remains and the predicted impact on the cropmark site is one of major magnitude resulting in an effect of major significance.
- 16.4.33 The route option would cross the eastern edge of Thainstone House Non-Inventory Designed Landscape (NJ71NE0161), truncating the eastern edge of the designed landscape. The core of the designed landscape would not be affected, although the eastern edge (woodland) of the designed landscape and the entrance/approach road to Thainstone House would be affected. On this basis, it is considered that the impact of the route option on the designed landscape would result in an effect of moderate significance.

Impacts on Setting

- 16.4.34 It is considered that the introduction of the Orange route option would potentially result in impacts on the setting of 33 cultural heritage assets:
- Ten Scheduled Monuments (SM18, SM70, SM90, SM99, SM3961, SM12118, SM12195, SM12302, SM12523, SM90188);
 - One Category A Listed Building (LB2830);
 - Four Category B Listed Buildings (LB2850, LB9075, LB9152, LB9153);
 - One Category C Listed Building (LB2851);
 - One Inventory Garden and Designed Landscape (GDL232);
 - One Inventory Historic Battlefield (BTL11);
 - Ten Regionally Significant sites (NJ71NE0059, NJ71NE0070, NJ72NW0055, NJ72SE0020, NJ72SE0038, NJ72SE0048, NJ72SE0100, NJ72SE0101, NJ72SW0008, NJ72SW0040); and
 - Five Non-Inventory Designed Landscapes (NJ71NE0161, NJ71NW0205, NJ72NW0101, NJ72NW0102, NJ72NW0107).
- 16.4.35 Potential significant effects have been predicted on the settings of:
- Six Scheduled Monuments Balquhain Castle (SM90), Mains of Balquhain Stone Circle (SM3961), St Apolinaris' Chapel and Burial Ground (SM12118), Dillyhill Enclosure (SM12195), Pitcurry Cairn (SM12302), Bruce's Camp Hillfort (SM12523), assets of high sensitivity;
 - One Category B Listed Building, Thainstone House (LB9152), an asset of medium sensitivity; and

- One Non-Inventory Designed Landscape, Thainstone House (NJ71NE0161), an asset of medium sensitivity.

- 16.4.36 The impacts on Mains of Balquhain Stone Circle (SM3961) and St Apolinaris' Chapel and Burial Ground (SM12118), both assets of high sensitivity, are of major magnitude resulting in effects of major significance. The impact on the Scheduled Monument Mains of Balquhain Stone Circle (SM3961) is a result of the close proximity of the route option to the monument and the presence of infrastructure (proposed junction) that would be visible in key views to and from the monument. The impact on the Scheduled Monument St Apolinaris Chapel and Burial Ground (SM12118) would result from the close proximity of a proposed bridge crossing the River Don, to the west of the monument, which would appreciably alter the character of the river valley setting in which the chapel stands.
- 16.4.37 The impacts on the other monuments (SM90, SM12195, SM12302, SM12523, LB9152, NJ71NE0161) are of moderate magnitude resulting in effects of moderate significance. The impact on the settings of the Scheduled Monuments would result from the proximity of the route option to these monuments and from impacts on the views to and from the monuments. The impact on Category B Listed Thainstone House (LB9152) and its Non-Inventory Designed Landscape (NJ71NE0161) would result from the route option (embankment) severing the approach drive to the House and directly affecting the woodland that makes up the eastern part of the site, thereby appreciably altering the character of the Non-Inventory Designed Landscape and the landscape surroundings of the House.
- 16.4.38 All other impacts are of no more than minor magnitude and not significant.

Table 16.12 Potential Impacts: Pitcaple to Kintore (Violet and Orange Route Options)

Potential Impacts	Adverse/ Beneficial	Impact Magnitude		Potentially Significant	
		Violet Route Option	Orange Route Option	Violet Route Option	Orange Route Option
Potential impacts on the setting of High sensitivity Scheduled Monuments	Adverse	No change – Moderate	No change - Major	✓	✓
Potential impacts on the setting of High sensitivity Category A Listed Buildings	Adverse	No change – Moderate	No change - Negligible	✓	x
Potential impacts on the setting of Medium sensitivity Category B Listed Buildings	Adverse	No change – Minor	No change - Moderate	x	✓
Potential impacts on the setting of Low sensitivity Category C Listed Buildings	Adverse	Negligible - Moderate	No change - Negligible	x	x
Potential impacts on the setting of High sensitivity Inventory Gardens and Designed Landscapes	Adverse	Minor	Negligible	x	x
Potential impacts on the setting of High sensitivity Inventory Battlefields	Adverse	Minor	Minor	x	x
Potential direct impacts on Medium sensitivity Regionally Significant HER Sites	Adverse	n/a	Major	x	✓
Potential impacts on the setting of Medium sensitivity Regionally Significant HER Sites	Adverse	No change – Minor	Mo change - Minor	x	✓
Potential direct impacts on Medium sensitivity Non-Inventory Designed Landscapes	Adverse	n/a	Moderate	x	✓
Potential impacts on the setting of Medium sensitivity Non-Inventory Designed Landscapes	Adverse	No change – Moderate	Negligible - Moderate	✓	✓

16.5 Mitigation

16.5.1 It is assumed that best practice will be followed during construction of the Preferred Option and committed mitigation measures from the cultural heritage assessment will be implemented in the works. The design of the Preferred Option will be assessed and where possible further developed in order to minimise impact on cultural heritage and more specific mitigation will be developed for the Preferred Option during DMRB Stage 3.

16.5.2 The following embedded mitigation/best practice measures (CH1 - CH9) have been identified as part of this DMRB Stage 2 assessment:

- CH1: Cultural heritage assets impacted by the scheme will be recorded in their present state prior to development through completion of an archaeological walkover survey;
- CH2: Archaeological remains that lie near the scheme will be marked-off for the duration of the construction works to avoid accidental damage;
- CH3: Where appropriate, the scheme will be designed to preserve archaeology in situ (for example retaining buried archaeological remains under earthwork bunds);
- CH4: Where appropriate, archaeology remains (upstanding and buried) predicted to be directly affected by the scheme will be subject to a programme of archaeological investigation to ensure preservation by record;
- CH5: If historic buildings or designed landscape features are directly affected, these will be recorded through a programme of survey and recording, involving photographic or measured surveys, as required;
- CH6: Improved public access, amenity and interpretation (for example interpretation boards, archaeological trails, Quick Response Codes) of cultural heritage assets, where appropriate, to promote awareness of heritage sites and provide information on the preserved archaeological remains;
- CH7: Landscaping and screening will be put into place, where appropriate, to reduce the visual impact on cultural heritage assets affected. Such screening may include new woodland planting or hedgerows (trees and shrubs) planting;
- CH8: Noise mitigation measures or acoustic screening will be included in the design to reduced impacts on the setting of cultural heritage assets, where appropriate; and
- CH9: Low-level, directional street lighting will be used to reduce light spill, to reduce effects on the setting of cultural heritage assets, where appropriate.

16.6 Predicted Environmental Effects

- 16.6.1 This section presents the key predicted environmental effects of the route options on cultural heritage. Predicted effects have been assessed prior to mitigation and the residual effects then evaluated following mitigation (set out in Section 16.5).
- 16.6.2 Tables 16.13 to 16.18 summarise the predicted 'significant' effects (i.e. effects of moderate or major significance) prior to mitigation, along with proposed mitigation and the predicted residual effects.
- 16.6.3 It should be noted that mitigation measures may not always be enough to reduce the overall significance category for the predicted residual effects.
- 16.6.4 Residual effects that are predicted to remain 'significant' are highlighted in bold.

Table 16.13 Predicted ‘Significant’ Cultural Heritage Effects - Cyan Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	Permanent impact on setting of monument due to proximity of route option: Colpy Cottage Palisaded Enclosure (SM11511)	Major adverse	None applicable	Major adverse residual effect

Table 16.14 Predicted ‘Significant’ Cultural Heritage Effects - Red Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Regionally Significant HER Sites	Permanent loss of aspects of the historical quarry site: Foudland Slate Quarries (NJ63SW0045)	Moderate adverse	CH1; CH2; CH3; CH4	Minor adverse residual effect
	Permanent impact on setting of monument due to proximity of route option: Foudland Slate Quarries (NJ63SW0045)	Moderate adverse	CH1; CH6; CH7	Moderate adverse residual effect

Table 16.15 Predicted 'Significant' Cultural Heritage Effects - Pink Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	<ul style="list-style-type: none"> Permanent impact on setting of monument due to proximity of route option: Durno Roman Camp (SM4123) Permanent impact on setting of monument due to proximity of route option: The Law Cairn (SM12113) Permanent impact on setting of monument due to proximity of route option: Newton of Lewesk Enclosure (SM12137) Permanent impact on setting of monument due to proximity of route option: Pitscurry Cairn (SM12302) 	Moderate adverse	CH6; CH7; CH8	Moderate adverse residual effect
Regionally Significant HER Sites	Permanent loss of aspects of the cropmark site: Lawfolds Cropmark Site (NJ62NE0025)	Major adverse	CH3; CH4	Minor adverse residual effect

Table 16.16 Predicted 'Significant' Cultural Heritage Effects - Brown Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	<ul style="list-style-type: none"> Permanent impact on setting of monument due to proximity of route option: Durno Roman Camp (SM4123) Permanent impact on setting of monument due to proximity of route option: Pitscurry Cairn (SM12302) 	Moderate adverse	CH6; CH7; CH8	Moderate adverse residual effect
	Permanent loss of aspects of Non-Inventory Designed Landscape: Logie House (NJ72NW0106)	Moderate adverse	CH1; CH5	Moderate adverse residual effect

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Non-Inventory Designed Landscapes	Permanent impact on setting of Non-Inventory Designed Landscape: Logie House (NJ72NW0106)	Moderate adverse	CH7; CH8; CH9	Moderate adverse residual effect

Table 16.17 Predicted ‘Significant’ Cultural Heritage Effects - Violet Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	Permanent impact on setting of monument due to proximity of route option: Pitscurry Cairn	Moderate adverse	CH6; CH7; CH8	Moderate adverse residual effect
Category A Listed Buildings	Permanent impact on setting of Listed Building due to proximity of route option: Bourtie House (LB2819)	Moderate adverse	CH7; CH8; CH9	Moderate adverse residual effect
Non-Inventory Designed Landscapes	Permanent impact on setting of Non-Inventory Designed Landscape due to proximity of route option: Bourtie House (NJ72SE0213)	Moderate adverse	CH7; CH8; CH9	Moderate adverse residual effect

Table 16.18 Predicted ‘Significant’ Cultural Heritage Effects - Orange Route Option

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	<ul style="list-style-type: none"> Permanent impact on setting of monument due to proximity of route option: Mains of Balquhain Stone Circle (SM3961) Permanent impact on setting of monument due to proximity of route option: St Apolinaris’ Chapel and Burial Ground (SM12118) 	Major	CH6; CH7; CH8; CH9	Major adverse residual effect

Asset type	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Scheduled Monuments	<ul style="list-style-type: none"> Permanent impact on setting of monument due to proximity of route option: Balquhain Castle (SM90) Permanent impact on setting of monument due to proximity of route option: Dillyhill Enclosure (SM12195) Permanent impact on setting of monument due to proximity of route option: Pitscurry Cairn (SM12302) Permanent impact on setting of monument due to proximity of route option: Bruce's Camp, Hillfort (SM12523) 	Moderate adverse	CH6; CH7; CH8; CH9	Moderate adverse residual effect
Category B Listed Buildings	Permanent impact on setting of Listed Building due to proximity of route option: Thainstone House (LB9152)	Moderate adverse	CH7, CH8, CH9	Moderate adverse residual effect
Regionally Significant HER Sites	Permanent loss of aspects of Regionally Significant HER Site: Mill of Pitcaple Cropmark Site (NJ72NW0052)	Major adverse	CH3; CH4	Moderate adverse residual effect
Non-Inventory Designed Landscapes	Permanent loss of aspects of Non-Inventory Designed Landscape: Thainstone House (NJ17NE0161)	Moderate adverse	CH1; CH5	Moderate adverse residual effect
	Permanent impact on setting of Non-Inventory Designed Landscape: Thainstone House (NJ71NE0161)	Moderate adverse	CH7; CH8; CH9	Moderate adverse residual effect

16.7 Cumulative Effects

- 16.7.1 A review of the proposed developments from the LDP and local planning applications (as of August 2020) indicates that there is limited potential for cumulative impacts based on currently known proposed developments.
- 16.7.2 Most of the proposed developments identified are small scale developments (for instance, construction of single dwelling houses, general purpose agricultural storage barns/sheds and pathways, and erection of signage) which will have a minimal cumulative effect on cultural heritage assets when considered in combination with the route options.
- 16.7.3 There are however several larger development proposals identified in the LDP Settlement Statements, particularly around the towns of Inverurie and Kintore, which may give rise to cumulative effects on cultural heritage assets within the route option study areas. These are:
- Old Rayne/OP1: allocation for 30 houses, business and retail use;
 - Old Rayne/OP2: allocation for 30 houses, business and retail use;
 - Inverurie & Port Elphinstone/OP3: allocation for 250 houses;
 - Inverurie & Port Elphinstone/OP4&OP11: allocation for 737 houses, business and industrial uses, community facilities and retail use;
 - Inverurie & Port Elphinstone/OP7-OP9: allocation for 750 houses;
 - Inverurie & Port Elphinstone/OP10: allocation for 220 houses;
 - Inverurie & Port Elphinstone/OP14: allocation for 25 houses;
 - Inverurie & Port Elphinstone/OP12, OP13 & OP16: allocation for business use;
 - Inverurie & Port Elphinstone/SR1/2: allocation for business use;
 - Inverurie & Port Elphinstone/BUS5-10: allocation for business use;
 - Kintore/BUS1: allocation for business use; and
 - Kintore/BUS2&R2: proposed new station and transport interchange.
- 16.7.4 Taking into consideration the locations and extents of these proposed developments, it is assessed that there would be potential cumulative effects on seven cultural heritage assets in combination with the Violet and Orange route options:
- Violet route option
 - **North Street, Bridgend Farmhouse and Steading (Category C Listed: LB49868):** potential future development of a new railway station and transport interchange (Kintore Business Park BUS2/R2), to the north of the Listed Building, would in combination with the Violet route option, result in a minor cumulative effect on the setting of the Listed Building.
 - Orange route option

- **Broomend, Henge, Standing Stones and Symbol Stone (SM18):** potential future housing development (Inverurie & Port Elphinstone OP4/OP11 & OP14), to the west of the Scheduled Monument, and potential future business development (Inverurie & Port Elphinstone OP12, OP16, SR1 & BUS5-10), to the south, would, in combination with the Orange route option, result in a moderate cumulative effect on the setting of the Scheduled Monument.
- **Bruce's Camp, Hillfort (SM12523):** Potential future housing development (Inverurie & Port Elphinstone OP4/OP11), to the north of the Scheduled Monument, and potential future business development (Inverurie & Port Elphinstone OP12-13, OP16, BU5-10 & SR1-2), to the east and south, would, in combination with the Orange route option, result in a moderate cumulative effect on the setting of the Scheduled Monument.
- **Kinkell Church and Burial Ground (SM90188):** Potential future business development (Inverurie & Port Elphinstone OP16, BUS5-8 & BUS10) to the west of the Scheduled Monument would, in combination with the Orange route option, result in a minor cumulative effect on the setting of the monument.
- **Thainstone House (Category B Listed: LB9152):** Potential future business development (Inverurie & Port Elphinstone OP11-OP13, SR1-2, BUS6-7 & 9) to the east and south of the Listed Building would, in combination with the Orange route option, result in a moderate cumulative effect on the setting of the Listed Building.
- **Thainstone Policies Gate Lodge and Gate Pilks (Posts) (Category B Listed: LB9153):** Potential future business development (Inverurie & Port Elphinstone OP12, OP13, SR1-2, BUS6-10) surrounding the Listed Building would, in combination with the Orange route option, result in a moderate cumulative effect on the setting of the Listed Building.
- **Fullerton, Cropmark Site (Regionally Significant HER Site: NJ71NE0070):** Potential future business development (Inverurie & Port Elphinstone OP12-13, SR1-2, BUS5-10) to the north and west of the monument would, in combination with the Orange route option, would result in a minor cumulative effect on the setting of the monument.

16.7.5 From the information available at this stage, it is considered that there would be no cumulative effects on cultural heritage assets for any other route options.

16.8 Summary of Effects

16.8.1 This section sets out a summary of the key findings of the route options assessment, based on the predicted significant residual effects. The summaries are presented in Tables 16.19 to 16.21.

Summary: East of Huntly to Colpy

Table 16.19 East of Huntly to Colpy: Summary of Predicted Residual Effects on Cultural Heritage

Cyan Route Option	Red Route Option
<ul style="list-style-type: none"> Major adverse residual effect on the setting of one Scheduled Monument: Colpy Cottage Palisaded Enclosure (SM1511) <p>Overall, it is predicted that the Cyan route option would have a Major adverse residual effect on cultural heritage assets in the study area.</p>	<ul style="list-style-type: none"> Moderate adverse residual direct effect and effect on the setting of one Regionally Significant HER Site: Foudland Slate Quarries (NJ63SW0045) <p>Overall, it is predicted that the Red route option would have a Moderate adverse residual effect on cultural heritage assets in the study area.</p>

- 16.8.2 Overall, a major adverse residual effect is predicted for the Cyan route option and a moderate adverse effect is predicted for the Red route option.
- 16.8.3 For the Cyan route option, the major adverse residual effect results from the predicted impact on the setting of Scheduled Monument: Colpy Cottage Palisaded Enclosure (SM1511), an asset of high sensitivity. The impact on its setting would result from the proximity of the Cyan route option to the Scheduled Monument, with infrastructure encircling the monument and separating it from its surroundings.
- 16.8.4 For the Red route option, the moderate adverse residual effect results from the predicted direct impact on, and the potential impact on setting of, the Regionally Significant HER Site: Foudland Slate Quarries (NJ63SW0045), an asset of medium sensitivity. The north-eastern end of the former 18th century quarry workings would be directly affected by the earthworks (cutting) required for the Red route option, north of Upper Scotstown. Although most of the quarry workings would not be affected, construction works would disturb elements of the north-eastern most part of the quarry workings, affecting the overall integrity of the quarry site.
- 16.8.5 Given the major adverse residual effect of the Cyan route option on Colpy Cottages Palisaded Enclosure (SM11511) the Cyan route option is predicted to have a slightly greater adverse residual effect on cultural heritage assets than the Red route option.

Summary: Colpy to Pitcaple

Table 16.20 Colpy to Pitcaple: Summary of Predicted Residual Effects on Cultural Heritage

Pink Route Option	Brown Route Option
<ul style="list-style-type: none"> Moderate adverse residual effect on the settings of four Scheduled Monuments: Durno Roman Camp (SM4123) The Law Cairn (SM12113) Newton of Lewesk Enclosure (SM12137) Pitscurry Cairn (SM12302) <p>Overall, it is predicted that the Pink route option would have a Moderate adverse residual effect on cultural heritage assets in the study area.</p>	<ul style="list-style-type: none"> Moderate adverse residual effect on the settings of two Scheduled Monuments: Durno Roman Camp (SM4123) Pitscurry Cairn (SM12302) Moderate adverse residual direct effect and effect on the setting of one Non-Inventory Designed Landscape: Logie House (NJ72NW0106) <p>Overall, it is predicted that the Brown route option would have a Moderate adverse residual effect on cultural heritage assets in the study area.</p>

- 16.8.6 The overall residual adverse effects for both route options are predicted to be moderate.
- 16.8.7 For the Pink route option, the moderate adverse residual effect results from the predicted impact on the setting of four Scheduled Monuments: Durno Roman Camp (SM4123), The Law Cairn (SM12113), Newton of Lewesk Enclosure (SM12137) and Pitscurry Cairn (SM12302), all of which are assets of high sensitivity. The impact on the settings of these monuments is a result of the proximity of the Pink route option to the monuments, and the impact on key views to and from each monument.
- 16.8.8 For the Brown route option, the moderate adverse residual effect results from the predicted impact on the setting of two Scheduled Monuments: Durno Roman Camp (SM4123) and Pitscurry Cairn (SM12302), assets of high sensitivity. The impact on the settings of these monuments is a result of the proximity of the Brown route option to the monuments, and the impact on key views to and from each monument. In addition, the Brown route option is predicted to result in a direct adverse impact on, and an impact on the setting of, Logie House Non-Inventory Designed Landscape (NJ72NW01016), an asset of medium sensitivity. The route option (requiring a combination of cuttings and embankments) would cross the northern edge of the designed landscape, bisecting the woodland and farmland that makes up the northern part of this site; thereby affecting its overall integrity.
- 16.8.9 There are more cultural heritage assets of high sensitivity that are predicted to have adverse residual effects within the Pink route option than on the Brown route option; including significant residual effects on the setting of four Scheduled Monuments. The Brown route option is therefore predicted to have slightly less of an impact on cultural heritage than the Pink route option.

Summary: Pitcaple to Kintore

Table 16.21 Pitcaple to Kintore: Summary of Predicted Residual Effects on Cultural Heritage

Violet Route Option	Orange Route Option
<ul style="list-style-type: none"> • Moderate adverse residual effect on the setting of one Scheduled Monument: Pitscurry Cairn (SM12302) • Moderate adverse residual effect on the setting of one Category A Listed Building: Bourtie House (LB2819) • Moderate adverse residual effect on the setting of one Non-Inventory Designed Landscape: Bourtie House (NJ72SE0213) <p>Overall, it is predicted that the Violet route option would have a Moderate adverse residual effect on cultural heritage assets in the study area.</p>	<ul style="list-style-type: none"> • Major adverse residual effects predicted on the settings of two Scheduled Monuments: Mains of Balquhain Stone Circle (SM3961) St Apolinaris' Chapel and Burial Ground (SM12118) • Moderate adverse residual effects predicted on the settings of four Scheduled Monuments: Balquhain Castle (SM90) Dillyhill Enclosure (SM12195) Pitscurry Cairn (SM12302) Bruce's Camp Hillfort (SM12523) • Moderate adverse residual effect on one Category B Listed Building: Thainstone House (LB9152) • Moderate adverse residual direct effect on one Regionally Significant HER Site: Mill of Pitcaple cropmarks (NJ72NW0052) • Moderate adverse residual direct effect and effect on the setting of one Non-Inventory Designed Landscapes: Thainstone House (NJ71ME0161) <p>Overall, it is predicted that the Orange route option would have a Major adverse residual effect on cultural heritage assets in the study areas.</p>

16.8.10 Overall, a major adverse residual effect is predicted for the Orange route option and a moderate adverse effect is predicted for the Violet route option.

16.8.11 For the Violet route option, the overall moderate adverse residual effect results from predicted impacts on a Scheduled Monument (Pitscurry Cairn (SM12302)) and on Category A Listed Bourtie House (LB2819) and its associated Non-Inventory Designed Landscape (NJ72SE0213). The Scheduled Monument and the Category A Listed Building are both assets of high sensitivity, and the Non-Inventory Designed Landscape is of medium sensitivity. The impact on the setting of the Scheduled Monument would result from the proximity of the Violet route option to the monument. The impact on the setting of Category A Listed Bourtie House and its associated Non-Inventory Designed Landscape would result from

embankments required for the Violet route option being visible in key views from the House and from within the designed landscape.

- 16.8.12 The Orange route option results in major adverse residual effects on the settings of two Scheduled Monuments: Mains of Balquhain Stone Circle (SM3961) and St Apolinaris' Chapel and Burial Ground (SM12118), and moderate adverse residual effects on the settings of four other Scheduled Monuments: Balquhain Castle (SM90), Dillyhill Enclosure (SM12195), Pitscurry Cairn (SM12302) and Bruce's Camp Hillfort (SM12523), all of which are assets of high sensitivity. The impact on their settings would result from the proximity of the Orange route option to these monuments and from the impact on the views to and from the monuments.
- 16.8.13 The Orange route option is predicted to have an impact on the setting of Category B Listed Thainstone House (LB9152) and a direct adverse impact and impact on the setting of Thainstone House Non-Inventory Designed Landscape (NJ71ME0161), both of which are assets of medium sensitivity. The route option (an embankment) would cross the eastern edge of the Non-Inventory Designed Landscape, directly affecting woodland that makes up the eastern part of this site and the route option would also sever the eastern end of the approach drive to Thainstone House.
- 16.8.14 A moderate residual direct effect is also predicted on the Regionally Significant Mill of Pitcaple (NJ72NW0052), an asset of medium sensitivity. The cropmark site would be crossed in its north-eastern corner by the Orange route option. Although most of the cropmark site would not be affected, the route option would affect the overall integrity of the site.
- 16.8.15 The Orange route option is predicted to have a greater adverse residual effect on cultural heritage assets than the Violet route option as a result of the predicted major adverse residual effects on Mains of Balquhain Stone Circle (SM3961) and St Apolinaris' Chapel and Burial Ground (SM12118).

16.9 Scope of DMRB Stage 3 Assessment

- 16.9.1 The DMRB Stage 3 assessment process will be based on DMRB (LA 101 Introduction to Environmental Assessment and LA 106 Cultural Heritage Assessment). It will review and expand upon the baseline information collated during the DMRB Stage 2 assessment, will follow the scope established in the DMRB for 'Detailed Assessment' (LA 101, p12) and undertaken in accordance with the methodology and reporting requirements set out in the DMRB (LA 104 Environmental Assessment and Monitoring).
- 16.9.2 A detailed assessment is designed to clearly establish the cultural heritage baseline of the Preferred Option through in-depth research, allowing the predicted impact of the scheme on cultural heritage to be fully assessed and detailed mitigation to be defined. The baseline collation will contain a higher level of detail and analysis than that undertaken at DMRB Stage 2.
- 16.9.3 The detailed assessment would involve two tiers of investigation:
- Desk-based Assessment: collation of cultural heritage baseline information comprising archival and documentary research and consultation with statutory consultees. The following information sources will be consulted:
 - Historic Environment Scotland Spatial Data Warehouse: for up-to-date data on the locations and extents of Scheduled Monuments, Listed

Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields;

- Aberdeenshire Council HER: for a digital database extract in GIS;
 - The National Record of the Historic Environment (NRHE): for any information additional to that contained in the HER;
 - Map Library of the National Library of Scotland: for Ordnance Survey maps and other historical map resources to identify any previously unrecorded historic features;
 - Historic Land-Use Data for Scotland (HLAmap): for information on the historic land use character along the Preferred Option;
 - Scottish Palaeoecological Archive Database (SPAD) (Coles et al. 1998): for information on site with palaeoenvironmental and palaeoecological potential;
 - Vertical and oblique aerial photographs held by the National Collection of Aerial Photography (NCAP); and
 - Other relevant sources of information (e.g. local archives, museums, local archaeological/historical societies, individuals), where relevant, following advice received from consultees.
- Field survey: forms of survey could include both non-intrusive (reconnaissance walk-over survey, geophysical survey, field walking, site visits) and intrusive survey (archaeological trial trench investigations):
 - Reconnaissance Walk-over Survey along the route of the Preferred Option. This survey will assess the condition of existing assets identified during the desk-based assessment and identify previously recorded archaeological and historic sites;
 - Geophysical survey to establish the extent of buried archaeological remains;
 - Field walking of suspected archaeological sites to identify artefacts providing an indication of age, importance and extent of sites;
 - Archaeological Trial Trench Investigations involving investigations of an area through the systematic excavation of trial trenches. These will cover a specific percentage of a site and are designed to provide an indication of the presence, extent, importance and condition of a cultural heritage asset; and
 - Site Visits to assess in detail the character and sensitivity of the settings of cultural heritage assets. The site visits will focus on those cultural heritage assets most likely to receive significant effects on the settings from the Preferred Option.

16.9.4 The programme of field survey required will be formulated during the compilation of the desk-based assessment and through consultation with HES and ACAS. A reconnaissance walk-over survey will be completed as a minimum.

16.9.5 Consideration will be paid at DMRB Stage 3 to those cultural heritage assets where residual effects have been identified at DMRB Stage 2 and where these effects are

considered significant. Setting impacts assessment will be completed for those cultural heritage assets in accordance with HES guidance. In addition, cropmark sites and other assets directly impacted by the scheme will be further investigated to better define their extent, condition and importance.

- 16.9.6 Ongoing consultation with HES and ACAS will be undertaken during the DMRB Stage 3 assessment to identify and address potential issues as they arise.

17 Landscape

17.1 Introduction

- 17.1.1 This chapter presents the findings of the landscape assessment of the route options for the scheme. The scheme is described in three geographical sections for which there are two route options for each geographical section. The route options are as follows:
- East of Huntly to Colpy – Cyan and Red route options;
 - Colpy to Pitcaple – Pink and Brown route options, and
 - Pitcaple to Kintore – Violet and Orange route options.
- 17.1.2 The assessment has been undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment (GLVIA3)¹¹², the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Part 5, Landscape Effects)¹¹³ and Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment¹¹⁴.
- 17.1.3 This chapter is supported by the following figures (Volume 5) and appendices (Volume 4b):
- Figures 17.1 to 17.13: Landscape Designations;
 - Figures 17.14 to 17.19: Landscape Character;
 - Appendix A17.1: Landscape Assessment Methodology;
 - Appendix A17.2: Landscape Baseline and Effects;
 - Appendix A17.3: Landscape Appraisal Approach Technical Note; and
 - Appendix A17.4: Addendum – Landscape Appraisal Approach Technical Note.
- 17.1.4 This chapter describes the landscape impact assessment of each route option. The landscape assessment identifies the potential impacts arising from each route option. It also describes proposed mitigation which is designed to minimise or reduce the overall impacts of the scheme upon receptors.
- 17.1.5 As the purpose of this assessment is to compare the route options, and the temporary effects are predicted to be similar for each route option, the assessment of temporary impacts during construction have considered but have been scoped out accordingly. This assessment concentrates on the residual permanent effects.

¹¹² Landscape Institute and Institute of Environmental Management and Assessment. *Guidelines for Landscape and Visual Impact Assessment*. Third revised edition. Routledge. 2013.

¹¹³ Design Manual for Roads and Bridges (DMRB), 1993, *Volume 11, Section 3, Part 5, Landscape Effects*

¹¹⁴ DMRB, *Interim Advice Note 135/10 Landscape and Visual Effects Assessment*, November 2010

Policy Context

Landscape Designations and Planning Policy

- 17.1.6 Various national, structure and local plan policies are relevant to landscape issues and these are summarised in the following paragraphs. Other relevant documents are referenced in Chapter 9, Policies and Plans.

The European Landscape Convention

- 17.1.7 The European Landscape Convention (ELC) (Florence 2000) also known as the Florence Convention¹¹⁵, came into force on 1 March 2004 and became binding in this country on 1 March 2007. The UK Government is signatory to the European Landscape Convention (ELC) which aspires to enhance and maintain the quality and condition of all landscapes not just those afforded policy protection by local or national designation. The underlying principle of the European Landscape Convention is that all landscapes are valuable being the result of the interaction of people, places and nature over time.
- 17.1.8 The convention recognises that all landscapes affect quality of life. Landscape is not a matter for individual states alone. It also needs to be considered in international policies and programmes.
- 17.1.9 The ELC concept relates to the 'outstanding universal value' of the world's cultural and natural heritage and that 'cultural landscape' is designed, evolved or associative. The ELC underlies implementation of the European Union Rural Development Programme. A well-known tangible expression of this is the revision of the Landscape Institute and Institute of Environmental Management's Assessment Guidelines¹¹².

Scotland's Third National Planning Framework¹¹⁶

- 17.1.10 Scotland's Third National Planning Framework 3 (NPF3) sets out the Scottish Government's strategy to deliver sustainable economic growth in Scotland through the planning system. It identifies the importance of the natural environment to the well-being and economic prospects of residents and visitors to Scotland. NPF3 identifies the following aspirations for landscape:
- 'Landscape quality is found across Scotland and all landscapes support place making';
 - 'Continue our strong protection for our wildest landscapes – wild land is a nationally important asset';
 - 'Closer to settlements, landscapes have an important role to play in sustaining local distinctiveness and cultural identity and in supporting health and well-being';
 - 'We need to manage change on the urban edge and work to improve productivity and the quality of the landscape setting of our towns and cities'; and

¹¹⁵ *European Treaty Series (ETS) Treaty no. 176* issued by The Council of Europe, October 2000.

¹¹⁶ *Scotland's Third National Planning Framework 3* was laid in the Scottish Parliament on June 23, 2014. <https://www.gov.scot/publications/national-planning-framework-3/>

- NPF3 also identifies a number of key priorities for Scotland's transport network which aim to stimulate economic growth, improve connectivity of rural communities and make travel on the network safer.

Scottish Government: Planning Advice Note 60¹¹⁷

- 17.1.11 Scottish Government Planning Advice Note (PAN) 60 provides a framework that includes policies and initiatives for positive action. It emphasises how the inter-relationship between development and natural heritage is crucially important in land use planning and needs to be well managed to enhance the quality of place. It shows how effective planning policy frameworks can demonstrate clear objectives and targets and how landscape character assessment can be used as a useful tool in identifying development opportunities, constraints, setting objectives and to provide broad guidelines for maintaining, restoring and enhancing landscape quality. Together with biodiversity action plans and biodiversity records these tools can influence the planning process to provide networks of quality greenspace that provide and enhance access and recreation and natural heritage benefits.

Transport Scotland: Fitting Landscapes¹¹⁸

- 17.1.12 Fitting Landscapes is the Scottish Government's policy statement addressing the landscape design and management of Scotland's transport corridors. It states that in addition to being designed and managed to meet their functional objectives as transport corridors, it is important they are designed to '...fit with the landscape through which they pass – reflecting local distinctiveness, conserving and enhancing areas of high quality or, where appropriate, creating a positive contrast to the natural setting.'
- 17.1.13 Fitting landscapes also recognises the importance of transport corridors as one of the main ways by which many people experience the landscape and that '...it is vital that this experience is recognised, supported and enhanced by sensitive and appropriate design and management practices.'
- 17.1.14 The policy sets out four key policy aims:
- Aim 1 – ensure high quality of design and place. Aims to achieve integration of new transport projects with their surroundings, create new landscapes and enhance the experience for travellers;
 - Aim 2 – enhance and protect natural heritage. Aims to achieve effective mitigation of adverse impacts on species and ecosystems through the positive enhancement of biodiversity and the creation and management of new habitats and green networks;
 - Aim 3 – use resources wisely. Advocates the use of simple design principles and a clear understanding of future management to allow a natural equilibrium of balance to be achieved early in the creation of new landscapes; and

¹¹⁷ Scottish Government. *Planning for Natural Heritage: Planning Advice Note 60*. August 2000. (paragraph 47 updated 14 January 2008).

¹¹⁸ Transport Scotland. *Fitting Landscapes; Securing More Sustainable Landscapes*. March 2014.

- Aim 4 – build in adaptability to change. Identifies how transport networks should respond to the implications of climate change and the role that they can play in accommodating storm drainage, providing refuge habitats and forming linkage to green networks.

17.1.15 By improving habitat connectivity, green networks can improve the health and viability of previously fragmented habitats and ecosystems, helping support adaptation to climate change. The objective of linking green spaces in and around settlements through green networks by creating or enhancing wildlife corridors is to ensure the delivery and long-term continuity of the benefits for people and nature.

Scottish Planning Policy¹¹⁹

17.1.16 The purpose of the Scottish Planning Policy (SPP) is to set out national planning policies which reflect Scottish Ministers' priorities for the development and use of land. They also set out how the Scottish Government expects the planning system to be delivered throughout Scotland by local planning authorities. Of the policy principles identified in SPP relating to the natural environment, the following are of most relevance to the scheme:

- Facilitate positive change while maintaining and enhancing landscape character; and
- Protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woodlands, hedgerows and individual trees with high nature conservation or landscape value.

Scottish Natural Heritage Landscape Policy Framework¹²⁰

17.1.17 Scottish Natural Heritage (SNH) advises the Scottish Government on the natural heritage including protection and management of designated areas and by statutory consultation on EIA development such as the scheme. The Landscape Policy Framework sets out SNH's remit for landscape and states that SNH works for the benefit of all Scotland's landscapes by supporting the work of local authorities. The Landscape Policy Framework emphasises that all landscapes are important and the importance of design in managing change and ensuring sustainable long-term use of landscape.

Scottish Natural Heritage National Scenic Areas Policy¹²¹

17.1.18 SNH's policy on National Scenic Areas (NSA) recognises the importance and the quality of Scotland's scenery and natural heritage and considers NSAs 'are of at least national importance'. SNH believe that such valued areas should be protected through designation as NSAs, with the aim to 'protect areas and sites of special natural heritage value and to secure their appropriate management.'

¹¹⁹ Scottish Government. *Scottish Planning Policy*. June 2014.

¹²⁰ Scottish Natural Heritage/Simon Brooks. *Scottish Natural Heritage Landscape Policy Framework: Policy Statement No. 05/01*. December 2005.

¹²¹ <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/national-scenic-areas/national-scenic-areas>.

Scottish Natural Heritage Wildness in Scotland's Countryside Policy¹²²

- 17.1.19 SNH's policy, Wildness in Scotland's Countryside, sets out guidance on how to identify Wildland and Wildness in Scotland and the difference between each. It also looks at how wildness is valued in society and the quality of wildness.

Policy E2 Natural Heritage and Landscape¹²³

- 17.1.20 The Aberdeenshire Council Local Development Plan (LDP) includes a policy that aims to protect the landscape character and locally designated Special Landscape Areas (SLA) from inappropriate development that would harm the key qualities and characteristics of such areas.

Aberdeenshire Special Landscape Areas Supplementary Guidance¹²⁴

- 17.1.21 Aberdeenshire Special Landscape Areas Supplementary Guidance (SLASG) identifies SLAs and describes the valued qualities and characteristics that distinguish these areas from surrounding landscapes.

Aberdeenshire Forestry and Woodland Strategy Supplementary Guidance¹²⁵

- 17.1.22 Aberdeenshire Forestry and Woodland Strategy Supplementary Guidance 2017 reflects national policy and is closely aligned to the Scotland's Forestry Strategy¹²⁶.
- 17.1.23 The strategy presents the key issues and opportunities in relation to forestry and woodlands in the region. It also presents a map of Preferred Areas for New Woodland Creation, identifying where new woodlands will maximise benefits and promote integrated land use.

Aberdeenshire Core Paths Plan¹²⁷

- 17.1.24 The Land Reform (Scotland) Act 2003 was amended by the Community Empowerment (Scotland) Act 2015 (CEA 2015). The Land Reform (Scotland) Act 2003¹²⁸ places a duty on each local planning authority to prepare a Core Paths Plan for their administrative area. The Aberdeenshire Core Paths Plan identifies core paths within Aberdeenshire. The purpose of core paths is to:

- Provide the basic framework of paths to meet the communities' needs;
- Minimise any potential conflict with land management; and
- Be well sign posted, well maintained and welcoming.

¹²² Scottish Natural Heritage. *Wildness in Scotland's Countryside Policy Statement No. 02/03*. July 2002. Available at: <https://www.nature.scot/wildness-scotlands-countryside-policy-statement>

¹²³ Aberdeenshire Council. *Aberdeenshire Local Development Plan 2017 (LDP2017)*, page 54; Natural Heritage and Landscape. Adopted on 17 April 2017.

¹²⁴ Aberdeenshire Council. *Aberdeenshire Local Development Plan Supplementary Guidance 9: Special Landscape Areas 2017 (LDP2017)*. Adopted on 17 April 2017.

¹²⁵ Aberdeenshire Council. *Aberdeenshire Local Development Plan Supplementary Guidance 8: Aberdeenshire Forestry and Woodland Strategy 2017 (LDP2017)*. Adopted on 17 April 2017.

¹²⁶ *Scotland's Forestry Strategy*, Scottish Government 2019. Available at: <https://www.gov.scot/policies/forestry/forestry-strategy/>

¹²⁷ Aberdeenshire Council. *Aberdeenshire Core Paths Plan*. 2015. Available at: <https://www.aberdeenshire.gov.uk/paths-and-outdoor-access/core-paths-plan/core-paths-plan-maps/>

¹²⁸ <https://www2.gov.scot/Topics/farmingrural/Rural/rural-land/right-to-buy/Resources/Act>.

Planning Advice: Landscaping Design Guidance

17.1.25 Aberdeenshire Council publishes Planning Advice documents which have the status of Supplementary Guidance. Planning Advice: Number 13/2015 Landscaping Design Guidance¹²⁹ describes the process and principles that should be adopted in new development of all types. It states that a quality landscape scheme should:

- Aid development to fit positively into its landscape setting;
- Promote and enhance biodiversity at an individual development site level;
- Enhance the overall appearance of new development of all types; and
- Add value to the development.

17.2 Approach to Assessment

Introduction

17.2.1 Landscape is defined by the ELC¹¹⁵ as: ‘...an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.’

17.2.2 The scheme has the potential to affect landscape and visual receptors in the following ways:

- Alteration or removal of physical features of landscape;
- Introduction of new features and elements that alter landscape character and quality; and
- Changes to the composition and scenic quality of views experienced by visual receptors.

17.2.3 Landscape and visual (refer to Chapter 15, Visual Effects) are separate but related matters which combine to form the Landscape and Visual Impact Assessment (LVIA). The methodology for landscape assessment is described in Volume 4b, Appendix A17.1, Landscape Assessment Methodology. The overall assessment allows for different conclusions to be made for landscape and visual impacts while still recognising the holistic nature of the assessment process. It also recognises the relationship between the landscape assessment, the cultural heritage assessment in Chapter 16 and the visual assessment within Chapter 12, People and Communities.

17.2.4 The LVIA follows previously recognised guidelines including IAN135/10 and the current GLVIA3. This landscape assessment concentrates on the specific impacts of each route option on a range of receptors. Landscape receptors are defined in GLVIA3 ‘...including the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the character of the landscape in different areas’ (p.36). For this landscape assessment, the receptors are categorised into landscape units (LUs), grouped together to form Local Landscape Character Areas (LLCAs). This process is described in Volume 4b, Appendix A17.3, Landscape

¹²⁹ Aberdeenshire Council. *Planning Advice: Number 13/2015 Landscaping Design Guidance*. 2015.

Appraisal Approach Technical Note and Appendix A17.4, Addendum - Landscape Appraisal Approach Technical Note.

- 17.2.5 The impacts of the route options on the LLCAs have been assessed. The LLCAs have been determined by incorporating elements of previous SNH assessments. Initially, the landscape was reviewed using the 2019 SNH Landscape Character Types¹³⁰. In addition, a desk-based survey was undertaken using the existing descriptions and Ordnance Survey (OS) base maps to define areas of similar characteristics based on topography, tree cover and field patterns and sizes. This also included a review of place names as descriptors of landscape character.
- 17.2.6 The proposed LUs were overlaid on the OS base maps. This was then taken forward into a detailed analysis involving a comprehensive site survey. Each proposed LU was visited and site notes were taken describing the key characteristics that make each area subtly different from the next, which if affected, could cause a change in the landscape character.
- 17.2.7 Following the site survey, the LUs were grouped and the boundaries of each LLCA were confirmed together with the name adopted for each LLCA. 113 LUs were identified based on the key landscape characteristics of the study area and these were grouped to form 25 LLCAs. Refer to Volume 4b, Appendix A17.3, Landscape Appraisal Approach Technical Note and Appendix A17.4, Addendum - Landscape Appraisal Approach Technical Note for further details.
- 17.2.8 The following sources of information have contributed to this assessment:
- Ordnance Survey 1:50,000 and 1:25,000 maps;
 - Aerial photographs and digital terrain model (5m resolution) data (2017);
 - SNH Review 102 - South and Central Aberdeenshire Landscape Character Assessment¹³¹;
 - Aberdeenshire Council dataset for Special Landscape Areas (SLAs¹³²);
 - Zone of Theoretical Visibility (ZTV);
 - Historic Environment Scotland (HES) dataset for the Inventory of Gardens and Designed Landscapes (GDL);
 - The National Record of the Historic Environment (NRHE) available at <https://canmore.org.uk/>;
 - The Aberdeenshire Council Local Development Plan 2017 and Policy E2 Landscape with relation to sensitive landscape areas as well as any other landscape studies undertaken as part of the Local Development Plan;
 - AmeyArup assessment of Landscape High Sensitivity Areas undertaken during site visits (Refer to Volume 4b, Appendix A17.3, Landscape Appraisal Approach Technical Note); and

¹³⁰ <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions>.

¹³¹ SNH Review 102; *South and Central Aberdeenshire Landscape Character Assessment*. Environmental Resource Management. 1998.

¹³² Aberdeenshire Council. *Aberdeenshire Local Development Plan 2017, Supplementary Guidance 9; Aberdeenshire Special Landscape Areas*. Adopted on 17 April 2017.

- Data from site visits and field assessment undertaken during 2017, 2018 and 2019.

Consultation

17.2.9 Consultation regarding the Landscape Assessment has been undertaken with:

- Scottish Natural Heritage (SNH);
- Aberdeenshire Council (AC);
- Historic Environment Scotland (HES); and
- Transport Scotland's Landscape Advisor (this was carried out jointly for landscape and visual aspects).

17.2.10 The topics relevant to the landscape assessment which were discussed included the following:

- Other landscape studies undertaken as part of the Local Development Plan;
- The scope and method of the DMRB Stage 2 LVIA (including the extent of the study area);
- Landscape and visual design objectives; including the preparation of the Technical Note and Addendum.¹³³ These are included in Appendices A17.3: Landscape Appraisal Approach Technical Note and A17.4: Addendum– Landscape Appraisal Approach Technical Note (Volume 4b);
- The landscape baseline assessment of the LLCAs;
- Assessment of the experience of the landscape within the LVIA; and
- Aberdeenshire Council's SLAs.

Assessment Methodology

17.2.11 This section summarises the main aspects of the landscape assessment methodology which is detailed fully in Volume 4b, Appendix A17.1: Landscape Assessment Methodology.

17.2.12 The landscape assessment is informed by a combination of desk and site-based assessments and guided by the following publications:

- The Guidelines for Landscape and Visual Impact Assessment (GLVIA3);
- An Approach to Landscape Character Assessment.¹³⁴;
- Fitting Landscapes: Securing More Sustainable Landscapes¹³⁵;
- DMRB (Volume 11, Section 3, Part 5, Landscape Effects¹³⁶);

¹³³ *Landscape Appraisal Approach Technical Note and Addendum*, See Appendix A17.3 and A17.4.

¹³⁴ Natural England. *An Approach to Landscape Character Assessment*. Christine Tudor, October 2014. Second version March 2018.

¹³⁵ Transport Scotland. *Fitting Landscapes; Securing More Sustainable Landscapes*. March 2014.

¹³⁶ Design Manual for Roads and Bridges (DMRB). *Volume 11, Section 3, Part 5, Landscape Effects*. June 1993.

- DMRB (Volume 10, Section 1, Part 1, New Roads Landform and Alignment¹³⁷); and
- Interim Advice Note 135/10¹³⁸.

17.2.13 Establishment of the study area has been informed by a working Zone of Theoretical Visibility model (ZTV). The ZTV was prepared using a 'bare ground' digital terrain model which gives a 'worst-case' scenario, without considering surface screening features. As such, the ZTV has been used as a tool for assessment and was supplemented by data collected on site that provided more site-specific information, such as where visibility would be affected by screening by woodland or buildings. The ZTV was produced as 10km from centreline of the route options to enable the landscape and visual assessments to focus in on the selection of an appropriate study area and was refined further, as described in Appendix A15.1, Visual Assessment Methodology (Volume 4b).

17.2.14 Between November 2017 and February 2018 an initial route sifting exercise was undertaken by AmeyArup as part of the DMRB Stage 2 process. This was based on the outcomes of the DMRB Stage 1 preliminary work¹³⁹. In accordance with 'Fitting Landscapes: Securing More Sustainable Landscapes'¹⁴⁰, following on from the initial Corridor Options sifting exercise, a series of strategic landscape design objectives were established for the scheme. Following consultation with SNH, Aberdeenshire Council and the Transport Scotland landscape advisor and based on the findings of the LVIA baseline assessment, these strategic landscape design objectives were developed in more detail. The landscape objectives were informed by identification of the sensitivities and opportunities of the baseline conditions and, in turn, informed the proposed primary and secondary mitigation measures identified in the LVIA. The mitigation measures will be refined further during DMRB Stage 3, informed by the more detailed LVIA and to influence the ongoing design development.

17.2.15 GLVIA3 defines landscape receptors as aspects of the landscape resource that have the potential to be affected by a proposal¹⁴¹. Elements that can be affected include 'the nature of the landscape pattern, qualities of spatial enclosure, or the shape and scale of the landform'. For this assessment, receptors have been categorised as LLCAs based on the landscape characteristics.

17.2.16 The LLCAs are a refinement of the SNH regional Landscape Character Types (LCT). For this assessment, the evaluation of the LLCAs is specific to the nature of the potential change. The chapter concentrates on the key characteristics of the LLCAs and how this may be affected by the introduction of the scheme.

17.2.17

In accordance with GLVIA3, the significance of impact on landscape receptors is based on sensitivity and magnitude. The sensitivity of any given landscape includes an assessment of its value and its capacity to accept change. The assessment of a landscape's sensitivity may include:

¹³⁷ Design Manual for Roads and Bridges (DMRB). *Volume 10, Section 1, Part 1, HA 55/92. New Roads Landform and Alignment.*

¹³⁸ DMRB. *Interim Advice Note 135/10 Landscape and Visual Effects Assessment.* November 2010.

¹³⁹ Transport Scotland. <https://www.transport.gov.scot/publication/dmrb-stage-2-early-sifting-reports-east-of-huntly-to-aberdeen-a96-dualling/>; August 2019.

¹⁴⁰ Transport Scotland. *Fitting Landscapes; Securing More Sustainable Landscapes.* March 2014.

¹⁴¹ Landscape Institute and Institute of Environmental Management and Assessment. *Guidelines for Landscape and Visual Impact Assessment.* Third revised edition. Routledge. 2013. Section 3.21, page 36.

- Landscape quality (or condition) - the physical state of repair of the individual element;
- Landscape value (or importance) - the relative value that is attached to the individual landscape element;
- Contribution to landscape/settlement character - the contribution of an individual element or group of elements to the local sense of place;
- Scope for replacement - the ability or otherwise to replace an individual element or group of elements; and
- Main trends for change - the degree of stability or level of change being experienced by the landscape.

- 17.2.18 The sensitivity of any given landscape character area to change is dependent on a complex range of factors, many of which are subjective in nature. A combined measure for sensitivity of landscape receptors is provided within the landscape assessment, categorised using a three-point scale: high, medium and low.
- 17.2.19 The criteria for assessing the magnitude of landscape effects are based upon the degree of physical change that will occur as a result of the route options, the compatibility of these changes with the overall trends for change within the landscape and the consequential effects that these changes may have on the landscape or settlement character. The magnitude of change is categorised using a four-point scale: high, medium, low and negligible. Where there is no change this is also reported.
- 17.2.20 As part of the LVIA process, potential landscape and visual mitigation measures have been considered. In accordance with GLVIA3, these measures are defined as primary and secondary measures. Primary mitigation measures are incorporated into the normal design development of the scheme. Secondary measures are additional and address any residual impacts remaining after the primary measures have been incorporated. At this stage, the secondary mitigation has been broadly considered as those elements that could reasonably be included in the scheme.
- 17.2.21 The significance of effects has been determined using a four-point scale: major, moderate, minor and negligible. Effects have been assessed as either beneficial or adverse. The assessment of significance of effects takes account of the nature of the effects ('magnitude') as well as the nature of the receptors ('sensitivity'). This is described by GLVIA3 as an 'overall profile' approach to combining judgements and requires that all the judgements against each of the pre-defined criteria (refer to Volume 4b, Appendix A17.1, Landscape Assessment Methodology) for sensitivity of receptors and magnitude of change contribute to an informed professional judgement of the overall level of effect. The residual effects on the landscape are determined as 'significant' or 'not significant' based on the following:
- Major and moderate levels of effect are considered significant; and
 - Minor and negligible levels of effect are considered not significant.

Assumptions and Limitations

New Guidance

- 17.2.22 In September 2019 and further updated in January 2020, DMRB Volume 11, Part 5 Landscape Effects was replaced by LA 104 Environmental assessment and

monitoring and by LA 107 Landscape and visual effects (hereafter referred to as the 'New Guidance'). This updated guidance now incorporates IAN 135/10 and more fully reflects the requirements of GLVIA3 and the EU Directive 2011/92/EU, as amended by 2014/52/EU.

- 17.2.23 The DMRB Stage 2 environmental assessment for this scheme, following a structure outlined in the previous published DMRB guidance, (hereafter referred to as the 'Withdrawn Guidance'), had already commenced at the time of the release of the New Guidance. It has been agreed with Transport Scotland and SNH that, following a review of the New Guidance, the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report that would be produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.
- 17.2.24 The following Paragraphs 17.2.25 to 17.2.35 outline the key differences between the Withdrawn Guidance and New Guidance and describe how this chapter meets the objectives of the New Guidance.
- 17.2.25 The relevant parts of the New Guidance are LA 104 Environmental assessment and monitoring and LA 107 Landscape and visual effects as follows:
- LA 107 outlines the assessment process from baseline through to determining the magnitude of effect for landscape and visual receptors.
 - LA 104 demonstrates how the significance of impacts is determined.
- 17.2.26 There is no change in the focus of the assessment.

Effects of the New Guidance

- 17.2.27 The current assessment mirrors the approach outlined in the New Guidance, as it uses the base information from GLVIA3 and has been informed by DMRB and IAN 135/10 for specific issues relating to roads projects.
- 17.2.28 LA 107 has very slight differences from the approach already undertaken. It uses a five-point scale for determining landscape sensitivity; from Very High to Negligible. This assessment uses a similar, but reduced, three-point scale, from High to Low. This effectively removes the top and bottom categories as none exist in the study area.
- 17.2.29 The magnitude scale in LA 107 uses slightly different nomenclature for the degrees of magnitude. Major instead of High and Moderate instead of Medium. This assessment combines the Negligible and No-change categories for simplicity.
- 17.2.30 Similarly, the changes in LA 104 are minimal as the significance matrix is simplified due to the reduced categories noted above. The nomenclature is also slightly different, but the conclusions would be the same.
- 17.2.31 The New Guidance re-iterates key points which have been considered in the assessment as follows:
- All landscape has value, but this does not mean that all effects are significant;
 - The sensitivities of local stakeholders are an important consideration;
 - Receptors with a view of the existing infrastructure should have low susceptibility to change;
 - Moderate and Large (Major) impacts are significant;

- Well-kept landscapes are not necessarily high quality; and
 - Non-designated landscapes can still be high quality.
- 17.2.32 Due to the similarity of approach for landscape assessment, using the New Guidance would not lead to a change in the conclusions made using the Withdrawn Guidance.
- 17.2.33 The purpose of the DMRB Stage 2 Scheme Assessment Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance. At subsequent reporting stages (DMRB Stage 3) the Preferred Option will be assessed using the New Guidance.
- 17.2.34 During the DMRB Stage 3 assessment, a more detailed LVIA will further consider the landscape design objectives and will inform the ongoing design development.
- 17.2.35 In developing the DMRB Stage 3 assessment, the New Guidance notes that opportunities for enhancement should be investigated, in addition to the mitigation measures. There is also a requirement to include a robust monitoring process to determine the effectiveness of the mitigation measures.

Other Assumptions and Limitations

- 17.2.36 Due to the level of design detail appropriate at DMRB Stage 2, a 'worst-case' approach has been taken for the assessment of landscape effects. This approach has also been taken in respect of the potential secondary mitigation measures. This means that where there is any ambiguity in the approach or efficacy of the mitigation measures, the secondary mitigation measures are not taken into consideration, resulting in no change to the impact significance.
- 17.2.37 The existing A96 has been considered in the baseline and in the creation of the ZTV. Traffic flows will be reduced on completion of the new dual carriageway, but it will remain as an active route.
- 17.2.38 The assessment recognises the additional impact of lighting, particularly at junctions. Where this has been identified, additional mitigation has been suggested. This will be assessed further at DMRB Stage 3 along with a further review of the effects of lights from vehicles.

17.3 Baseline

Study Area Context

- 17.3.1 The landscape study area is shown in Volume 5, Figures 17.1 to 17.13 and Volume 4b, Appendix A15.1: Visual Assessment Methodology. As an overview, the landscape can be summarised as:
- The study area runs approximately north-west to south-east in a broad corridor from east of Huntly to Kintore. Much of the area is farmed and there are distinctive pockets of mature woodland. To the north-west, the landform becomes more prominent as the corridor runs into the outlying hills and ridges LCT. To the south-east, the topography is softer towards the Coastal Agricultural Plain LCT.
 - The study area is largely rural but there is a network of roads and a regular distribution of settlements including small villages and individual dwellings. Within the area there are several windfarms and individual turbines as well as

a network of pylons and high voltage power lines. The area is already affected by the existing A96 and traffic noise is evident.

- The main settlement within the study area is Inverurie which lies to the eastern end of the scheme. Inverurie is a large town located at the confluence of the River Urie and the River Don to the south of the town. The town sits in the Urie and Don valley between farmland to the north-east and hills and woodland to the south-west. There are limited views of the existing A96 due to embankments and vegetation protecting the nearest properties.
- The area contains several cultural heritage assets and several Inventory Gardens and Designed Landscapes. The most significant of these are Harlaw Battlefield, Leith Hall, Williamston House, Newton House, Keith Hall, Balbithan House, Aquhorthies Stone Circle and Kinkell Church. Further information on historic features can be found in Chapter 16, Cultural Heritage.
- The rural landscape within the study area is popular for recreation and contains a number of Aberdeenshire's core paths (CP) and cycle ways. Aberdeenshire's CPs are commonly located around towns allowing access from villages and towns to rural, scenic areas or sites of interest. The longer routes can be found surrounding the larger towns, namely Huntly, Inch, Old Rayne, Oyne and Inverurie which are located along the A96 corridor. These paths can also be found linking with other CPs leading to villages and countryside trails providing connectivity across the landscape. A number of CPs have views over the existing A96 and the route options. There are also several golf courses in the area.
- There are two LDP Special Landscape Areas within the overall study area. To the north, the Deveron Valley is 'a farmed landscape framed by wooded hills and ridges'. To the west, the Bennachie range is a highly distinctive ridge that can be seen from across the study area.

17.3.2 The LVIA baseline assessment of the study area identifies 25 LLCAs. These are:

- 1 Huntly;
- 2 A97 Corridor;
- 3 Ba' Hill and Surrounds;
- 4 Strath Bogie Corridor;
- 5 Mains of Newtongarry;
- 6 Dummies to Stoneyfield;
- 7 Ridge from Gartly to Hill of Tillymorgan;
- 8 Bisset Moss;
- 9 Ythanwells;
- 10 Inch Basin;
- 11 Low Area from Colpy to Fisherford;
- 12 Hill of Rothmaise to Hill of Easterton;
- 13 Old Rayne to Harlaw

- 14 Bennachie and Surrounds;
- 15 Pitcapple to Daviot;
- 16 Wooded Farmland South of Chapel of Garioch;
- 17 River Don Wooded Corridor;
- 18 Wooded Farmland around Kemnay;
- 19 Inverurie and Settlement Corridor;
- 20 Old Meldrum and Surrounds;
- 21 Keith Hall and Surrounds;
- 22 Farmland East of Newmachar;
- 23 Hill of Marcus;
- 24 River Don Open Corridor; and
- 25 Open Farmland South of Kintore.




17.3.3 A visual representation of their extent and location is shown in Volume 5, Figures 17.14 to 17.19. The key characteristics of these LLCAs are described in Tables 1.5 to 1.7 of Appendix A17.2: Landscape Baseline and Effects (Volume 4b).





17.3.4 As a first step, the baseline assessment considered the Landscape Character Types outlined in the 2019 SNH guidance¹⁴². This defines in broad terms the qualities of the landscape. From this point, the landscape units were able to be identified which allowed a more detailed description of important characteristics. Finally, the LUs (refer to Table 17.1) were grouped into LLCAs. Each LLCA is described so that the cumulative characterisations provide a picture of what makes each LLCA unique and distinct. It should be noted that the landscape character assessment is based on these LLCAs.





17.3.5 Consideration was also given to the sensitivity of undesignated areas within the study area. The methodology for defining these Landscape High Sensitivity Areas is explained in the Landscape Appraisal Approach Technical Note found in Volume 4b, Appendix A17.3.



¹⁴² <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions/>

Table 17.1 Types of Landscape Units across the Study Area

Landscape Unit	Photographic Example	Key Characteristics / Sense of Place
<p>Settlement</p> <p><i>Typical of LUs</i> 1, 12, 41, 45, 46, 51, 60, 74, 80, 85, 88, 91, 95, 104, 107, 113</p>		<ul style="list-style-type: none"> • Groups of buildings with peripheral development • Complex landscape including mature trees • High levels of movement and noise • Influenced by infrastructure
<p>Corridor</p> <p><i>Typical of LUs</i> 2, 20, 30, 57</p>		<ul style="list-style-type: none"> • Linear routes including rivers, roads, rail • Often supported by lines of planting • Impact of infrastructure including power lines • Generally busy, appearing less natural
<p>Wooded hills</p> <p><i>Typical of LUs</i> 3, 4, 8, 11, 14, 18, 27, 29, 34, 38, 53, 77, 99, 106, 110</p>		<ul style="list-style-type: none"> • Distinctive hills mainly covered in trees with coniferous plantations and broadleaved woodland • Contained or limited views from this Landscape Unit • Edges create a contrast to surrounding landscape

Landscape Unit	Photographic Example	Key Characteristics / Sense of Place
<p>Farmed hill slopes</p> <p><i>Typical of LUs 13, 16, 19, 22, 24, 28, 42, 83, 105,</i></p>		<ul style="list-style-type: none"> • Steeper farmland below wooded or open hills. Field pattern is linear and generally up the slope • Predominantly grazing with hedges or stone walls <p>Long views and a sense of openness</p>
<p>Flatter wet land</p> <p><i>Typical of LUs 5, 10, 25, 36, 48, 52, 58, 59, 64, 69, 75, 98, 100</i></p>		<ul style="list-style-type: none"> • Flatter areas often at the foot of hills • May have standing water or moss areas • Largely unimproved grazing • Can look unkempt with reed growth in grassland
<p>Open hill</p> <p><i>Typical of LUs 6, 15, 21, 23, 26, 33, 39, 49, 54, 55, 56, 63, 78, 82, 84, 94</i></p>		<ul style="list-style-type: none"> • Hillside with few trees or hedges • Sense of openness often windswept • Many have wind turbines an obvious man-made element • Can also be grazed, usually by sheep
<p>Undulating farmland</p> <p><i>Typical of LUs 7, 31, 35, 37, 61, 71, 72, 97, 101</i></p>		<ul style="list-style-type: none"> • Wide-open large-scale landscape with good views from higher points • Undulating landscape curtails some views • Hedgerows and intermittent mature trees • Generally arable with large field sizes

Landscape Unit	Photographic Example	Key Characteristics / Sense of Place
<p>Distinctive ridges and shelterbelts</p> <p><i>Typical of LUs 9, 17, 32, 50</i></p>		<ul style="list-style-type: none"> • Shelter belts or avenues seen against a skyline • May contain footpaths or old tracks centrally • Often has relics of stone walls
<p>Meandering watercourse</p> <p><i>Typical of LUs 87, 90, 102</i></p>		<ul style="list-style-type: none"> • Enclosed river corridor contained by mature trees with flat land around river • Main feature is meandering, sinuous watercourse • May include other routes including roads and paths
<p>Designed estate</p> <p><i>Typical of LUs 44, 47, 62, 65, 66, 67, 70, 76, 86, 92, 96, 111</i></p>		<ul style="list-style-type: none"> • Designed estates and policies with a sense of security and enclosure • Parcels contained with tree screens, walls and hedges • Often includes estate houses or outbuildings
<p>Rolling wooded farmland</p> <p><i>Typical of LUs 68, 73, 81</i></p>		<ul style="list-style-type: none"> • Intricate landscape of smaller fields and blocks of planting • Views curtailed by topography and planting • Evidence of stone circles

Landscape Unit	Photographic Example	Key Characteristics / Sense of Place
<p>Wooded farmland</p> <p><i>Typical of LUs 93, 108, 109</i></p>		<ul style="list-style-type: none"> • Lowland areas with small fields and a pattern of woodland blocks • Intricate, enclosed landscape with contained views • Sheltered and secure in feel
<p>Recreation site</p> <p><i>Typical of LUs 40, 43, 79, 89, 103, 112</i></p>		<ul style="list-style-type: none"> • Various outdoor activities including fishing and golf • High maintenance areas • Active sites with human and vehicular movement • Generally sensitive to the surroundings

East of Huntly to Colpy

17.3.6 This section of the chapter summarises the baseline conditions within the study area between east of Huntly and Colpy which are described in detail within Table 1.5 of Appendix A17.2: Landscape Baseline and Effects (Volume 4b). Reference should be made to Figures 17.1 to 17.4 (Volume 5) and Figures 17.14 and 17.15 (Volume 5) for the distribution of landscape designations and the LLCAs respectively.

17.3.7 This study area between east of Huntly and Colpy includes 11 LLCAs of which the route options pass through six. On a broad level, this is a mixed area of land use, with intricate spaces and variable landform. It is largely rural and contains areas of undulating farmland, farmed hill slopes and clusters of coniferous woodland which lie on prominent open hills.

- The town of Huntly (LLCA1) lies at the western most edge of the study area. This is a large historic settlement which is set out over a traditional grid pattern and lies within the Deveron Valley Special Landscape Area. Peripheral trading estates and superstores are situated on the east, west and south-west edges of the settlement.
- At the western end of the study area, to the east of Huntly, the landscape is primarily a mix of open farmland and prominent hills which are lined with woodland. A large expanse of undulating farmland lies to the south-east of Huntly (see LLCA3) and is characterised by large, arable fields which are generally well maintained. Small pockets of woodland are common and field boundaries consist of hedgerow and post and wire fencing. Views from this farmland are generally open. Ba’ Hill Wood and Belts of Shanquhar are

encompassed by this farmland. Ba' Hill Wood consists of well managed coniferous woodland set on a distinct hill, while Belts of Shanquhar is a distinctive ridgeline feature with unkempt areas of rough grazing adjoining a mature tree belt.

- To the north-east of Huntly, there is a further large expanse of open farmland (see LLCA2). This is a broad sloping landscape, where land on the north facing slopes is utilised as grazing land, while the south facing slopes are used for arable purposes. The field boundaries generally run along the slopes and consist of stone walls and post and wire fencing. The area lies partially within Landscape High Sensitivity Area 2.
- Prominent hills including Cairn Hill and Battle Hill are situated within farmland to the east of Huntly and both form distinctive features within the landscape. Cairn Hill (see LLCA3) is an open hill which is surrounded by agricultural properties at its base. It contains distinctive masts and individual mature trees which are visible from the existing road network. Battle Hill (see LLCA2) is an area of rough grazing, bare slopes and mixed woodland, which also lies within the boundary of Deveron Valley Special Landscape Area¹⁴³.
- Towards the centre of this study area, there is a mix of open hills and further areas of farmed slopes. From the existing A96 road corridor, there are long views and a sense of openness with pylons and turbines visible from long distances. To the north and south of Hillhead, the landscape is broad and open, and there is a subtle area of undulating hills which extends from Hill of Chapelton to Hill of Dummuies (see LLCA6). Land use consists of arable and grazing land, and the area lies within Landscape High Sensitivity Area 2. Hill of Bainshole (see LLCA6) and Hill of Foudland (see LLCA7) are further areas of open hills, which are distinctive features within this area of the landscape. Hill of Bainshole is a group of open hills hosting a wind farm which lies partially within Landscape High Sensitivity Area 3. Hill of Foudland lies to the south of Bainshole and is an open hill with a rugged, distinctive skyline as a result of former quarrying. Hill of Foudland lies within Landscape High Sensitivity Area 4.
- As the existing A96 runs eastwards through the landscape at Glens of Foudland (see LLCA7), it passes through boggy fields, where the grassland appears to be less well drained. These are small rough, grazed fields which are bracketed by the road, surrounding hills and Glen Water. On either side of the road corridor to the north and south, there are areas of farmed hill slopes, which comprise open fields with mixed grazing and pockets of gorse in breaks and ridges.
- Large woodlands on prominent hills also lie to the north and south of the road corridor on Hill of Stoneyfield and Gartly Moor. Gartly Moor (see LLCA7) lies to the south of the existing A96 and is a large coniferous woodland set over prominent hills with telecoms masts on the skyline. The area is a working forestry area where planting and tree felling take place, yet is a relatively quiet, tranquil landscape. Hill of Stoneyfield lies to the north of the existing A96 and is a further area of coniferous woodland under woodland management.

¹⁴³ https://www.aberdeenshire.gov.uk/ldpmedia/9b_Special_landscape_areas_Part2.pdf.

- At the eastern end of this study area, Hill of Skares and Hill of Tillymorgan (see LLCA7) are dominant features of the landscape and make up distinctive skyline features. Hill of Skares is a group of hills covered with coniferous woodland which lies within Landscape High Sensitivity Area 4. Hill of Tillymorgan lies amongst the same hill range yet contains little woodland in comparison to the hills which surround it. It lies within the boundary of Landscape High Sensitivity Area 3. To the south of these hills beyond the existing A96 lies a further large area of undulating farmland.
- The village of Colpy (see LLCA11) lies at the eastern most section of this part of the study area and is a small hamlet which lies close to the existing A96 and within Landscape of High Sensitivity 4. Mature woodland surrounds the approaches to this hamlet. Farmed slopes to Hill of Skares surrounds much of Colpy in all directions.

Colpy to Pitcaple

- 17.3.8 This section of the chapter summarises the baseline conditions within the study area between Colpy and Pitcaple. This study area is described in detail within Table 1.6 of Appendix A17.2: Landscape Baseline and Effects (Volume 4b). Reference should be made to Figures 17.5 to 17.8 (Volume 5) and Figures 17.16 to 17.17 (Volume 5) for the distribution of landscape designations and the LLCAs respectively.
- 17.3.9 Between Colpy and Pitcaple, the study area contains seven LLCAs. At a broad level, this study area has a mix of different land uses where undulating farmland, open hills, small settlements and walled historic estates make up much of the landscape. A description of the area is summarised in the following paragraphs:
- To the east of Colpy, there are a number of land-uses which contribute to the landscape character (see LLCA11). The landscape at this location is primarily flat, open and made up of undulating farmland and an extensive flat, open area of rough grazing. The farmland is mostly grazing pasture with some beech lined roads and stone dykes that contribute to the landscape character. The area of rough grazing lies primarily in the north-eastern section of the study area between the existing A96 and the A920. It appears to be less well drained and contains rushes, sedges and areas of broadleaved woodland.
 - Several large estates are set amongst this farmland including Williamston House, Freefield House and Newton House. These estates share common features such as large houses, historic walled gardens with decorative ponds and mature estate trees. Williamston House lies within the boundary of Landscape High Sensitivity Area 3 whilst Newton House lies within the boundary of Landscape High Sensitivity Area 9. The small historic settlement of Inch is located at the south-west of this study area (see LLCA10). This large village has a historic core and contains a range of residential properties as well as a leisure centre and golf course. It lies within Landscape High Sensitivity Area 7.
 - At the centre of this study area, the existing A96 passes Pitmachie and Old Rayne (see LLCA13), two small settlements which lie within close proximity to one another, separated by the River Urie which flows south-east through the study area. Both are simple linear settlements which have developed along the lines of the surrounding roads and lie within the boundary of Landscape High Sensitivity Area 11.

- Beyond these settlements, the existing A96 road corridor runs through an area of flat farmland between Gadie Burn and the River Urie, known as Moor of Carden (see LLCA13). Unimproved grassland and broken stone walls are common features of this area.
- To the north and north-east of Moor of Carden, there is a further large expanse of undulating farmland which surrounds the small village of Meikle Wartle. Fields in this area are of differing sizes and primarily used for grazing, although some arable land use is present. Stone circles and other historic features are present within the area, as well as beech lined roads with shelter belts and stone dykes. To the south of Moor of Carden, there is a large area of rough grazing which surrounds Candle Hill which lies within Landscape High Sensitivity Area 11. Oyne Valley corridor dissects this area further south and runs east to west between Inch and Pitcaple. The small town of Oyne lies within this valley corridor. Oyne is a small settlement with a dispersed mix of new houses and some industrial units. Beyond the Oyne Valley lies Berry Hill; an open hill topped with gorse which lies in the shadow of Bennachie.
- At the Pitcaple end of this study area (see LLCA15), the landscape is similar to that at the west and comprises farmland, rolling hills and large country estates with subsequent gardens and houses.
- Estates such as Logie House, Crowmallie House and Pittodrie House are dominant features in the eastern section of the study area (see LLCA15 and LLCA16). The properties include features such mature estate lands, stone walls and mature estate trees, including beech shelterbelts. Crowmallie House lies within Landscape High Sensitivity Area 14, adjacent to Pittodrie House Hotel while Logie House lies within Landscape High Sensitivity Area 11.

Pitcaple to Kintore

- 17.3.10 This section of the chapter summarises the baseline conditions within the study area between Pitcaple and Kintore which are described within Table 1.7 of Appendix A17.2: Landscape Baseline and Effects (Volume 4b). Reference should be made to Figures 17.9 to 17.13 (Volume 5) and Figures 17.18 to 17.19 (Volume 5) for the distribution of landscape designations and the LLCAs respectively.
- 17.3.11 Between Pitcaple and Kintore, the study area contains 12 LLCAs and has a number of contrasting areas with mixed land use and varied landform. On a broad level, the western and eastern parts of this area are largely made of up of rolling farmland, with wide open landscapes. The central and south-eastern areas of the study area contain the two large settlements of Inverurie and Kintore.
- The town of Inverurie (see LLCA19) lies in the centre of this study area. It is a historic town constrained by the surrounding road and river corridors. The town predominantly contains stone buildings in its centre and there is industrial and retail development on its outer edges. The settlement has experienced linear development along the corridor of the existing A96 and connected to the other main settlement of the area; Kintore (see LLCA19). This is situated in the south-east of this study area and is a linear settlement which has developed along the River Don Valley (see LLCA24). Residential properties lie in the north of the settlement, while industrial activities operate in the south;

- The River Urie and the River Don both flow through this section of the study area and their valleys contribute to the local landscape character. The River Urie flows in a south-easterly direction through the area and appears as a distinct linear feature in the landscape (see LLCA24). It has a broad meandering river valley and a wide flat floodplain with a network of footpaths running through the surrounding reeds. The River Don flows in a north-easterly and south-easterly direction throughout the area. To the south of Inverurie, it is an enclosed river corridor contained by mature trees with some surrounding farmland and located within the boundary of Landscape High Sensitivity Area 11. As the river flows through Inverurie and to the north-east of Kintore, the river corridor becomes flatter and there are areas of rough grazing. This section of the river lies within the boundary of Landscape High Sensitivity Area 17;
- To the west of Inverurie, a significant portion of this landscape is designated as Bennachie Special Landscape Area¹⁴⁴ and also lies within the boundary of Landscape High Sensitivity Area 11 (see LLCA16). This area primarily consists of undulating, mixed arable fields and grazing pasture with mixed coniferous and deciduous tree belts and open views of the existing A96;
- The Pittodrie House Non-Inventory Designed Landscape and other mature policy woodlands has tree belts providing lushness and variety to the lower lying landscape which contrast with the remoteness, wildness and simplicity of upland moorland landscapes associated with the main Bennachie ridge (see LLCA14), an iconic landform, visible from much of the wider landscape area;
- Wooded slopes to Bennachie consist of large-scale coniferous plantations and the rocky rugged summits provide a distinctive sense of place. The surrounding settled landscape can often be viewed against the skyline in contrast with the green lowlands;
- The historic area of Pitcaple Castle also lies within this study area and is a heavily wooded estate (see LLCA15). There are little or no views of Pitcaple Castle itself outside the estate boundary;
- The settlement of Daviot is surrounded by rolling farmland and a wide-open area of landscape containing tree belts and wind turbines on Gallows Hill (see LLCA15). The settlement has a historic core with areas of new residential development expanding from its outer edges and is located within the boundary of Landscape High Sensitivity Area 13;
- At the eastern end of this study area, the landscape predominantly comprises large scale arable farmland which surrounds the small settlement of Kinmuck (see LLCA21). This is an open landscape with good views although there are minor areas of woodland, including a larger cluster of coniferous woodland at Newton Wood (see LLCA22). Smaller scale farmland is also present on the land to the north of the River Don. The south-eastern edge of this section (see LLCA18) also contains Clovenstone Quarry, a large excavated hill where

¹⁴⁴ Aberdeenshire Council. *Aberdeenshire Local Development Plan Supplementary Guidance 9: Special Landscape Areas 2017 (LDP2017), Statement of Importance: Bennachie Special Landscape Area*. Adopted on 17 April 2017. The eastern most extent of the area boundary covers the River Don valley east of Port Elphinstone joining the B993 and south to Kemnay, to Chapel of Garioch in the north.

infrastructure extends beyond the boundary of the quarry and noise and dust generating activities are likely to disrupt the tranquillity of the landscape;

- To the south-east, there is a further area of farmland which lies along land to the north of the River Don. Field sizes are smaller at this point and there is a pattern of woodland blocks; and
- There are two historic estates that lie within this study area: Bourtie House and Keith Hall. Bourtie House (see LLCA13) lies to the north-east of Inverurie and is a highly visible man-made landscape with broadleaved woodland plantations and a large pond system. Keith Hall (see LLCA21) is a large, heavily wooded estate which sits to the north-east of Inverurie. The estate is enclosed by woodland and rough grazing, creating an area of peaceful tranquillity.

17.4 Potential Impacts

17.4.1 Impacts from the following elements of the scheme have the potential to have a significant landscape effect:

- Introduction of the new dual carriageway with grade separated junctions and link roads;
- Associated moving vehicles (visible and audible);
- Changes to the existing road network, footpaths, rights of way and cycleways;
- Changes to the existing landform due to embankments and cuttings as part of the road construction;
- Loss of existing woodland, trees and hedgerows;
- New woodland, trees and hedgerows used as mitigation;
- New structures at bridge crossings and junctions;
- New road furniture, including signs;
- New lights and lighting at junctions;
- Loss of stone boundary walls; and
- New boundary walls or fencing installed as mitigation.

17.4.2 These impacts are examined further in respect of landscape character and in accordance with the strategic landscape objectives as identified in Appendix A17.3, Landscape Appraisal Approach Technical Note (Volume 4b) and are reflected in Tables 1.5 to 1.7 of Appendix A17.2, Landscape Baseline and Effects (Volume 4b), where the sensitivity of each LLCA is also considered.

17.5 Mitigation

17.5.1 Possible mitigation measures are split between primary mitigation measures and secondary mitigation measures, as described in GLVIA3 Section 4.21. Primary mitigation measures have been incorporated in the scheme design. These measures include design of the road alignment in cutting and use of underbridges

rather than overbridges where possible, whereas the following secondary mitigation measures (M1 – M7) have been considered to mitigate adverse visual effects identified through the LVIA:

- M1: Trees, woodland and hedgerows removed during construction of the scheme will be replaced in suitable locations as part of the landscape design;
- M2: New hedgerow planting (trees and shrubs). New lengths of hedgerow will be established where appropriate to integrate the new works with the existing landscape character and/or to screen or filter views from visual receptors;
- M3: Small areas of new woodland planting. Small areas of new woodland will be planted to integrate the new road with the existing landscape character and/or to screen or filter views from visual receptors. The species and density will be selected to relate to the distinct qualities of the landscape;
- M4: Extensive woodland planting. Large areas of new woodland will be planted to integrate the new road with the existing landscape character and/or to screen views from visual receptors. The species and density will be selected to relate to the distinct qualities of the landscape;
- M5: Landform modification. Embankment and cutting slopes will be shaped to integrate the new road with the surrounding existing landscape character and/or to screen views from visual receptors. Earthwork features may include linear earth bunds, convex slopes, broad landform mounds and false cuttings. The intention of some earth shaping will be to reduce the steepness and sharp changes in gradient of embankments or cuttings;
- M6: Reinstatement of stone walls or new stone walls. Stone walls to integrate the new road with the existing landscape character and/or screen views from visual receptors; and
- M7: Low lighting levels at junctions. Design of lighting at junctions to integrate the new road with the existing landscape character and/or minimise artificial lights being seen within the surrounding landscape.

17.5.2 Potential mitigation measures were considered for all the predicted adverse visual effects identified during the LVIA. The mitigation measures listed above are considered to help in reducing the level of effects. This is shown in Volume 4b, Appendix A15.2, Visual Receptors: Baseline Description and Assessment of Effects. At DMRB Stage 3 mitigation measures for the Preferred Option will be developed to address specific adverse effects.

17.5.3 For clarity, all suggested mitigation measures are included in Tables 17.2 to 17.7 of this chapter. These cover all the predicted adverse landscape effects considered at this stage. The mitigation measures are based on the DMRB Stage 2 route options but will be adjusted and developed in more specific detail during DMRB Stage 3.

17.5.4 The landscape assessment covers areas beyond the 3km study area as described in Chapter 15, Visual Effects. These wider areas may be affected by views towards the route option. Mitigating impacts from these areas may require additional measures, such as specific areas of screen planting. Consideration of the potential negative impacts from these measures will be taken during detailed design to ensure the best outcome.

17.6 Predicted Environmental Effects

17.6.1 This section provides a summary of the predicted landscape effects of each route option. The effects are described in detail within Tables 1.5 to 1.7 of Appendix A17.2: Landscape Baseline and Effects (Volume 4b). The general descriptions follow the route options from west to east.

East of Huntly to Colpy

17.6.2 The predicted effects of the Cyan and Red route options are described in Table 1.5 in Appendix A17.2: Landscape Baseline and Effects (Volume 4b). This section of the chapter provides a summary of the main issues. For landscape designations and the location of LLCAs refer to Figures 17.1 to 17.4 (Volume 5) and Figures 17.14 to 17.15 (Volume 5) respectively.

Cyan Route Option

- This route option closely follows the existing A96, joining the existing A96 near Leys of Dummies running between the Hills of Dummies and Chapelton (see LLCA6) along the existing A96 corridor and skirting the Hill of Skares (see LLCA7) before passing west of Colpy (see LLCA11).
- This route option would have adverse effects on some of the elevated landscape units including Hill of Dummies, Hill of Bainshole (see LLCA6) and the Hill of Foudland (see LLCA7). Views from high ground are difficult to screen and any changes will therefore be emphasised.
- The farmed hill slopes that contain the existing road corridor will also be affected. Due to the openness and elevation, the character of both the farmed hill slopes of Bainshole (see LLCA6) and Foudland (see LLCA7) will change due to the increased road corridor width and increase in general infrastructure.
- The increase in the road corridor width will change the landscape character. There will be a greater impact from the infrastructure associated with the road along its length. While this may not be as substantial as a completely new road corridor, there will still be an impact.
- Due to their proximity, the existing boggy fields along the road corridor between LLCA6 and LLCA7, will also be adversely affected. While this is not a very sensitive landscape, already being affected by the existing road corridor, there will be a noticeable increase in the proportion of road corridor to linear field pattern.
- There will be a noticeable change in character and adverse effect on the farmed slopes to the Hill of Skares (see LLCA7) as the widened corridor passes through this landscape.
- This route option passes close to the village of Colpy (see LLCA10). The route option is largely in cutting but the access roads and part of the route option are on embankment which together with the new Colpy junction north of the village will have a negative effect.

17.6.3 A summary of the results of the assessment for the Cyan route option can be found in Table 17.2. Moderate and major effects are deemed significant effects and are highlighted in bold.

Table 17.2 Predicted Landscape Effects: East of Huntly to Colpy (Cyan Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	1	Huntly	*					
LLCA	2	A97 Corridor		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	3	Ba' Hill and surrounds		Medium	Low	Minor	Not required	Minor
LLCA	4	Strath Bogie Corridor	*					
LLCA	5	Mains of Newtongarry		High	Medium	Moderate	M1, M2, M5, M7	Moderate
LLCA	6	Dummuies to Stoneyfield		High	High	Major	M1, M2, M5	Moderate
LLCA	7	Ridge from Gartly to Hill of Tillymorgan		High	Medium	Moderate	M1, M2, M3, M5, M7	Minor
LLCA	8	Bissett Moss		Medium	Negligible	Negligible	Not required	Negligible
LLCA	9	Ythanwells		High	Medium	Moderate	M1, M2, M3	Minor
LLCA	10	Insch Basin		High	Low	Minor	M1, M2, M5, M6	Minor
LLCA	11	Low Area from Colpy to Fisherford		High	Medium	Moderate	M1, M2, M3, M5	Moderate

NB - All effects are adverse unless noted

Red Route Option

- This route option runs off-line to the south of the existing A96. It requires large-scale earthworks on Saddle Hill (see LLCA6) with substantial cutting into the side of the hill to accommodate the increased road width.
- The route option then runs along the slopes of the Hill of Foudland before cutting through the gap between the Hill of Foudland and the Hill of Skares (see LLCA7), again requiring large-scale earthworks.
- As the route option becomes elevated up the farmed slopes of the Hill of Foudland, it will be more noticeable and will have a greater adverse impact on the landscape character (see LLCA7).
- Because of the earthworks and alignment of the route option across the slope, the hill slopes to Hill of Bainshole and Hill of Foudland will also be greatly affected. The Hill of Bainshole (see LLCA6) will be visually affected while the Hill of Foudland will be physically affected.
- Several elevated areas within LLCA6 and LLCA7 will have adverse effects including Hill of Dummuies, Hill of Bainshole, the Hill of Foudland and the Hill of Skares. The increase in the corridor width will change the character.
- Due to the proximity of this route option, the existing fields along the corridor will be adversely affected.
- The Hill of Foudland will become physically detached from the Hill of Skares (see LLCA7) by this route option as the new road runs through a cutting created in the shallow valley between the hills. This will have a significant effect on the character of this group of hills.
- There will be a noticeable change in character and an adverse impact on the farmed slopes to the Hill of Skares, particularly around the small group of houses known as Jericho (see LLCA7 and LLCA10), where the introduction of a new road corridor will have an impact on this pastoral setting.
- This route option passes west of the village of Colpy (see LLCA10) on embankment. Access roads rise from the existing level to join the elevated road. Due to the scale and elevation, this route option will be visible from some distance.

17.6.4 A summary of the results of the assessment for the Red route option can be found in Table 17.3. Moderate and major effects are deemed significant effects and are highlighted in bold.

Table 17.3 Predicted Landscape Effects: East of Huntly to Colpy (Red Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	1	Huntly	*					
LLCA	2	A97 Corridor		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	3	Ba' Hill and Surrounds		Medium	Low	Minor	Not required	Minor
LLCA	4	Strath Bogie Corridor	*					
LLCA	5	Mains of Newtongarry		High	Medium	Moderate	M1, M2, M5, M7	Moderate
LLCA	6	Dummuies to Stoneyfield		High	High	Major	M1, M2, M5	Major
LLCA	7	Ridge from Gartly to Hill of Tillymorgan		High	High	Major	M1, M2, M3, M5, M7	Moderate
LLCA	8	Bissett Moss		Medium	Negligible	Negligible	Not required	Negligible
LLCA	9	Ythanwells		High	Low	Minor	Not required	Minor
LLCA	10	Insch Basin		High	Medium	Moderate	M1, M2, M3, M4	Minor
LLCA	11	Low Area from Colpy to Fisherford		High	Medium	Moderate	M1, M2, M3, M5	Moderate

NB - All effects are adverse unless noted

Colpy to Pitcaple

17.6.5 The predicted effects of the Pink and Brown route options are described in Table 1.6 in Appendix A17.2: Landscape Baseline and Effects (Volume 4b). This section of the chapter provides a summary of the main issues. For landscape designations and the location of LLCAs refer to Figures 17.5 to 17.8 (Volume 5) and Figures 17.16 to 17.17 (Volume 5) respectively.

Pink Route Option

- This route option runs east past the Loch Inch fishery (see LLCA10) before running north of Newton House separating it from Freefield House (see LLCA11). It will be visible from the farmed slopes to Hill of Skares as it continues to run on embankment through the undulating farmland around Meikle Wartle. It will change the character of the view which is currently across flat farmland to the gently undulating farmland between Freefield House and Newton House (see LLCA11).
- The Pink route option turns east at the Loch Inch Fishery. This area has bungalows, a campsite and recreational fishing lakes. This section of the route option cuts through the site bringing the road corridor closer to the fishery creating a change in the character of this part of LLCA10.
- There will be a noticeable change in character and adverse effects to several areas within LLCA10 / LLCA11 caused both by the route option itself and the required access roads and the new Kellockbank junction.
- There is a large section of embankment between Freefield House and Newton House (see LLCA11) running across a field adjacent to St Cloud which would cause a change in the landscape character by introducing infrastructure into a pastoral landscape.
- This route option runs north of Old Rayne (see LLCA13) separating the groups of houses and farms that make up Westerton of New Rayne, Mains of New Rayne and Easterton of New Rayne. It also requires the removal of woodland close to Mill of Bonnyton.
- This route option runs through the undulating farmland north of Old Rayne before cutting through woodland at Woodend north of Logie House (see LLCA15).
- This route option then runs near Pitscurry Quarry (see LLCA15), in cutting, necessitating the removal of trees at Glenlogie near the quarry. The introduction of the road corridor through this intricate and intimate landscape will have a noticeable effect.

17.6.6 A summary of the results of the assessment for the Pink route option can be found in Table 17.4. Moderate and major effects are deemed significant effects and are highlighted in bold.

Table 17.4 Predicted Landscape effects: Colpy to Pitcaple (Pink Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	10	Insch Basin		High	Negligible	Minor	Not required	Minor
LLCA	11	Low Area from Colpy to Fisherford		High	High	Major	M1, M2, M5	Major
LLCA	12	Hill of Rothmaise to Hill of Easterton	*					
LLCA	13	Old Rayne to Harlaw		High	Low	Minor	M1, M2, M3, M5	Minor
LLCA	14	Bennachie and Surrounds		High	Low	Minor	M1, M2	Minor
LLCA	15	Pitcaple to Daviot		High	High	Major	M1, M2, M3, M5	Moderate
LLCA	16	Wooded Farmland South of Chapel of Garioch	*					

NB - All effects are adverse unless noted

Brown Route Option

- The Brown route option travels on a southern alignment from Loch Inch Fishery (see LLCA10). This area has bungalows, a campsite and recreational fishing lakes. This route option cuts through the site bringing the road corridor closer to the fishery creating a change in the landscape character of this area.
- The route option is on embankment at Little Lediken affecting a small part of this undulating farmland. This route option includes an overbridge close to East Lediken (see LLCA10) which will also affect the surrounding character. The route option at this point may also require the felling of a small block of mature trees at East Lediken.
- The route option travels west of Old Rayne (see LLCA13). As it runs alongside the existing A96, the infrastructure corridor will be significantly widened adding to the impact on the surrounding landscape.
- The increase in infrastructure and additional junctions mean it will also have an adverse impact on the higher open areas of undulating farmland and the more open parts around Candle Hill to the south-west of Old Rayne (see LLCA13).
- The route option then runs alongside the River Urie through Moor of Carden and surrounds, where there is another junction between Over Carden and Strathorn. It then runs on an embankment allowing it to cross the River Urie close to Logie House. This will have a significant adverse effect on the low-lying area around the river (see LLCA13).
- The route option then runs through the grounds of Logie House (see LLCA15). There will be a noticeable change in character and adverse effect as it travels through the Logie House estate. A significant amount of mature estate woodland will need to be felled to accommodate this route option.
- The route option travels past Logie Durno Farm on embankment to cross over the local road, further affecting the setting of Logie House.
- The route option passes Pitscurry Quarry, in cutting, necessitating the removal of trees at Glenlogie near the quarry. The introduction of the road corridor through this intricate and intimate landscape will have a noticeable impact (see LLCA15).

17.6.7 A summary of the results of the assessment for the Brown route option can be found in Table 17.5. Moderate and major effects are deemed 'significant' effects and are highlighted in bold.

Table 17.5 Predicted Landscape Effects: Colpy to Pitcaple (Brown Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	10	Insch Basin		High	Low	Minor	M3, M5, M7	Minor
LLCA	11	Low Area from Colpy to Fisherford		High	Low	Minor	M3, M5, M7	Minor
LLCA	12	Hill of Rothmaise to Hill of Easterton	*					
LLCA	13	Old Rayne to Harlaw		High	High	Major	M1, M2, M3, M5, M7	Major
LLCA	14	Bennachie and Surrounds		High	Medium	Moderate	M2, M3, M5, M7	Moderate
LLCA	15	Pitcaple to Daviot		High	High	Major	M1, M2, M3, M5	Major
LLCA	16	Wooded Farmland South of Chapel of Garioch	*					

NB - All effects are adverse unless noted

Pitcaple to Kintore

17.6.8 The predicted effects of the Violet and Orange route options are described in Table 1.7 in Appendix A17.2: Landscape Baseline and Effects (Volume 4b). This section of the chapter provides a summary of the main issues. For landscape designations and the location of LLCAs refer to Figures 17.9 to 17.13 (Volume 5) and Figures 17.18 to 17.19 (Volume 5) respectively.

Violet Route Option

- This route option runs south of Daviot to a new junction which sits in undulating farmland (see LLCA13). There will be a change in character with noticeable effects to this area caused both by the route option itself and necessary access roads and junctions. The wide-open spaces around the Harlaw monument will be retained, but because the landscape is gently undulating, high and open, the introduction of the road at this point will be noticeable.
- The route option travels close to the northern housing extension of Inverurie. While there is an impact associated with the introduction of new junctions at this point, there are blocks of mature tree planting that help to mitigate the impact.
- The route option then passes close to Bourtie House (see LLCA13), through an area of low-lying farmland. The character of Bourtie House with its open views across the man-made lake to countryside and trees will be adversely affected by the proximity of the new road.
- Due to the elevation of Lawel Hill (see LLCA20) overlooking the route option running across the lower lying farmland, there will be a change in the landscape character.
- The route option then travels through the eastern policies associated with Keith Hall at Ordiefauld (see LLCA21). This requires the felling of blocks of mature woodland to accommodate the road embankment. This will have an adverse impact on this landscape.
- The route option then travels across the undulating farmland before crossing the River Don (see LLCA24). The route option at this location has a wider impact as it will be visible across the valley. However, the impact will be mitigated by increased distance. The structure taking the road across the River Don will be an obvious change in the character of this area.
- This route option then joins the existing road at the Tavelty Junction (see LLCA19). This will change the gateway to Kintore.

17.6.9 A summary of the results of the assessment for the Violet route option can be found in Table 17.6. Moderate and major effects are deemed 'significant' effects and are highlighted in bold.

Table 17.6 Predicted Landscape Effects: Pitcaple to Kintore (Violet Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	13	Old Rayne to Harlaw		High	High	Major	M1, M2, M3, M5, M7	Major
LLCA	14	Bennachie and Surrounds		High	Low	Minor	M1, M2, M3, M5	Negligible
LLCA	15	Pitcaple to Daviot		High	Medium	Moderate	M1, M2, M3, M5, M7	Minor
LLCA	16	Wooded Farmland South of Chapel of Garioch		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	17	River Don Wooded Corridor	*					
LLCA	18	Wooded Farmland around Kemnay		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	19	Inverurie and Settlement corridor		High	Low	Minor	M1, M2, M3, M5, M7	Negligible
LLCA	20	Old Meldrum and Surrounds		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	21	Keith Hall and Surrounds		High	High	Major	M1, M2, M3, M5	Moderate
LLCA	22	Farmland East of Newmachar		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	23	Hill of Marcus		High	Low	Minor	Not required	Minor
LLCA	24	River Don Open Corridor		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	25	Open Farmland South of Kintore		Medium	Low	Minor	Not required	Minor

NB - All effects are adverse unless noted

Orange Route Option

- At Glenlogie, this route option crosses Pitscurry Moss, where the new Pitscurry Junction and overbridge are located in rolling wooded farmland (see LLCA15), creating an obvious change to this landscape character. The route option then begins to turn south to Mill of Pitcaple before it crosses the Oyne valley corridor.
- This route option then crosses the River Urie, the railway line and the existing A96 at Milton of Inveramsay before a new junction at Drimmies (see LLCA16). The openness of the farmland around Chapel of Garioch and Harlaw means any new development will be more obvious.
- Passing to the south-west of Inverurie the route option is on a slope before running behind Dilly Hill (see LLCA16). As it travels across the slope it will be more visible from Harlaw than the existing road corridor. The junction at Drimmies and the road in cutting will be visible from the River Urie corridor (see LLCA24) creating an adverse impact on this landscape.
- The Blackhall Road Junction west of Inverurie, close to Alton (see LLCA16), will be visible from more open areas as the road is on embankment.
- The wooded farmland (see LLCA16 and LLCA18) along this route option has the capacity to absorb change due to the tree coverage and topography, however, there will be a noticeable change in character and impact on other areas caused by the route option and the required access roads and junctions.
- The route option crosses the River Don (see LLCA17) where a considerable structure will be required to allow the crossing and the access roads. The substantial engineering works required to cross the River Don will have a noticeable impact on this area which is intricate and natural in appearance.
- Substantial tree felling at Haughton and Roquharold Hill (see LLCA17) will be required to accommodate the route option. As it runs across the side slope of Roquharold Hill the engineering works associated with the side cutting will be obvious, having an adverse impact on the contained river valley.
- The route option then travels close to Bruce's Camp behind Thainstone (see LLCA18), in cutting. Parts of the access roads will be elevated and have an adverse impact, but as most of the route option at this point is in cutting, the impacts will be lessened.
- The route option then merges with the existing road adjacent to Thainstone.

17.6.10 A summary of the results of the assessment for the Orange route option can be found in Table 17.7. Moderate and major effects are deemed 'significant' effects and are highlighted in bold.

Table 17.7 Predicted Landscape Effects: Pitcaple to Kintore (Orange Route Option)

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	13	Old Rayne to Harlaw		High	High	Major	M1, M2, M3, M5, M7	Moderate
LLCA	14	Bennachie and Surrounds		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	15	Pitcaple to Daviot		High	Medium	Moderate	M1, M2, M3, M5, M7	Minor
LLCA	16	Wooded Farmland South of Chapel of Garioch		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	17	River Don Wooded Corridor		High	High	Major	M1, M2, M3, M5	Major
LLCA	18	Wooded Farmland around Kemnay		High	Medium	Moderate	M1, M2, M3, M5	Minor
LLCA	19	Inverurie and Settlement Corridor		High	Negligible	Minor	M1, M2, M5	Negligible
LLCA	20	Old Meldrum and Surrounds	*					
LLCA	21	Keith Hall and Surrounds		High	Medium	Moderate	M1, M2, M3, M5, M7	Minor
LLCA	22	Farmland East of Newmachar	*					
LLCA	23	Hill of Marcus	*					
LLCA	24	River Don Open Corridor		High	Medium	Moderate	M1, M2, M3, M5	Minor

LLCA Landscape Receptor			Scoped out due to Distance or Screening	Sensitivity of Receptor	Magnitude of Change	Predicted Effects	Assumed Mitigation	Predicted Residual Effects
LLCA	25	Open Farmland South of Kintore		Medium	Low	Minor	Not required	Minor

NB - All effects are adverse unless noted

17.7 Cumulative Effects

- 17.7.1 GLVIA3 highlights that 'cumulative landscape and visual effects must be considered in LVIA' and highlights that 'the emphasis is on likely significant effects, careful thought should be given to what significant cumulative landscape and visual effects are likely to be generated. This should allow a sensible decision to be reached at the scoping stage so that the task is reasonable and in proportion to the nature of the project under consideration'¹⁴⁵.
- 17.7.2 This chapter reviews the significant known other developments within the study areas and beyond, that could have a significant cumulative effect on the landscape character.
- 17.7.3 The Aberdeenshire Council planning website¹⁴⁶ provides a list of known developments in this area that should be considered in any assessment of cumulative impact:

Clashindarroch II Wind Farm

- 17.7.4 Vattenfall Wind Power Ltd is seeking consent under Section 36 of the Electricity Act 1989 to install and operate a wind farm comprising up to 14 wind turbines and associated infrastructure. The Clashindarroch II Wind Farm would be located on land north-east to the existing operational Clashindarroch Wind Farm, approximately 6km to the south-west of Huntly with an approximate capacity of 56-84 MW. The turbines would be 180m tip height and 4-6MW each. Access to the 1,234Ha site would be from the A920, west of Huntly. Within a 10-20km of the proposed wind farm development site, 13-14 wind turbine blade tips may be visible as indicated on the submitted planning application drawing Figure 7.5a 'Blade Tip Zones of Theoretical Visibility'.¹⁴⁷ Figure 7.6 of the same application 'Blade Tip vs Hub Height Zones of Theoretical Visibility'¹⁴⁸ indicates blade tips and hubs will be visible. The higher elevation of the Red route option increases the potential for cumulative effects when both developments can be seen in the same view. The Cyan route option has less potential for cumulative effects when both developments can be seen in the same view because it follows the existing A96 on land of a lower elevation. Figure Viewpoint 16: A96, Leys of Dummuies of the EIA Report for Clashindarroch Wind Farm II illustrates the predicted effect from the existing A96 at Leys of Dummuies¹⁴⁹.
- 17.7.5 Due to the location, distance of the wind farm and intervening topography, no LLCAs will be significantly affected. Any LLCA south of the scheme will only be subject to cumulative effects on an experiential basis, not in terms of visibility as it would not be possible to view both developments at the same time.
- 17.7.6 Cumulative effects may be perceived from LLCA5, LLCA6, LLCA7, LLCA8 and LLCA9. However, due to the complexity of the wider landscape and the presence

¹⁴⁵ Landscape Institute and Institute of Environmental Management and Assessment. *Guidelines for Landscape and Visual Impact Assessment*. Third revised edition. Routledge. 2013. Page 132-133

¹⁴⁶ (<https://www.aberdeenshire.gov.uk/planning/masterplans/>)

¹⁴⁷ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement*, Prepared for: Vattenfall Wind Power Ltd. November 2019. Figure 7.5a 'Blade Tip Zones of Theoretical Visibility'.

¹⁴⁸ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement*, Prepared for: Vattenfall Wind Power Ltd. November 2019. Figure 7.6 'Blade Tip vs Hub Height Zones of Theoretical Visibility'.

¹⁴⁹ SLR Ltd. *Clashindarroch II Wind Farm Environmental Statement*, Prepared for: Vattenfall Wind Power Ltd. November 2019. Figure 7.37; 'Viewpoint 16: A96, Leys of Dummuies'.

of closer wind turbines, at Dummuie and Greenmyres, the effect on these LLCAs from the Clashindarroch proposal some 11km away is not significant.

Housing Sites

Inverurie South, Crichtie

17.7.7 This site, south-east of Inverurie, for 737 dwellings in a mixed-use masterplan has been approved in principle. This site lies to the north of LLCA18, close to Port Elphinstone and would affect the Orange route option.

17.7.8 When completed, this development would form an expansion to Port Elphinstone. There would be a cumulative effect, but as LLCA18 can accommodate change, it would not significantly alter its character.

Uryside, Portstown and Boynds Farm

17.7.9 This large-scale housing development area lies to the north-east of Inverurie and comprises a number of individual applications totalling over 600 dwellings. The sites sit within LLCA13 and would only affect the Violet route option.

17.7.10 On completion, this development would form a new north-east edge to Inverurie. Together with the Violet route option, there would be a cumulative effect but it would not alter the character of the adjacent LLCA.

Cumulative Effects Summary

17.7.11 It is considered that the landscape effects of these developments will not alter the overall findings of the landscape assessment.

17.8 Summary of Effects

17.8.1 This section summarises the key findings of the predicted residual effects for each route option in Tables 17.8 to 17.10.

Summary: East of Huntly to Colpy

Table 17.8 Summary of Predicted Residual Landscape Effects: East of Huntly to Colpy

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
<p>This route option closely follows the existing road corridor, joining the existing A96 near Leys of Dummuies running between the Hills of Dummuies and Chapelton along the existing A96 corridor and skirting the Hill of Skares before converging on a new junction west of Colpy.</p> <ul style="list-style-type: none"> • There are no Major adverse predicted residual effects for the Cyan route option. • There are Moderate adverse predicted residual landscape effects in: 	<p>This route option runs offline to the south of the existing A96. It requires significant earthworks on Saddle Hill and runs along the slopes of the Hill of Foudland before cutting through the gap between the Hill of Foudland and the Hill of Skares, before converging at a new junction at Colpy.</p> <ul style="list-style-type: none"> • There are Major adverse predicted residual landscape effects in: LLCA6 Dummuies to Stoneyfield • There are Moderate adverse predicted residual landscape effects in:

Predicted Residual Effects for Cyan Route Option	Predicted Residual Effects for Red Route Option
<p>LLCA5 Mains of Newtongarry LLCA6 Dummuies to Stoneyfield LLCA11 Low Area from Colpy to Fisherford.</p> <ul style="list-style-type: none"> • This route option will have adverse effects on some of the elevated landscapes including Hill of Dummuies, Hill of Bainshole and the Hill of Foudland. The increase in the road corridor width will change the character. Due to the proximity, the existing fields along the road corridor will also be adversely affected. • This route option cuts through Ramstone Hill. The section north of Saddle Hill will be on embankment making it more visible. • There will be a noticeable change in character and Moderate adverse effects to the farmed slopes to the Hill of Skares and Moderate adverse effects to the village of Colpy. 	<p>LLCA5 Mains of Newtongarry LLCA7 Ridge from Gartly to Hill of Tillymorgan LLCA11 Low Area from Colpy to Fisherford</p> <ul style="list-style-type: none"> • This route option runs across the lower slopes of the Glens of Foudland requiring significant earthworks. This will have a Major adverse effect on LLCA6. • There will be a noticeable change in character and Moderate adverse effects to the farmed slopes to the Hill of Skares and Moderate adverse effects to the village of Colpy. Additionally, because of the earthworks and alignment of the route option across the slope, the hill slopes to Hill of Bainshole and Hill of Foudland will also significantly be affected. • A number of elevated landscape areas will also have adverse effects including Hill of Dummuies, Hill of Bainshole, the Hill of Foudland and the Hill of Skares. The road corridor will change the character. The existing fields along the road corridor will also be adversely affected.

17.8.2 The Cyan route option more closely relates to the existing corridor and therefore has less impact than the Red route option as the Red route option cuts its way through highly visible slopes and existing natural gaps in adjoining hills. The Red route option would have a greater impact on the overall landscape character of these areas. In addition, both route options have moderate adverse predicted residual effects on the village of Colpy.

17.8.3 Overall the Cyan route option is predicted to have fewer negative effects on the landscape.

Summary: Colpy to Pitcaple

Table 17.9 Summary of Predicted Residual Landscape Effects: Colpy to Pitcaple

Predicted Residual Effects for Pink Route Option	Predicted Residual Effects for Brown Route Option
<p>This route option travels east past the Loch Inch fishery before running between Newton House and Freefield House. It then runs through the undulating farmland north of Old Rayne before cutting through woodland north of</p>	<p>This route option runs on a southern alignment from the fishery, generally following the existing A96. It passes to the west of Old Rayne and along the River Urie corridor where there is another junction at Carden. It then cuts through</p>

Predicted Residual Effects for Pink Route Option	Predicted Residual Effects for Brown Route Option
<p>Logie House. The route option then emerges near Pitscurry Quarry.</p> <ul style="list-style-type: none"> • There are Major adverse predicted residual landscape effects in: LLCA11 Low Area from Colpy to Fisherford • There are Moderate adverse predicted residual landscape effects in: LLCA15 Pitcaple to Daviot • The embankment between Freefield House and Newton House will have a Major adverse effect by introducing elevated infrastructure into a pastoral landscape. • There will be a noticeable change in character and Moderate adverse effects to a number of areas around Durno due to loss of woodland and earthworks within the undulating landscape. • Due to proximity, Loch Inch Fishery is adversely affected by this route option. 	<p>the policies of Logie House before emerging near Pitscurry Quarry.</p> <ul style="list-style-type: none"> • There are Major adverse predicted residual landscape effects in: LLCA13 Old Rayne to Harlaw LLCA15 Pitcaple to Daviot • There are Moderate adverse predicted residual landscape effects in: LLCA14 Bennachie and surrounds • The Carden Junction with sections of embankment will be very visible in the lower, flatter area; altering the character of this landscape. • There will be a noticeable change in character and Major adverse effects to the Logie House estate as the route option cuts through the policies. • From open areas on Bennachie this route option will cause a distinctive change in the landscape. • The new junction at Kellockbank affects a small part of the wider undulating landscape. The increase in infrastructure and additional junctions mean it may also have an adverse impact on the higher open areas around Meikle Wartle. • Due to proximity, Loch Inch Fishery is adversely affected by this route option.

17.8.4 The Pink route option impacts are associated with the junction and the proposed earthworks on the dual carriageway. The Brown route option keeps close to the existing A96 road corridor but then cuts through Logie House estate.

17.8.5 Overall the Pink route option is predicted to have fewer negative effects on the landscape.

Summary: Pitcaple to Kintore

Table 17.10 Summary of Predicted Residual Landscape Effects: Pitcaple to Kintore

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>This route option travels south of Daviot to a new junction which sits in undulating farmland. It runs through this landscape</p>	<p>The route option begins by a new junction at Pitscurry then crosses the River Urie and railway line at Milton of</p>

Predicted Residual Effects for Violet Route Option	Predicted Residual Effects for Orange Route Option
<p>coming close to the northern housing extension of Inverurie. It then travels close to Bourtie House through an area of flat low-lying farmland before cutting through the policies associated with Keith Hall. It then runs across the undulating farmland before crossing the River Don and joining the existing A96 at a large new junction by Kintore.</p> <ul style="list-style-type: none"> There are Major adverse predicted residual landscape effects in: LLCA13 Old Rayne to Harlaw There are Moderate adverse predicted residual landscape effects in: LLCA21 Keith Hall and surrounds Three junctions at Daviot, Uryside West and Uryside East with access roads and embankments will have a Major adverse effect on the landscape character. This route option runs through the policies associated with Keith Hall and requires the felling of important mature trees. This causes a Moderate adverse effect. There will be a noticeable change in character and Moderate adverse effects caused both by the route option itself and the necessary access roads and junctions. The character of Bourtie House with its open views across the man-made lake to countryside and trees will be adversely affected by the proximity of the new road. 	<p>Inveramsay before a new junction at Drimmies. In passing to the south-west of Inverurie the route option is on a slope before passing behind Dilly Hill. There is a new junction south-west of Inverurie which will be visible from the more open areas around East Aquhorthies. The route option then crosses the River Don where a considerable structure will be required. The route option then travels close to Bruce's Camp behind Thainstone in cutting.</p> <ul style="list-style-type: none"> There are Major adverse predicted residual landscape effects in: LLCA17 River Don wooded corridor There are Moderate adverse predicted residual landscape effects in: LLCA13 Old Rayne to Harlaw The substantial engineering works required to cross the River Don will have an adverse impact on this landscape which is intricate and natural in appearance. There will be a noticeable change in character and Moderate adverse effects caused both by the route option itself and the necessary access roads and junctions. The openness of the farmland around Chapel of Garioch and Harlaw means any new development is more obvious. The wooded farmland landscape has some capacity to absorb change due to tree coverage and topography.

17.8.6 The Violet route option runs north-east of Inverurie through more open countryside. It therefore has a larger impact as the Orange route option runs through a more complex, undulating landscape.

17.8.7 While both options show similar overall levels of impact, the impact of the Orange route option is more contained and is therefore predicted to have fewer negative effects on the landscape.

17.9 Scope of DMRB Stage 3 Assessment

17.9.1 The DMRB Stage 3 assessment process will be based on GLVIA3 and DMRB LA 107 Landscape and Visual Effects. It will consist of a more detailed review of the Preferred Option and its effects on receptors within the study area.

17.9.2 The key aspects of the DMRB Stage 3 landscape assessment process are as follows:

- Based on the Preferred Option, a revised specific landscape study area will be defined;
- Taking the Preferred Option and revised study area, a new digital ZTV will be produced. This will inform further site analysis and will be used to review the Preferred Option and any future alterations;
- Where it serves to illustrate effects and mitigation measures, wirelines and photomontages will be produced;
- Additional site surveys will be undertaken of both public and private land to add to the existing baseline information;
- The Preferred Option will be specifically reviewed against the developed strategic landscape objectives;
- Sensitive landscape receptors will be reviewed to ascertain if additional mitigation measures are possible. Mitigation measures will be reviewed to check that they do not cause additional negative effects elsewhere and where possible also provide mitigation for other topic areas;
- Landscape effects will be assessed for both the construction and operational stages of the Preferred Option. For the operational stage, assessment of effects will represent Year 1 winter and Year 15 summer, unless otherwise agreed with consultees; and
- Ongoing consultation with SNH, Aberdeenshire Council and the landscape advisor at Transport Scotland will take place during DMRB Stage 3 to discuss the method and scope of the LVIA, landscape sensitivities, further development of the landscape design objectives and potential landscape effects and mitigation measures.

18 Nature Conservation

18.1 Introduction

- 18.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the predicted effects of the route options on nature conservation.
- 18.1.2 At this stage in the design and assessment process, information about the likely nature, location and scale of some construction activities (e.g. location of construction compounds) is not available. The predicted effects reported in this chapter, therefore, focus on the permanent effects of the route options. Where construction activities can be predicted these are included.
- 18.1.3 This chapter is supported by the following appendices (Volume 4b):
- Appendix A18.1, Nature Conservation Assessment Methodology;
 - Appendix A18.2, Valuation of Ecological Features;
 - Appendix A18.3, Phase 1 Habitat Survey Target Notes; and
 - Appendix A18.4, Habitat Loss Calculations.
- 18.1.4 This chapter is supported by the following figures (Volume 5):
- Figures 8.1 to 8.13: Key Environmental Constraints;
 - Figures 18.1 to 18.21: Phase 1 Habitat Survey – Mapping; and
 - Figure 18.22: Wintering Geese Results.

Policy Context

- 18.1.5 The planning principles of protecting, enhancing and promoting access to key environmental resources, whilst supporting their sustainable use as described within Scottish Planning Policy (SPP) and Scotland's Third National Planning Framework (NPF3) are transcribed into local policy via the Aberdeenshire Local Development Plan (LDP). For an account of how the scheme relates to and complies with the full scope of SPP, NPF3 and Aberdeenshire LDP policies see Chapter 9, Policies and Plans.
- 18.1.6 Policies from the Aberdeenshire LDP of direct relevance to Nature Conservation are Policy E1 Natural Heritage and Policy P1 Layout, Siting and Design.
- 18.1.7 Policy E1 states that:

‘We will not allow new development where it may have an adverse effect on a nature conservation site designated for its biodiversity or geodiversity importance, except where the following circumstances apply...For other recognised nature conservation sites (such as Local Nature Conservation Sites, nature reserves, designated wetlands, woodland in the Scottish Natural Heritage Ancient Woodland Inventory and the Native Woodland Survey of Scotland) the proposal's public benefits must clearly outweigh the nature conservation value of the site. In all cases, impacts must be suitably mitigated and, for any proposals involving the removal of woodland, the Scottish Government's Control of Woodland Removal Policy will apply.’

- 18.1.8 The Scottish Government's Control of Woodland Removal Policy¹⁵⁰ states that:
- '...there is a strong presumption in favour of protecting Scotland's woodland resources'
- and
- 'There will be a strong presumption against removing the following types of woodland: ancient semi-natural woodland; woodland integral to the value of designated or special sites (Special Areas of Conservation (SACs); Special Protection Areas (SPAs); Sites of Special Scientific Interest (SSSIs); Ramsar sites; National Nature Reserves (NNRs); areas supporting priority habitats and species listed in the UK Biodiversity Action Plan; Scheduled Monuments; National Scenic Areas; and woodlands listed within the Inventory of Gardens and Designed Landscapes); woodlands critical to water catchment management or erosion control; or woodlands listed as 'Plantations on Ancient Woodland Sites' (PAWS). There will also be a strong presumption against woodland removal where it would lead to fragmentation or disconnection of important forest habitat networks.'
- 18.1.9 With respect to protected species and wider biodiversity Aberdeenshire LDP Policy E1 states:
- 'Development should seek to avoid any detrimental impact on protected species through the carrying out of surveys and submission of protection plans describing appropriate mitigation where necessary...A Baseline ecological survey should be conducted for all major developments...'
- 18.1.10 It also states that where a development may affect undesignated species or habitats of local or wider importance approval will only be given:
- '...when a baseline ecological survey has been carried out; the development has been designed to avoid impacts where possible; and, where impacts cannot reasonably be avoided, an ecological or geological management plan demonstrates public benefits that outweigh the ecological or geological value of the site. Development will not be allowed if it fragments habitats or is not designed to minimise any adverse impact on the sites environmental quality, ecological status or viability.'
- 18.1.11 Aberdeenshire LDP Policy P1 states that:
- 'All developments should identify measures that will be taken to improve biodiversity and geodiversity in proportion to the potential opportunities available and the scale of the development.'
- 18.1.12 It is clear from these policies that any chosen route option is required to minimise impacts on habitats (especially woodland), protected species and landscape connectivity present at the time of baseline reporting through avoidance and appropriate mitigation. The scheme should also look to deliver ecological enhancements locally and at the landscape scale in order to provide additional ecological benefits.

¹⁵⁰ The Scottish Government's Policy on Control of Woodland Removal available at: <https://forestry.gov.scot/publications/285-the-scottish-government-s-policy-on-control-of-woodland-removal/viewdocument>

18.2 Approach to Assessment

Introduction

18.2.1 This assessment was undertaken based on the guidance provided in DMRB (Volume 11, Section 3, Part 4, Ecology and Nature Conservation) and Interim Advice Note (IAN) 130/10 Ecology and Nature Conservation. This assessment considers the impacts on the following aspects of nature conservation:

- Designated sites (biological interests only);
- Terrestrial habitats and plant species;
- Terrestrial faunal species; and
- Freshwater habitats and species.

18.2.2 A full description of the assessment methodology is set out in Volume 4b, Appendix A18.1, Nature Conservation Assessment Methodology and Chapter 8, Introduction and Approach to Environmental Assessment.

18.2.3 This chapter also sets out the mitigation (see Section 18.5) which it is assumed will be further developed and delivered, and it reports any residual effects following mitigation.

Sources of Information

18.2.4 In addition to the DMRB guidance, the following published guidance was also considered in the preparation of this chapter:

- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment¹⁵¹;
- Scottish Natural Heritage (SNH) Environmental Impact Assessment Handbook¹⁵²;
- Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 habitat survey¹⁵³; and
- Wintering bird survey methods from Bird Census Techniques¹⁵⁴ and Bird Monitoring Methods: a manual of techniques for key UK species¹⁵⁵.

¹⁵¹ Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. CIEEM, Winchester.

¹⁵² Scottish Natural Heritage [SNH] (2018) *Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland*. SNH and Historic Environment Scotland (HES).

¹⁵³ Joint Nature Conservation Committee (JNCC) (2010) *Handbook for Phase 1 habitat survey – a technique for environmental audit*. JNCC, Peterborough.

¹⁵⁴ Bibby C., Burgess N., Hill D. (1992 and 2000) *Bird Census Techniques. Chapter 7 - Counting Individual Species. (2nd Edition)*.

¹⁵⁵ Gilbert G., Gibbons D., Evans J. (2011) *Bird Monitoring Methods: a manual of techniques for key UK species*. Royal Society for the Protection of Birds (RSPB)

Consultation

- 18.2.5 Consultation was undertaken with key statutory bodies, non-statutory consultees, and other local ecology groups. For a full list of those consulted refer to Table 8.3 in Section 8.3 of this report.
- 18.2.6 Where data and information on species and habitats has been provided and this has been verified by, or received from, a suitably experienced ecologist, this has been incorporated into the baseline assessment. This includes data received from members of the public and landowners which has informed our knowledge of the study area.

Assessment Methodology

- 18.2.7 The assessment and evaluation of nature conservation features was undertaken taking into consideration advice provided in IAN 130/10 and guidance published by CIEEM (2018).
- 18.2.8 In accordance with this guidance, at DMRB Stage 2, following the completion of baseline surveys, nature conservation features were assigned a level of value. The characterisation of impact on the nature conservation feature was then assessed, with consideration given to the scale, magnitude, duration and reversibility of effects, and whether the impacts were adverse or beneficial.
- 18.2.9 A characterisation of impact value was assigned, based on a scale of high, medium, low, or negligible. This characterisation of impact was correlated with the assigned receptor value to provide the predicted significance of effect, based on a scale of major, moderate, minor, or negligible.
- 18.2.10 The full methodology and criteria used to assess the value of nature conservation features is detailed in Volume 4b, Appendices A18.1, Nature Conservation Assessment Methodology and A18.2, Valuation of Ecological Features.
- 18.2.11 At DMRB Stage 3, a separate Habitats Regulations Appraisal (HRA) report will assess the Preferred Option in relation to potential impacts on European designated sites (Special Protection Areas (SPAs), Special Areas of Conservation (SACs), and Ramsar Sites) and the potential for Likely Significant Effects (LSEs) under the Habitat Regulations. SNH will be consulted on the development of the HRA process and the conclusions during DMRB Stage 3.

Limitations and Assumptions

New Guidance

- 18.2.12 An update to the Ecology and Nature Conservation assessment methodology, now referred to as Sustainability & Environment Appraisal LA 108 Biodiversity (hereafter referred to as the 'New Guidance') outlined in the DMRB was released in November 2019. The DMRB Stage 2 environmental assessment for this scheme was nearing completion at the time of the release of the New Guidance and this followed a structure outlined in the previous published DMRB guidance, (hereafter referred to as the 'Withdrawn Guidance'). It has been agreed with Transport Scotland and SNH that the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.

- 18.2.13 The following Paragraphs 18.2.14 to 18.2.21 outline the key differences between the Withdrawn Guidance and New Guidance and describe how this chapter meets the objectives of the New Guidance.
- 18.2.14 The New Guidance is titled Biodiversity, rather than Ecology and Nature Conservation and the definition of biodiversity is given as:
‘The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems’
- 18.2.15 This is a transition from the Withdrawn Guidance which had a more static approach to the conservation of habitats and species. The New Guidance still gives habitats and species a high value but explicitly positions them as units within a functional and dynamic ecosystem. In this way the New Guidance brings DMRB in line with recent guidance documentation produced by the Chartered Institute of Ecology and Environmental Management (CIEEM) about conducting ecological surveys and assessments¹⁵⁶. The most recent CIEEM guidance, adopted in this assessment, pre-dates the commencement of the DMRB Stage 2 Report and, as a result, the planning, data collection and reporting for the Nature Conservation chapter complies with the more functional and dynamic assessments required in the New Guidance.

Effects of New Guidance

- 18.2.16 Rather than identifying an explicitly three stage assessment, the New Guidance advocates a reporting process¹⁵⁷ differentiating between two elements; scoping and assessment. The conclusion of the scoping phase is the production of a report answering a set of scoping questions, based on a baseline scenario underpinned by desk study/ walk over surveys, and incorporating an evaluation of the potential significant effects on biodiversity resources. This leads into an assessment phase underpinned by detailed surveys to inform the final assessment and design. This DMRB Stage 2 Report fits well into this new process at the scoping reporting stage. It answers the scoping question ‘what is the preferred route?’, reports any potentially significant effects and outlines what surveys and further work need to be carried out to inform design and mitigation and to deliver the detailed assessment report.
- 18.2.17 Aside from the emphasis shift (nature conservation to biodiversity), the New Guidance requires an almost identical assessment of resource value as the Withdrawn Guidance, with the levels of resource importance (international, national, regional etc) remaining the same as that outlined in Interim Advice Note 130/10. The New Guidance explicitly includes certain habitats in addition to ancient woodland as examples of UK or nationally important habitats (e.g. blanket bog, limestone pavements) but this has no material change on the assessment conducted as part of the DMRB Stage 2 Report for this project. There is no change to the level of impacts (no change to major) assigned to biodiversity resources (formally referred to as ecological receptors) or the Significance of Effects (neutral to very large) in the New Guidance.
- 18.2.18 The New Guidance includes a significance matrix to be used to determine the significance effect appropriate for a particular level of impact on a resource of a given value. This was not provided in the Withdrawn Guidance. This DMRB Stage

¹⁵⁶ *Guidelines for ecological impact assessment in the UK and Ireland. Terrestrial, freshwater, coastal and marine.* CIEEM (2018)

¹⁵⁷ Figure 3.19 in DMRB LA 108 Biodiversity

2 Report assigns significance of impact using information from the literature, baseline assessment and professional judgement. The purpose of the DMRB Stage 2 Report is route option comparison and, as the methodology of assessment was applied consistently to each route option, the conclusions are valid under the New Guidance. At subsequent reporting stages the Preferred Option will be assessed using the New Guidance significance matrix.

- 18.2.19 Once the scheme progresses to the DMRB Stage 3 Reporting phase and onto an assessment of the Preferred Option, the New Guidance does diverge from the Withdrawn Guidance.
- 18.2.20 The New Guidance explicitly identifies mitigation design as an iterative process requiring early and ongoing engagement between the design engineers and the environmental team. As part of the reporting framework, the New Guidance suggests that the scale and nature of biodiversity change can include environmental net gains and incorporate ecosystem service assessments, natural capital assessments or biodiversity metric evaluation¹⁵⁸.
- 18.2.21 It also highlights enhancement opportunities as an integral part of project design which should be identified through the biodiversity assessment process. Monitoring of designed mitigation is also cited as a key element to be considered.

Other Limitations

Survey Constraints

- 18.2.22 The principal constraints of undertaking field surveys at this stage of the assessment are the following:
- Due to the large survey area, some Phase 1 Habitat Surveys were undertaken outside the optimum season in some cases. As a result, some botanical interests may be under recorded. However, habitats likely to support valuable or notable flora and which fall within the survey area for the Preferred Option will be subject to detailed botanical surveys (such as National Vegetation Classification (NVC)) at DMRB Stage 3;
 - Only those receptors captured as part of a standard extended Phase 1 Habitat Survey and wintering bird survey have been recorded during the field surveys. For example, aquatic invertebrates and macrophytes have not been recorded; and
 - Surveys have only been undertaken where access was obtained and it has been safe to survey.
- 18.2.23 Despite these limitations, it is considered that the information available and data collected is robust and sufficient to inform this assessment.

Assessment Constraints

- 18.2.24 Groundwater dependent terrestrial ecosystems (GWDTEs) have been scoped out of assessment at this stage as there is insufficient habitat data resolution and design detail to undertake a meaningful assessment. However, based on the

¹⁵⁸ There are annexes detailing supplementary guidance on measuring biodiversity change for schemes in different UK nations. No additional guidance is given for Scotland.

habitat data available, it is unlikely that the anticipated effects on GWDTEs would be a significant driver in determining the Preferred Option.

18.3 Baseline

18.3.1 The extended Phase 1 Habitat Survey consisted of a desktop study and field surveys within the study area.

Study Area Context

18.3.2 In accordance with DMRB guidance, the size of the study area will vary for each group of ecological features being considered, in order to encompass all potentially significant impacts.

18.3.3 The study area for the desk study was defined using a 2km buffer width from the outermost edge of the outermost route options i.e. top/toe of earthworks slope.

18.3.4 The study area for field surveys was defined using a 500m buffer width from the outermost edge of each route options i.e. top/toe of earthworks slope.

Desk Study Methodology

18.3.5 A search of the following sources of information was carried out to identify relevant literature, statutory and non-statutory designated sites of nature conservation value, and to obtain records of protected or notable species and habitats which may be present within the study area.

18.3.6 Geological designated sites are addressed in Chapter 19, Geology, Soils, Contaminated Land and Groundwater.

18.3.7 Information to inform the desk study was collated from the following sources:

- Scottish Natural Heritage (SNH) Sitelink¹⁵⁹ website;
- The Scottish Government's Land Information Search¹⁶⁰ tool;
- Scottish Environment Protection Agency (SEPA) River Basin Management Plan¹⁶¹ Interactive Map;
- SEPA Water Classification Hub¹⁶²;
- Joint Nature Conservation Committee (JNCC) website¹⁶³;
- National Biodiversity Atlas (NBN) Scotland website¹⁶⁴;
- Scottish Biodiversity List (SBL)¹⁶⁵;

¹⁵⁹ SNH SiteLink. Available at: <https://sitelink.nature.scot/map>

¹⁶⁰ Scottish Government. Land Information Search. Available at: https://map.environment.gov.scot/LIS_Agri/Agri.html

¹⁶¹ SEPA. *River Basin Management Planning*. Available at: <https://www.sepa.org.uk/environment/water/river-basin-management-planning/>

¹⁶² SEPA. *Water Classification Hub*. Available at: <https://www.sepa.org.uk/data-visualisation/water-classification-hub/>

¹⁶³ JNCC. Available at: <https://jncc.gov.uk/>

¹⁶⁴ NBN *Atlas Scotland*. Available at: <https://scotland.nbnatlas.org/>

¹⁶⁵ Scottish Government. *Scottish Biodiversity List*. Available at: <http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL>

- Birds of Conservation Concern (BoCC)¹⁶⁶ lists;
- North East Scotland Biological Recording Centre (NESBReC)¹⁶⁷;
- Ancient Woodland Inventory (AWI)^{168,169};
- Native Woodland Survey of Scotland (NWSS)¹⁷⁰;
- Native Woodland Habitat Networks (NWHN)¹⁷¹; and
- Consultee input (see Section 8.3).

18.3.8 Only records since January 2009 have been included within this assessment as it is considered that anything beyond this timeframe would not be representative of the current ecological status of the study area.

Field Survey Methodology

18.3.9 All habitats encountered were identified and coded according to the survey methods outlined in the Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit.

18.3.10 Target notes (as set out in Volume 4b, Appendix A18.3, Phase 1 Habitat Survey Target Notes) were made where necessary to record key habitat features and other features of nature conservation interest such as field signs or incidental sightings of any protected and notable¹⁷² species. Botanical names follow guidance provided by Stace¹⁷³. Some protected species data is required to remain confidential and, therefore, these are not mapped as Target Notes on the Phase 1 Habitat map. Badger (*Meles meles*), freshwater pearl mussel (FWPM) (*Margaritifera margaritifera*) and wildcat (*Felis silvestris*) data (both desktop data received, and field evidence recorded) will be collated in a confidential appendix at DMRB Stage 3, together with any other confidential protected species information. The sensitivity of data on other species will be assessed on a case by case basis.

18.3.11 Greylag goose (*Anser anser*) and pink-footed goose (*Anser brachyrhynchus*) are qualifying features of European designated sites within the Strategic Environmental Assessment (SEA)¹⁷⁴ area. As a result, wintering bird surveys for geese have been undertaken and the data collected has been used to inform this assessment. Wintering bird surveys will continue during DMRB Stage 3, to inform the assessment of the preferred route and the HRA.

¹⁶⁶ Eaton M.A., Aebischer N.J., Brown A.F., Hearn R.D., Lock L., Musgrove A.J., Noble D.G., Stroud D.A., Gregory R.D. (2015) *Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man*. British Birds 108: 708–746.

¹⁶⁷ NESBReC. Available at: <http://www.nesbrec.org.uk/>

¹⁶⁸ SNH *Ancient Woodland Inventory*. Available at: <https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=AWI>

¹⁶⁹ SNH *A guide to understanding the Scottish Ancient Woodland Inventory (AWI)*. Available at: <https://www.nature.scot/guide-understanding-scottish-ancient-woodland-inventory-awi>

¹⁷⁰ Scottish Forestry *Native Woodland Survey of Scotland (NWSS)*. Available at: <https://forestry.gov.scot/forests-environment/biodiversity/native-woodlands/native-woodland-survey-of-scotland-nwss>

¹⁷¹ Forest Research *Habitat Networks*. Available at: <https://www.forestresearch.gov.uk/research/habitat-networks/>

¹⁷² A 'notable' species is defined as those that are not afforded legal protection but are of importance at a national, regional or local scale. The species identified as 'notable' for this assessment are those listed on the SBL, as a BoCC, or on the North East Biodiversity Action Plan (BAP).

¹⁷³ Stace C.S (2019) *New Flora of the British Isles (4th Edition)*. C & M Floristics, Stowmarket.

¹⁷⁴ Transport Scotland (2015) *A96 Dualling Programme Strategic Environmental Assessment, Tier 2 Environmental Report Non-Technical Summary* May 2015.

Baseline Results

18.3.12 This section provides a discussion of protected and important ecological features within 500m of all route options. This is summarised in Table 18.2.

Designated Sites

18.3.13 The desk study shows that there are no European or nationally designated sites within 2km of any route option.

18.3.14 There are nine non-statutory designated sites within 2km of the outermost route options. Table 18.1 lists these sites along with their designation and qualifying features.

18.3.15 Geological designated sites are addressed in Chapter 19, Geology, Soils, Contaminated Land and Groundwater.

Table 18.1 Details of Designated Sites within 2km of the Outermost Route Options

Site Name	Designation	Approximate Grid Reference (Centre Point)	Qualifying Features
Strathbogie	Wildcat Priority Area (WPA)	NJ 49739 34210	Area known to support wildcat and with funding to support wildcat monitoring.
Cairnhill	LNCS	NJ 67122 32634	Mosaic of wet and heathland habitats including fen, rush pasture, wet woodland and acid grassland surrounding quarry.
Cottown Woods	LNCS	NJ 76548 15599	Mosaic of woodland types with small area of fen habitat. Good diversity of plant and invertebrate species. The site forms part of a network of woodlands within the local area.
Fetternear	LNCS	NJ 73307 17981	One of a series of woodlands around the Kemnay area, adjacent to River Don, largely dominated by birch (<i>Betula</i> sp.) with oak (<i>Quercus</i> sp.), ash (<i>Fraxinus</i> sp.) and small stands of aspen (<i>Populus</i> sp.). Wetter areas within the woodland contain willow (<i>Salix</i> sp.) scrub and wetland plants.
Kinkell Belt	LNCS	NJ 78398 19972	Wooded banks at the confluence of the Rivers Don and Urie. The long-established woodland contains a mixture of tree species with good ground flora of relatively common species.

Site Name	Designation	Approximate Grid Reference (Centre Point)	Qualifying Features
Pitscurry Moss	LNCS	NJ 73115 27410	Small area of wet meadow, wet woodland and birch woodland which supports a good diversity of plant species including some locally uncommon species such as creeping lady's tresses (<i>Goodyera repens</i>).
Sunnybrae Moss	LNCS	NJ 80031 23625	Small area of fen and grassland. Although small in size this site contributes to a network of wetland and fen habitats within the local area which are important for the small pearl-bordered fritillary butterfly (<i>Boloria selene</i>).
Toms Forest	LNCS	NJ 75909 17438	One of a suite of woodland sites around the Kemnay area. Mainly birch woodland with areas of open grassland and rich in invertebrates.
Bisset Moss	LNCS	NJ 61571 37184	A good example of a very wet lowland bog which supports a good diversity of plants.

East of Huntly to Colpy

Cyan Route Option

- 18.3.16 The Cyan route option primarily remains within the existing A96 corridor. Habitats impacted are primarily grassland and arable although there will be diversions required to the River Urie¹⁷⁵ and its riparian corridor. The realignment of the River Urie is expected to be less than 200m in length and other realignments required for the Cyan route option are short in length and affect minor watercourses.
- 18.3.17 This route option will result in approximately 5.5km of construction within the Strathbogie WPA (approximately extending from NJ 56146 37506 to NJ 59924 34904). As the route option is within the existing A96 corridor, there is limited direct land take from the WPA, although dense gorse scrub with a healthy rabbit population bordering some of the existing A96 is likely to provide an important wildcat prey resource. Desk study data and consultation responses indicate that wildcat are not restricted to the WPA and may be present in suitable habitats along the majority of this route option. Forestry and woodland either side of the existing A96 as it passes through the Glens of Foudland are of particular importance for wildcat, as is the riparian corridor of the River Urie.
- 18.3.18 A woodland to the west of Colpy (NJ 64064 32311), identified on the AWI as long established and of plantation origin, is also crossed.

¹⁷⁵ River Urie - source to Old Rayne (23369-MW)

- 18.3.19 Desk study data also indicates that badger, otter (*Lutra lutra*), water vole (*Arvicola amphibius*), pine marten (*Martes martes*), bats and red squirrel (*Sciurus vulgaris*) are likely to be present in suitable habitats along this route option. Road Traffic Accident (RTA) data demonstrates that badger attempt to cross the existing A96 along the entire online section and most habitats in the offline section are also suitable. Badger signs were noted at several locations in habitats within a 500m radius of this route option during the Phase 1 Habitat Surveys. As such, it is reasonable to assume badger will be present.
- 18.3.20 Desk data indicate pine marten are likely to be present in woodland to the north and east of this route option, around the Hill of Tillymorgan. RTA data indicates pine marten are crossing the existing A96 around the Hill of Skares.
- 18.3.21 Otter records are reported from the River Urie and otter are likely to exploit riparian habitats and forage in small tributaries along this route option. There are no water vole records within 500m of this route option, however, as they are present in tributaries to the north of the River Urie, it is reasonable to assume they may be present in suitable watercourses crossed by this route option. FWPM shells of unknown origin washing up at Inverurie following flooding events, and consultation responses suggest that the presence of a few small patches of FWPM in the River Urie catchment cannot be ruled out.
- 18.3.22 Woodland to the west of Colpy crossed by this route option is ecologically connected to locations of recent red squirrel records. Professional judgement indicates that red squirrel will likely be present in woodland in the Glens of Foudland.
- 18.3.23 Desk study records indicate that arable fields to the east of this route option may periodically support large numbers (>2000) of wintering geese, although these feeding areas are not anticipated to be impacted by direct land take.
- 18.3.24 The Cyan route option crosses at the headwaters of the River Urie, a water body with a 'good' ecological status¹⁶² supporting important stocks of resident and anadromous¹⁷⁶ trout (*Salmo trutta*). Giant hogweed (*Heracleum mantegazzianum*) is present along the River Urie near Colpy.
- 18.3.25 This route option follows the existing A96 through a potential habitat corridor linking a large ancient woodland block at Hill of Tillymorgan in the east, to Gartly Forest in the west. Although not offering continuous forest cover, it is likely to provide ecological connectivity for more mobile species which exploit edge habitats such as wildcat and pine marten, and species which are supported by the moorland habitat this habitat corridor is comprised of. This is supported by RTA records.

Red Route Option

- 18.3.26 The Red route option primarily crosses grassland, arable fields and forestry. These are intensively managed habitats and, while not floristically diverse, do support several rare or notable species. The Red route option crosses the River Urie, numerous field drains as well as the Jordan Burn¹⁷⁷, which is likely to require a significant realignment.
- 18.3.27 Approximately 5.8km of the Red route option passes through the Strathbogie WPA (from NJ 56146 37506 to NJ 59966 34681). This non-statutory designated site

¹⁷⁶ An anadromous fish is one which is born in fresh water, spends most of its life in the sea, but returns to fresh water to spawn.

¹⁷⁷ Jordan Burn (Ref No. 23369-T-1048)

defines an area known to support a population of wildcat and receives funding to promote and protect the species. Records received from consultees and the NESBReC confirm that wildcat and high scoring wildcat and domestic cat hybrids (*Felis silvestris x catus*¹⁷⁸) are present within the WPA, but also occur in suitable habitat across the wider landscape to the east of the WPA. Den sites are likely to be associated with forestry or gorse scrub although not exclusively. Consultation responses, desk study data, and assessment of habitats during the Phase 1 Habitat Surveys indicate that wildcat may exploit a significant proportion of the area within 500m of the Red route option.

- 18.3.28 Woodland to the west of Colpy (NJ 64064 32311) is listed on the Ancient Woodland Inventory (AWI) as long established and of plantation origin.
- 18.3.29 Desk study data also indicates that pine marten, badger, otter, water vole, bats and red squirrel are present in habitats crossed by the Red route option or within 500m of it.
- 18.3.30 Large blocks of forestry such as those at Jericho and the Hill of Skares are suitable for pine marten and desk study data indicate they have historically been present at the northern end of the Red route option, around Greenmyres Farm. Woodland to the west of Colpy is ecologically connected to locations of recent red squirrel records, and it is likely red squirrel are present in suitable blocks of forestry and semi-natural woodland along the entire Red route option.
- 18.3.31 The presence of foraging, commuting and sett building habitat, numerous desk study records and professional judgment indicate badger will be present in suitable habitats along the entire Red route option. Badger signs were noted at several points during the extended Phase 1 Habitat Surveys.
- 18.3.32 Barn owl (*Tyto alba*) are present in habitats adjacent to the Red route option and the Glens of Foudland has historically supported breeding peregrine (*Falco peregrinus*) within 500m of the route option. Woodland within the study area has the potential to support several Schedule 1 bird species.
- 18.3.33 The Red route option crosses River Urie in its upper reaches. Here the channel is narrow but provides suitable foraging and commuting habitat for otter, while slower-flowing reaches and smaller tributaries are likely to be suitable habitat for water vole. Desk study records show water vole present in tributaries of the River Urie to the north of the existing A96 and it is reasonable to assume they are also present in suitable habitat to the south.
- 18.3.34 The Red route option cuts across a potential habitat corridor¹⁷⁹ linking a large ancient woodland block at Hill of Tillymorgan in the east, to Gartly Forest in the west. This corridor is already cut by the current single carriageway A96 and although not offering continuous forest cover, it is likely to provide functional connectivity for more mobile species which exploit edge habitats such as wildcat, pine marten and badger or those supported by the moorland habitats which it comprises. Use of this habitat corridor is supported by RTA data.

¹⁷⁸ For additional information on the conservation status of wildcat and the interaction with feral cats, see Volume 4b, Appendix A18.2.

¹⁷⁹ A habitat corridor has been defined as an area of land considered to be particularly permeable to mobile animals, based on professional judgement of the type and mosaic of habitats present in relation to the wider landscape and desk study data received.

Colpy to Pitcaple

Pink Route Option

- 18.3.35 This route option primarily crosses arable fields and improved grassland although it also bisects two significant blocks of plantation woodland. The Pink route option also crosses a number of mature tree lines demarcating field boundaries. This is a feature of Aberdeenshire, noted throughout the field surveys undertaken, which enhances the overall ecological value by providing connectivity and additional diversity and structure through otherwise relatively homogeneous farming landscapes. This route option also crosses the River Urie¹⁷⁵, Bonnyton Burn (23289-MW) and the Burn of Durno (23287-MW).
- 18.3.36 The Pink route option passes through the centre of two blocks of woodland. The woodland block at NJ 68165 29121 is commercial forestry and the other, located at NJ 71313 27311 towards the southern end of this route option, is a 32ha block recorded as ancient woodland, classified as long established and of plantation origin. This block connects to the south with a large continuous woodland mosaic comprising both coniferous and broadleaved woodland patches.
- 18.3.37 Desk study data and consultation responses indicate that wildcat, badger, red squirrel, otter, pine marten, water vole and bats are all likely to be present in suitable habitats along the Pink route option.
- 18.3.38 This route option intersects with potential wildcat habitat at several locations, especially those crossing or adjacent to woodland. This assessment is supported by wildcat records from the block of ancient woodland south of Durno.
- 18.3.39 Badger records have been returned from Logie Woodlands and the availability of foraging, commuting and sett habitat along the entire Pink route option indicates badger are likely to be present in suitable habitats throughout. Pine marten have also been recorded in Logie Woodlands.
- 18.3.40 Red squirrel have been recorded around the southern end of this route option in Logie Woodlands, as well as along tree lines and gardens to the northern end of this route. It is reasonable to assume that red squirrel will be present wherever the route option interacts with suitable woodland.
- 18.3.41 Desk study data indicates that otter are likely to be present along the River Urie in the northern part of this route option and are not restricted to the riparian corridor, probably exploiting ponds and a nearby fishery. It is unlikely that either Bonnyton Burn or the Burn of Durno form part of otter core territory, more likely being exploited as an occasional resource. Both of these watercourses may support water vole. Although there are no confirmed records of water vole within 500m of the route option, given their distribution throughout the River Urie catchment, it would be reasonable to assume presence in suitable habitats.
- 18.3.42 Barn owl are known to be active within 500m of the Pink route option and will likely exploit all suitable habitats in the area. Desk study data indicates that arable land crossed by this route option is exploited on occasion by wintering geese, although regular feeding areas are predominantly further south.
- 18.3.43 The River Urie is classified as having a 'good' ecological status supporting very important stocks of resident and anadromous trout. There are recent records of FWPM shells of unknown origin washing up at Inverurie following flooding events, and consultation responses suggest that the presence of a few small patches of FWPM in the River Urie catchment cannot be ruled out. Bonnyton Burn and Burn of Durno are classified as having a 'moderate' ecological status, and still have the

potential to support protected or notable species. They also function as ecological corridors although this function is diminished by limited riparian cover.

- 18.3.44 Logie Woodlands are at the northern end of a potential habitat corridor. This corridor comprises adjacent woodland blocks which extend south to riparian woodland along the River Urie. For mobile species able to exploit edge habitats, this corridor provides an ecological link to habitats further south, on the northern flanks of Bennachie.

Brown Route Option

- 18.3.45 This route option primarily crosses improved grassland, arable farmland, and coniferous and mixed woodland as well as a number of mature tree lines. The Brown route option also crosses The Kellock (23292-MW), the Shevock Burn (23291-MW), Burn of Durno (23287-MW) and River Urie¹⁸⁰.
- 18.3.46 Four blocks of ancient woodland, all classed as being long established and of plantation origin, are crossed by this route option. This route option crosses directly through the middle of three of those blocks and skirts the northern tip of the other.
- 18.3.47 Giant hogweed is present in abundance along the River Urie, downstream of Old Rayne, along the western bank of the river adjacent to Logie Woodlands.
- 18.3.48 Desk study data indicates that wildcat, badger, red squirrel, otter, pine marten, water vole and bats are all likely to be present in suitable habitats along the Brown route option.
- 18.3.49 The Brown route option interacts with large areas of habitat suitable for wildcat, especially in and around Logie Woodlands. Desk study data indicates that wildcat and pine marten are active in woodland ecologically connected to the specific woodland blocks that this route option bisects, and it is therefore reasonable to assume that these species are present within the entire woodland complex. The interaction of small blocks of woodland, scrub and treelines within a predominantly agricultural landscape also make a large area around Pitmachie and Old Rayne suitable for wildcat.
- 18.3.50 The Brown route option crosses and interacts with multiple areas providing high quality badger habitat; arable land, connected via treelines and hedgerows, interspersed with large blocks of woodland. RTA information corroborates this with numerous badger fatalities recorded along this section of the existing A96. It is assumed that badger are active in all suitable habitats along the Brown route option.
- 18.3.51 The majority of woodland blocks crossed by or adjacent to this route option have red squirrel records associated with them. It is reasonable to assume that all woodlands along the Brown route option support red squirrel.
- 18.3.52 Desk study data indicates that otter are likely to be present along the River Urie and will, therefore, also likely exploit all suitable habitats crossed by the Brown route option, including watercourses and woodland blocks close to watercourses. There are no confirmed water vole records within 500m of this route option although given their distribution throughout the River Urie catchment and their elusive nature, it is reasonable to assume presence in suitable habitats along the Brown route option. Unconfirmed water vole records have been reported within the vicinity of Loch Inch Fishery.

¹⁸⁰River Urie - Old Rayne to Pitcaple (Ref No. 23288-MW)

- 18.3.53 Barn owl are known to be active within 500m of the Brown route option and will likely exploit all suitable habitats in this area. Osprey (*Pandion haliaetus*) have also been recorded foraging close to this route option and woodland within the study area has the potential to support several Schedule 1 bird species. Desk study data indicates that arable land crossed by the Brown route option is exploited on occasion by wintering geese, although regular feeding areas are predominantly further south.
- 18.3.54 The River Urie is classified as having a 'good' ecological status¹⁶² supporting important stocks of resident and anadromous trout. There are recent records of FWPM shells of unknown origin washing up at Inverurie following flooding events, and consultation responses suggest that the presence of a few small patches of FWPM in the River Urie catchment cannot be ruled out. The Shevock Burn is also identified as having a 'good' ecological status¹⁶² and provides an ecological corridor from the River Urie to several ponds, a potential resource for otter. The Kellock and Burn of Durno are classified as being of 'moderate' ecological status¹⁶², however, they still have the potential to support protected or notable species and function as ecological corridors.
- 18.3.55 Logie Woodlands are located at the northern end of a potential habitat corridor. This corridor comprises adjacent woodland blocks which extend south to riparian woodland along the River Urie. For mobile species able to exploit edge habitats, this corridor provides an ecological link to habitats further south, at the flanks of Bennachie.

Pitcaple to Kintore

Violet Route Option

- 18.3.56 This route option predominantly crosses arable and improved grassland. It crosses a single large block of plantation woodland south of Ordiefauld and three small blocks identified as ancient woodland. The route option also crosses a number of mature tree lines as well as the Ides Burn (23284-T-1130), Lochter Burn/Kings Burn (23284-MW) and the River Don¹⁸¹.
- 18.3.57 This route option bisects Pitscurry Moss LNCS. This locally designated site is a small area of wet meadow, wet woodland and birch woodland which supports a diversity of plant species including some locally uncommon species such as creeping lady's tresses.
- 18.3.58 The three blocks of ancient woodland crossed by the Violet route option are all classified as long-established woodland of plantation origin. The route option cuts through the middle of blocks of ancient woodland close to Glenlogie and Hill of Den. The majority of the ancient woodland at Portstown would be lost.
- 18.3.59 There are records of giant hogweed in woodland at Pitscurry Quarry, within 500m of the Violet route option. Large stands of Indian balsam (*Impatiens glandulifera*) are present upstream of the proposed crossing point of the River Don, but none have been recorded within 500m of this proposed crossing point.
- 18.3.60 Desk study data indicate that badger, otter, bats and red squirrel are likely to be present along the Violet route option. Desk study data also indicates that wildcat and pine marten may be present at the northern extent of the route option, south of Durno.

¹⁸¹ River Don - Inverurie to Dyce (Ref No. 23269-MW)

- 18.3.61 The Violet route option passes through high quality badger foraging and sett building habitat. RTA records indicate badger are historically active along this route option and recent walkover evidence corroborates this with an active sett recorded within 400m of the route option centreline, close to Mossfield. Badger field signs have been recorded in several land parcels crossed by the Violet route option.
- 18.3.62 Otter have been recorded upstream and downstream of the proposed crossing of the River Don and within 500m of the proposed crossing point of the Lochter Burn/Kings Burn. It should be assumed that any suitable stream or riparian habitat along this route option may support otter. There are several historic records (>10 years ago) of water vole along the Lochter Burn/Kings Burn but no recent records within 500m of the Violet route option.
- 18.3.63 The density of red squirrel records in woodland connected to or adjacent to woodland crossed by the Violet route option indicated that all blocks of woodland are likely to support red squirrel.
- 18.3.64 Desk study data indicate barn owl are present within 500m of the Violet route option and it is likely they will exploit all suitable habitats in the area. Osprey have also been recorded foraging close to the Violet route option, and woodland along the route option has the potential to support several Schedule 1 species. Significant numbers of wintering geese are regularly recorded on improved grassland and arable fields along this route option. Flock sizes reported in the desk study regularly exceed 200, with over 1000 reported on one occasion.
- 18.3.65 At the proposed water crossing points, the River Don is classified as having a 'good' overall ecological status¹⁶² and the Lochter Burn/ Kings Burn is classified as having a 'moderate' overall ecological status¹⁶². The River Don and Lochter Burn support a number of salmonid fish species. Aside from these main watercourses the Violet route option crosses several small field drains.

Orange Route Option

- 18.3.66 This route option crosses the River Urie¹⁸² and to the north of this crossing habitats are predominantly improved grassland. Between the River Urie and the River Don¹⁸³ it crosses predominantly arable and improved grassland habitats with arable being more dominant. Immediately to the south of the proposed crossing of the River Don the Orange route option passes through several woodlands which include mixed, broadleaved and coniferous stands. This route option then reverts back to predominantly arable and improved grassland habitat as the Orange route option re-joins the existing A96. This route option also crosses a number of mature tree lines.
- 18.3.67 This route option, specifically the proposed Pitscurry Junction, covers a large proportion of Pitscurry Moss LNCS. This locally designated site is a small area of wet meadow, wet woodland and birch woodland which supports a diversity of plant species including some locally uncommon species such as creeping lady's tresses.
- 18.3.68 This route option crosses and runs adjacent to six separate blocks of ancient woodland. At its northern extent the Orange route option crosses woods at Glenlogie, and further south-west it cuts across the western tip of Mill Wood, runs through and along the edge of Kemnay Woods, crosses the centre of two woodland blocks contributing to Kintore Woods, and also crosses the eastern end of

¹⁸² River Urie - Pitcaple to Lochter Burn (Ref No. 23283-MW)

¹⁸³ River Don – Alford to Inverurie (Ref No. 23293-MW)

- Thainstone House Woods. All these woodlands are classed as long-established woodland of plantation origin.
- 18.3.69 There are records of giant hogweed in woodland in Pitscurry Quarry, within 500m of the Orange route option. There are also records of giant hogweed (upstream) and Indian balsam (downstream) within 500m of the proposed crossing point of the River Don.
- 18.3.70 Desk study data indicates that badger, pine marten, otter, bats and red squirrel are likely to be active along the Orange route option. Desk study data indicates that wildcat may be active towards the northern extent of this route option while habitat to the south of Inverurie also has the potential to support this species.
- 18.3.71 The Orange route option crosses a mix of woodland and arable habitats which are optimal for badger. RTA data provide evidence of badger activity, and setts have been noted in the walkover surveys. to the north of the proposed River Don crossing.
- 18.3.72 To the north of the River Don, there are no records of pine marten within 500m of the Orange route option. South of the River Don there are records of this species from Kemnay Woods and a record of a single RTA along the existing A96. Pine marten are, therefore, assumed to be present within all suitable habitat south of the River Don.
- 18.3.73 The density and wide distribution of red squirrel records in woodland crossed or adjacent to the Orange route option indicates that all blocks of woodland crossed or adjacent to this route are likely to support red squirrel. Of particular interest are the woodlands along the River Don and around the River Urie at Pitcaple which have a high density of records.
- 18.3.74 Otter have been recorded upstream and downstream of the proposed crossing points along the Rivers Don and River Urie. Otter are likely to be active along these watercourses and in adjacent riparian habitat wherever the Orange route option passes close to the River Don and River Urie. In addition, any tributaries or adjacent habitats are likely to offer feeding opportunities. There are no water vole records within 500m of this route option, however, numerous ditches and field drains are crossed by the Orange route option and consultation with Scottish Wildlife Trust (SWT) and the River Don Trust has indicated that water vole are likely to be present in suitable habitat along the Orange route option.
- 18.3.75 Desk study data indicates wintering geese have been recorded foraging in pastures crossed by the Orange route option. Particularly large flocks (>300 birds) have been recorded around Inveramsay.
- 18.3.76 Where the Orange route option crosses the River Don and River Urie, the watercourses are classed as having a 'moderate' and 'good' ecological status respectively¹⁶². These rivers both support a variety of salmonid species and the River Urie is also noted for its populations of brown resident and anadromous trout. The Orange route option also crosses several small field drains.
- 18.3.77 The complex of riparian habitats and woodland to the west and south of Inverurie form a broad habitat corridor with ecological connectivity for mobile, edge tolerant species, linking to the eastern flanks of Bennachie.

Table 18.2 Summary of Protected and Important Ecological Features within 500m of All Route Options

Ecological Feature (within 500m of Each Route Option)	East of Huntly to Colpy		Colpy to Pitcaple		Pitcaple to Kintore	
	Cyan Route Option	Red Route Option	Pink Route Option	Brown Route Option	Violet Route Option	Orange Route Option
Internationally designated site	None	None	None	None	None	None
Nationally designated site	None	None	None	None	None	None
Locally designated site	None	None	None	None	Pitscurry Moss crossed	Pitscurry Moss – more than half of site lost
Informally designated site	WPA – 5.2km of online ¹⁸⁴ construction	WPA – 5.8km of new construction	None	None	None	None
Ancient woodland	34.3ha	6.4ha	55.1ha	121.2	68.2ha	145.6ha
Woodland area ¹⁸⁵ (classed as ancient and/or native) within air quality impact zones ¹⁸⁶	Likely Zone: 2.4ha Potential Zone: 9.1ha	Likely Zone: 2.4ha Potential Zone: 6.2ha	Likely Zone: 15.0ha Potential Zone: 29.9ha	Likely Zone: 26.1ha Potential Zone: 58.1ha	Likely Zone: 14.1ha Potential Zone: 24.4ha	Likely Zone: 34.7ha Potential Zone: 65.9ha

¹⁸⁴ In this context, online refers to within or immediately adjacent to the existing A96 corridor, and therefore there will be implications for roadside habitats.

¹⁸⁵ Ancient woodland is woodland listed on the Scottish Ancient Woodland Inventory (AWI), Native woodland is woodland classed as native on the Native Woodland Survey of Scotland (NWSS) which is not also classified as ancient. For more detail see Appendix A18.2.

¹⁸⁶ Air quality impact zones are Likely impact = <100m from the edge of the carriageway; Potential impact = 100-200m from the edge of the carriageway. These broad categories are taken from Natural England (2016) *The ecological effects of air pollution from road transport: an updated review*.

Ecological Feature (within 500m of Each Route Option)	East of Huntly to Colpy		Colpy to Pitcaple		Pitcaple to Kintore	
	Cyan Route Option	Red Route Option	Pink Route Option	Brown Route Option	Violet Route Option	Orange Route Option
Protected species and other species of nature conservation value – evidence of recent presence ¹⁸⁷	Wildcat Pine marten Red squirrel Badger Bats Otter Water vole Geese	Wildcat Pine marten Red squirrel Badger Otter Water vole Bats Barn owl	Wildcat Pine marten Red squirrel Badger Bats Otter Water vole Barn owl	Red Squirrel Badger Otter Water vole Bats Barn owl	Red squirrel Badger Otter Water vole Bats Geese	Red Squirrel Badger Pine marten Otter Water vole Bats Geese
Main watercourses	River Urie (23369-MW)	River Urie (23369-MW)	River Urie (23369-MW) Bonnyton Burn (23289-MW) Burn of Durno (23287-MW)	River Urie (232288-MW) Shevock Burn (23291-MW) The Kellock (23292-MW) Burn of Durno (23287-MW)	River Don (23269-MW) Lochter Burn / Kings Burn (23284-MW)	River Urie (23283-MW) River Don (23293-MW)

¹⁸⁷ Evidence compiled from NESBReC data and field evidence.

Ecological Feature (within 500m of Each Route Option)	East of Huntly to Colpy		Colpy to Pitcaple		Pitcaple to Kintore	
	Cyan Route Option	Red Route Option	Pink Route Option	Brown Route Option	Violet Route Option	Orange Route Option
Habitat corridor ¹⁷⁹	Enlargement of current break in corridor between Hill of Tillymorgan to Gartly Forest	New construction through corridor connecting Hill of Tillymorgan to Gartly Forest	New construction through corridor connecting Logie Woodlands to River Urie	New construction through corridor connecting Logie Woodlands to River Urie	Limited impact on significant corridors	New construction through corridor connecting Inverurie to Bennachie

18.4 Assessment

Potential Impacts

- 18.4.1 The potential impacts associated with each route option are presented below. The magnitude of predicted impacts has been considered in combination with the sensitivity of the baseline to determine the potential for significant effects. At this stage a full suite of potential impacts has been considered. This includes those impacts on features of nature conservation value which could be present, but for which there is no recent evidence¹⁸⁸. This has been done following the precautionary principle to ensure that potential impacts on species such as great crested newt (GCN) or FWPM are recorded. For the purposes of the assessment, impacts on these species are considered possible wherever suitable habitat is present.
- 18.4.2 The potential impacts are presented in Table 18.3 to Table 18.6. Potential impacts relevant to all route options are shown in Table 18.3 and Tables 18.4 to 18.6 show potential impacts specific to the three different geographical sections of the scheme. Impacts shown in the tables which are not predicted to be potentially significant have not been assessed or reported further in this chapter.
- 18.4.3 The detailed assessment methodology and valuation of ecological features is contained in Volume 4b, Appendix A18.1 Nature Conservation Assessment Methodology and Appendix A18.2, Valuation of Ecological Features.
- 18.4.4 The potential impacts detailed in Table 18.3 to Table 18.6 are reported in line with the following criteria:
- Potential impacts are those which could result from the construction (including land take) or operation of the route options;
 - Potential impacts are described without mitigation, and therefore represent a worst-case scenario. Mitigation measures are described in Section 18.5. Further mitigation to reduce impacts and effects will be developed for the Preferred Option during the DMRB Stage 3 assessment;
 - The assessment of impacts includes those that are common to all route options and those that vary between the route options. The potential impacts that are common to all route options have been based on the level of significance for a given feature in a specific location; and
 - For each route option, the amount of habitat loss has been calculated (Volume 4b, Appendix A18.4, Habitat Loss Calculations). This comprises areas which are predicted to be permanently lost as a result of the route option (but does not include construction loss (e.g. construction compounds) as explained in Paragraph 18.1.2).
- 18.4.5 Potential impacts may interact with each other causing an increase in the overall adverse effect. For example, habitat loss resulting from construction work has the

¹⁸⁸ Good examples of this are FWPM and GCN. Historical data has been cited as evidence that small isolated populations of FWPM may be present somewhere in the River Urie catchment, and GCN have recently been reported much further north (along the existing A96 corridor near Inverness). At this stage of the assessment, it is considered unlikely that either species will be recorded, however, given that they could be present, they have not been discounted at this stage.

potential to also result in disturbance and fragmentation effects. This aspect will require further analysis during the DMRB Stage 3 assessment.

- 18.4.6 The route options assessed have significant overlap in terms of their potential impacts, therefore, a combined table has been produced of the generic impacts that are applicable to all the route options being assessed at this stage. Table 18.3 presents these potential impacts. This is followed by individual Tables 18.4 to 18.6 covering additional potential impacts specific to each geographical section as stated in Paragraph 18.4.2.

Table 18.3 Potential Ecological Impacts for All Route Options

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
Red Squirrel	Collisions with construction traffic	Construction	Temporary	Authority	Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)		Permanent		
	Destruction of places of shelter				
	Loss or degradation of habitat				
	Reduction in landscape permeability				
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		
	Collisions with road traffic				
Badger	Collisions with construction traffic	Construction	Temporary	Local	Adverse
	Entrapment in excavations		Permanent		
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)				
	Destruction of setts				
	Loss or degradation of habitat				
	Reduction in landscape permeability (including severance of territories)				

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		
	Collisions with road traffic				
Bats	Destruction of roost sites	Construction	Permanent	Regional	Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
Otter	Collisions with construction traffic	Construction	Temporary	Regional	Adverse
	Destruction of places of shelter	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
Water Vole	Collisions with construction traffic	Construction	Temporary	Authority	Adverse
	Destruction of places of shelter	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
Wildcat	Collisions with construction traffic	Construction	Temporary	National	Adverse
	Destruction of places of shelter	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
Pine Marten	Collisions with construction traffic	Construction	Temporary	Authority	Adverse
	Destruction of places of shelter	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
Breeding Birds	Collisions and destruction of nests during vegetation clearance	Construction	Temporary	Regional	Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
Barn Owl	Collisions with construction traffic	Construction	Temporary	Authority	Adverse
	Destruction of roost sites	Construction	Permanent		Adverse
	Destruction of nesting sites	Construction	Permanent		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
Wintering birds (geese)	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary	International	Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
Non-Native species	Transfer of invasive non-native species (INNS) around the route	Construction	Temporary	Regional	Adverse
	Increased access to area of INNS	Operation	Permanent		Adverse
Fish (all species)	Interaction with construction vehicles at crossing and realignment points	Construction	Temporary	Authority	Adverse
	Dewatering channels during crossing works or realignments	Construction	Temporary		Adverse
	Reduction in water quality	Construction	Permanent		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Barriers to migration	Construction	Permanent		
Macroinvertebrates	Interaction with construction vehicles at crossing and realignment points	Construction	Temporary	Authority	Adverse
	Dewatering channels during crossing works or realignments	Construction	Temporary		Adverse
	Reduction in water quality	Construction	Permanent		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Loss or degradation of habitat	Construction	Permanent		Adverse
Aquatic macrophytes	Interaction with construction vehicles at crossing and realignment points	Construction	Temporary	Site	Adverse
	Reduction in water quality	Construction	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
Terrestrial invertebrates	Interaction with construction vehicles at crossing and realignment points	Construction	Temporary	Authority	Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
Great crested newt (GCN) ¹⁸⁹	Collisions with construction traffic	Construction	Temporary	National	Adverse
	Destruction of hibernacula	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse

¹⁸⁹ Included following precautionary principle

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Reduction in water quality	Construction	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
Amphibians	Collisions with construction traffic	Construction	Temporary	Local	Adverse
	Destruction of hibernacula	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (noise, light, vibration)	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
	Reduction in water quality	Construction	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
Reptiles	Collisions with construction traffic	Construction	Temporary	Authority Authority	Adverse
	Destruction of hibernacula	Construction	Permanent		Adverse
	Entrapment in excavations	Construction	Temporary		Adverse
	Disturbance associated with construction (noise, dust, lighting, vibration, footfall)	Construction	Temporary		Adverse
	Disturbance associated with operation (Noise, light, vibration)	Operation	Permanent		Adverse
	Reduction in landscape permeability	Construction	Permanent		Adverse
	Collisions with road traffic	Operation	Permanent		Adverse
	Loss or degradation of habitat	Construction	Permanent		Adverse
Overall habitat connectivity	Cumulative impact of the removal or severance of small scale habitat or landscape features	Construction	Permanent	Authority	Adverse
Transfer of wildlife diseases	Introduction of diseases from outside of scheme area or transference within scheme area	Construction	Temporary	National	Adverse
Waterbodies	Loss of habitat and installation of structures acting as obstacles to passage	Construction	Permanent	Authority	Adverse
	Realignment	Construction	Permanent		Adverse

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial
		Phase of Impact	Duration		
	Change in physical processes (sediment/ flow regime)	Construction	Permanent		Adverse
Hydrological connectivity/ changes	Severance of hydrological linkages	Construction	Permanent	Local	Adverse
Ancient Woodland	Direct loss of ancient woodland	Construction	Permanent	National	Adverse
	Loss of functionality of the remaining woodland though elevated pollution, shifts in drainage and increased disturbance	Operation	Permanent		Adverse
Native woodland	Direct loss of native woodland	Construction	Permanent	Authority	Adverse
	Loss of functionality of the remaining woodland though elevated pollution, shifts in drainage increased disturbance	Operation	Permanent		Adverse
Terrestrial habitats	Direct loss of non-designated semi-natural habitats	Construction	Permanent	Local	Adverse
	Increased local air pollution and deposition of pollutants on habitats adjacent to route corridor		Permanent		Adverse

Table 18.4 Potential Ecological Impacts Specific to East of Huntly to Colpy

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial	Relevant Route Option
		Phase of Impact	Duration			
Strathbogie Wildcat	Acute pollution events	Construction	Temporary	National	Adverse	Cyan and Red

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial	Relevant Route Option
		Phase of Impact	Duration			
Protection Area (WPA)	Land take	Construction	Permanent		Adverse	
	Changes to habitat suitability	Construction	Permanent		Adverse	
Habitat corridor connecting Hill of Tillymorgan to Gartly Forest	Severance (loss of function)	Construction	Permanent	Authority	Adverse	Cyan and Red
	Land take	Construction	Permanent		Adverse	
	Changes to habitat suitability	Construction	Permanent		Adverse	
	Increased interaction between fauna and traffic including RTA, disturbance and air pollution	Operation	Permanent		Adverse	
Freshwater Pearl Mussel (FWPM) ¹⁸⁹	Destruction of FWPM beds	Construction	Permanent	International	Adverse	Cyan
	Dewatering channels during crossing works or realignments	Construction	Temporary		Adverse	
	Reduction in water quality	Construction	Permanent		Adverse	
	Loss or degradation of habitat	Construction	Permanent		Adverse	

Table 18.5 Potential Ecological Impacts Specific to Colpy to Pitcaple

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial	Relevant Route Option
		Phase of Impact	Duration			
Habitat corridor connecting Logie Woodlands to River Urie	Severance (loss of function)	Construction	Permanent	Authority	Adverse	Pink and Brown
	Land take	Construction	Permanent		Adverse	
	Changes to habitat suitability	Construction	Permanent		Adverse	
	Increased interaction between fauna and traffic including RTA, disturbance and air pollution	Operation	Permanent		Adverse	
Freshwater Pearl Mussel (FWPM) ¹⁸⁹	Destruction of FWPM beds	Construction	Permanent	International	Adverse	Pink and Brown
	Dewatering channels during crossing works or realignments	Construction	Temporary		Adverse	
	Reduction in water quality	Construction	Permanent		Adverse	
	Loss or degradation of habitat	Construction	Permanent		Adverse	

Table 18.6 Potential Ecological Impacts Specific to Pitcaple to Kintore

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial	Relevant Route Options
		Phase of Impact	Duration			
Pitscurry Moss Local Nature Conservation Site (LNCS)	Acute pollution events	Construction	Permanent	Authority	Adverse	Violet and Orange
	Land take	Construction	Permanent		Adverse	
	Changes to habitat suitability	Construction	Permanent		Adverse	
Habitat corridor connecting the south of Inverurie to Bennachie.	Severance (loss of function)	Construction	Permanent	Authority	Adverse	Orange
	Land take	Construction	Permanent		Adverse	
	Changes to habitat suitability	Construction	Permanent		Adverse	
	Increased interaction between fauna and traffic including RTA, disturbance and air pollution	Operation	Permanent		Adverse	
Freshwater Pearl Mussel (FWPM) ¹⁸⁹	Destruction of FWPM beds	Construction	Permanent	International	Adverse	Violet and Orange
	Dewatering channels during crossing works or realignments	Construction	Temporary		Adverse	
	Reduction in water quality	Construction	Permanent		Adverse	

Potential Impact		Impact Timescale		Value	Adverse/ Beneficial	Relevant Route Options
		Phase of Impact	Duration			
	Loss or degradation of habitat	Construction	Permanent		Adverse	

18.5 Mitigation

- 18.5.1 It is not possible at this stage of the design process for mitigation measures to be designed in detail. This section therefore identifies possible mitigation measures which are considered appropriate given the current understanding of the scheme. These measures will be developed and refined further based on detailed ecological survey work for each ecological feature, which will be undertaken on the Preferred Option, as part of the Stage 3 DMRB assessment.
- 18.5.2 The mitigation measures outlined within this section consider best practice, legislation and guidance from CIEEM, DMRB, Scottish Natural Heritage and SEPA. The following hierarchical approach to mitigation has been adopted throughout the design process: avoid; mitigate; compensate; enhance, in order to avoid impacts in the first instance and then minimise those remaining where possible. This accords with CIEEM EclA guidance (2018)¹⁵¹; DMRB LA 108 Biodiversity; Planning Advice Notice (PAN) 1/2013: Environmental Impact Assessment¹⁹⁰, and the A96 Dualling Strategic Environmental Principles Report¹⁹¹ and A96 Dualling SEA – Post Adoption Statement¹⁹².
- 18.5.3 It has been assumed that all mitigation will be designed to support Biodiversity Net Gain as a route to delivering the Scottish Planning Policy¹⁹³ objective of ‘benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats’. It also aligns with Transport Scotland’s ‘Fitting Landscapes’ policy¹⁹⁴, which supports the following key aims: ensure high quality of design and place; enhance and protect natural heritage; use resources wisely; and build in adaptability and change. These aims are designed to ensure the landscapes that Transport Scotland creates ‘are of high quality, well integrated, bio-diverse, adaptable and deliver a meaningful contribution to national sustainability targets’.
- 18.5.4 It has been assumed that impacts of negligible significance and the majority of impacts with minor significance will be mitigated through best practice methodologies.
- 18.5.5 Impacts of moderate or higher significance will be mitigated by a combination of best practice and the generic mitigation techniques outlined below (i.e. Eco_1 to 26), applied to each specific circumstance. These will be reviewed and refined at DMRB Stage 3. In some cases compensation may also be required which would be detailed following further ecological survey and stakeholder engagement:
- Eco_1: Construction activities will be timed to avoid sensitive seasons or daily activity periods of sensitive ecological features wherever possible (e.g. vegetation clearance outwith the breeding bird season; percussive

¹⁹⁰ Scottish Government (2013) *Planning Advice Note 1/2013: Environmental Impact Assessment (Rev. 1.0 2017)*. Available at: <https://www.gov.scot/publications/planning-advice-note-1-2013-environmental-impact-assessment/>

¹⁹¹ Transport Scotland (2016) *A96 Dualling Programme: Strategic Environmental Principles*.

¹⁹² Transport Scotland (2016) *A96 Dualling Programme: Strategic Environmental Assessment Post Adoption Statement*. Available at: <https://www.transport.gov.scot/media/39288/a96-t2-sea-post-adoption-statement.pdf>

¹⁹³ Scottish Government (2014) *Scottish Planning Policy*. Available at: <https://www.gov.scot/publications/scottish-planning-policy/pages/2/>

¹⁹⁴ Transport Scotland. *Landscape and biodiversity and ‘Fitting Landscapes’ policy* Available at: <https://www.transport.gov.scot/our-approach/environment/landscape-and-biodiversity/> and <https://www.transport.gov.scot/media/33663/j279083.pdf>

construction works in proximity to watercourses outwith sensitive salmon migration periods);

- Eco_2: Noise limiting measures such as baffles and soft-start techniques will be implemented when works pose a risk of disturbance to sensitive ecological features (e.g. badger setts or places of shelter for mammals);
- Eco_3: Visual screens will be used during construction where appropriate to screen activities from sensitive ecological features (e.g. active birds' nests);
- Eco_4: Detailed preconstruction surveys will be undertaken to allow micro management of vegetation clearance activities and location of ground investigation points to minimise disturbance and direct mortality of protected species and other species and habitats of nature conservation value;
- Eco_5: Exclusion zones will be implemented where appropriate to minimise disturbance of sensitive ecological features (e.g. raptor nests);
- Eco_6: Destruction of habitats and disturbance of species will be kept to a minimum by minimising land take (especially of ecologically valuable habitats) for the working corridor and having ecologically-sensitive access routes;
- Eco_7: Individual plant specimens identified as being of conservation importance will be transplanted;
- Eco_8: Measures for the correct storage and reuse of topsoil will be implemented during construction to maximise seedbank retention in situ or within other appropriate locations if in situ reinstatement is not possible;
- Eco_9: An invasive non-native species (INNS) management plan will be produced, informed by detailed INNS surveys. This will be implemented for the full duration of construction and subsequently be adopted by the road operator. The management plan will involve both onsite management and off-site disposal using licenced contractors;
- Eco_10: A biosecurity plan will be produced and implemented;
- Eco_11: An appropriate and targeted conservation management plan will be produced which could include habitat and/or species management plans, measurable targets, monitoring methodologies and accountability plans;
- Eco_12: Active management of implemented mitigation based on feedback from monitoring will be explicitly written into a long-term Mitigation, Compensation and Monitoring Agreement (MCMA) agreed with statutory bodies and the planning authority. Delivery of the MCMA may be overseen by a regulators group;
- Eco_13: Fauna will be excluded from live construction sites where necessary on a temporary or permanent basis by implementing protection systems and exclusion zones. Temporary fencing (e.g. mammal/ amphibian) will be implemented where required;
- Eco_14: Best practice methods for mitigating mortality from traffic during operation and maintaining landscape permeability will be implemented. This will include a combination approach between fencing, planting and the design and the co-ordinated location of crossing elements such as bridges, culverts

and underpasses (both fauna specific and those to maintain the integrity of farms);

- Eco_15: The severance of species key commuting routes by the new road will be mitigated by the provision of location appropriate features (e.g. underpasses/bridges) supplemented by a planting regime allowing safe passage across or under the road;
- Eco_16: Where resting sites, breeding sites or refugia are lost or are considered no longer functional, artificial replacements will be created in locations chosen and planted to maximise their success¹⁹⁵. All specific mitigation will be agreed with SNH and in accordance with best practice but is likely to draw from the following: artificial badger setts and otter holts; pine marten and red squirrel den boxes, bird boxes; bat boxes, amphibian and reptile artificial refuges and hibernation sites, ponds for GCN;
- Eco_17: Restriction on night-time working, appropriate lighting during construction activities, as well as appropriate lighting design for operation will be provided to reduce disturbance to badgers, bats and otters (and other nocturnal species) where applicable;
- Eco_18: New planting will be used to create linkages between habitats to mitigate for severance of bat commuting routes and habitat. These linkages will also be appropriate to other species;
- Eco_19: Watercourses programmed for realignment will be re-instated with natural planforms and function in consultation with hydrologists, ecologists and geomorphologists. All re-instated channels will be designed to provide a net gain with respect to area and quality of habitats lost and if appropriate the channel returned to a historic, natural alignment;
- Eco_20: Proposed extensions to culverts and new culverts will be constructed to take into account migratory fish species and potential use by aquatic mammals where applicable;
- Eco_21: Habitat restoration and enhancement will be designed with a net gain approach¹⁹⁶. This will include the potential creation of new areas of native woodland, wetlands, priority habitats and where possible enhancement of LNCS. These enhancements will be sensitive of location with cognisance of the fact that pollutants from the road (e.g. NOx) may act as fertilizers and undermine the re-creation of nutrient poor habitats;
- Eco_22: Specific mitigation and compensation to account for the potential impacts on Pitscurry Moss LNCS will be discussed with Aberdeenshire Council and SNH. This could include measures such as on-site habitat enhancement and off-site habitat recreation;
- Eco_23: The potential for pollution incidents during construction to affect nature conservation resources will be mitigated through the adherence to

¹⁹⁵ Success being taken in this instance as evidenced use by the target organism.

¹⁹⁶ This is in line with the National Planning Framework 3 (2014), Scottish Planning Policy (2014) and the recently released DMRB Guidance (2019)

standard best practice and guidelines, such as the SEPA Guidance for Pollution Prevention;

- Eco_24: Operational potential pollution impacts (e.g. run-off, air pollution from Volatile Organic Compounds (VOCs)) will be mitigated through appropriate provision of Sustainable Drainage Systems (SuDS) and an appropriate planting scheme;
- Eco_25: Prior to the realignment of any watercourses or where significant alterations are required to bodies of standing water, fish rescues (electro-fishing and temporary relocation of fish and large aquatic invertebrates) will be implemented; and
- Eco_26: All bridge abutments and embankments will be set back from riverbanks to allow riparian mammal passage.

18.6 Predicted Ecological Effects

18.6.1 Key predicted ecological effects of the route options on nature conservation have been assessed using the assessment methodology set out in Volume 4b, Appendix A18.1, Nature Conservation Assessment Methodology. Potential impacts (Section 18.4) have been assessed prior to mitigation (Section 18.5) and the residual effects than predicted taking account of the assumed mitigation. The predicted residual effects are presented in Tables 18.7 to 18.13. Effects that are considered to be 'significant' (effects of moderate or major significance) are highlighted in bold. The estimation of the extent of habitat loss for each route option is included in Volume 4b, Appendix A18.4, Habitat Loss Calculations.

Common to All Route Options

18.6.2 The predicted effects common across all route options on features of nature conservation are described in Table 18.7. These include protected species such as badger, red squirrel, otter, pine marten, wildcat and fish where desk study data indicates they are present or likely to be present given the habitat within a route option. Species which are relatively abundant in northern Scotland, as evidenced by biological records, such as amphibians, breeding birds and reptiles, have been included as they are likely to be found across all potential route options and can be present within a variety of habitat types. Species of high conservation value, which have been highlighted as possibly present due to historical records (e.g. FWPM) or potential under recording (e.g. GCN) have also been included following the precautionary principle.

18.6.3 Also included within Table 18.7 are predicted effects which are more generic and not location specific which could arise during construction. These include dust pollution, pollution of watercourses and transfer of disease, where it is not possible to provide a location and effects can occur at any time throughout the construction phase.

18.6.4 Although common across all route options, the loss of ancient woodland and terrestrial habitats has been quantified for each route option, and so the effects of impacts to these features has been assessed for each route option in Table 18.8 to 18.13.

Table 18.7 Predicted Ecological Effects-All Route Options

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Red squirrel (Authority)	<p>Potential for direct mortality of red squirrel due to collisions with construction traffic and destruction of shelters.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_4 Eco_6 Eco_11 Eco_12 Eco_13 Eco_15	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Disturbance (light, noise, dust and vibration) during construction and operation reducing the suitability of important local habitats leading to shelter abandonment and habitat avoidance.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_2 Eco_3 Eco_6 Eco_11	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Increased direct mortality during operation due to collisions with traffic.</p> <p>Magnitude: Low</p>	Minor adverse	<p>Eco_14 Eco_15 Eco_12</p>	Negligible
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat and greater barriers to dispersal/ severance of dispersal routes.</p> <p>Magnitude: High</p>	Moderate adverse	<p>Eco_16 Eco_15 Eco_12 Eco_21</p>	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Badger (Local)	<p>Potential for direct mortality of badger due to collisions with construction traffic and entrapment in excavations.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_4 Eco_6 Eco_12 Eco_13 Eco_15	Negligible
	<p>Reduced individual and group fitness due to forced abandonment of sett(s) and relocation during construction.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_6 Eco_4 Eco_11 Eco_16	Negligible
	<p>Disturbance (light, noise, dust and vibration) during construction and operation reducing the suitability of important local habitats or setts leading to abandonment.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_2 Eco_3 Eco_6 Eco_11 Eco_5 Eco_17	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Increased direct mortality during operation due to collisions with traffic.</p> <p>Magnitude: Low</p>	Minor adverse	<p>Eco_14</p> <p>Eco_15</p> <p>Eco_12</p>	Negligible
	<p>Damage to local population structure and territory integrity during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat and greater barriers to dispersal / severance of dispersal routes.</p> <p>Magnitude: High</p>	Minor adverse	<p>Eco_16</p> <p>Eco_15</p> <p>Eco_12</p> <p>Eco_21</p>	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Bats (Regional)	Disturbance (light, noise, dust and vibration) during construction and operation reducing the suitability of roost sites leading to abandonment. Magnitude: Moderate	Minor adverse	Eco_2 Eco_3 Eco_6 Eco_11 Eco_5 Eco_17	Negligible
	Direct mortality due to destruction of roost sites. Magnitude: Low	Minor adverse	Eco_4 Eco_6 Eco_11 Eco_12	Negligible
	Loss (migration) of local populations due to a reduction in habitat quality and cumulative loss of roosting/ resting sites. Magnitude: High	Moderate adverse	Eco_21 Eco_16	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to loss of commuting and foraging habitat and greater barriers to dispersal e.g. created by an altered lighting regime.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_15 Eco_12 Eco_18 Eco_21	Minor adverse
	<p>Direct mortality due to collisions with traffic during operation.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_14 Eco_15	Negligible
Otter (Regional)	<p>Potential for direct mortality of otter due to collisions with construction traffic and entrapment in excavations.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_4 Eco_6 Eco_11 Eco_12 Eco_13 Eco_15	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Potential for destruction of breeding holts resulting in reduced breeding success if alternatives are not available.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_4 Eco_6 Eco_11 Eco_12 Eco_16	Minor adverse
	<p>Reduced individual fitness due to damage or isolation from specific feeding grounds or the cumulative impact on riverine and riparian productivity caused by scheme operation.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_23 Eco_24 Eco_19 Eco_21 Eco_15 Eco_25	Minor adverse
	<p>Disturbance (light, noise, dust and vibration) during construction reducing the suitability of important local habitats leading to shelter abandonment.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_2 Eco_3 Eco_6 Eco_11 Eco_5 Eco_17	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Increased direct mortality during operation due to collisions with traffic.</p> <p>Magnitude: Low</p>	Minor adverse	<p>Eco_14</p> <p>Eco_15</p> <p>Eco_12</p> <p>Eco_25</p>	Negligible
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat and greater barriers to dispersal.</p> <p>Magnitude: High</p>	Major adverse	<p>Eco_16</p> <p>Eco_15</p> <p>Eco_12</p> <p>Eco_21</p> <p>Eco_25</p>	Minor adverse
Water vole (Authority)	<p>Direct mortality due to action of construction traffic or operations.</p> <p>Magnitude: Low</p>	Minor adverse	<p>Eco_4</p> <p>Eco_6</p> <p>Eco_12</p> <p>Eco_13</p> <p>Eco_15</p>	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Reduced individual and population fitness due to the cumulative impact on riverine and riparian productivity caused by the road operation.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_23 Eco_24 Eco_19 Eco_21 Eco_15	Negligible
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat and greater barriers to dispersal.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_16 Eco_15 Eco_12 Eco_21 Eco_25	Negligible
Wildcat (National)	<p>Disturbance (light, noise, dust and vibration) during construction reducing the suitability of locally important habitats.</p> <p>Magnitude: Low</p>	Moderate adverse	Eco_2 Eco_3 Eco_6 Eco_11 Eco_5 Eco_17	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Potential for direct mortality of wildcat due to collisions with construction traffic and entrapment in excavations.</p> <p>Magnitude: High</p>	Major adverse	Eco_4 Eco_6 Eco_11 Eco_12 Eco_13 Eco_15	Minor
	<p>Reduced individual fitness of local wildcat due to severance of corridors within and between wildcat home ranges or territories. A barrier reducing the permeability of an animal's territory may isolate it from key foraging or denning habitats or indeed mates. The result will be expansion into less suitable or already occupied territories, or a reliance on a reduced prey/ den resource. Either way it is likely to cause a reduction in individual fitness.</p> <p>Magnitude: High</p>	Major adverse	Eco_16 Eco_15 Eco_12 Eco_21	Moderate adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Increased direct mortality through road traffic collisions during operation.</p> <p>Magnitude: High</p>	Major adverse	<p>Eco_14</p> <p>Eco_15</p> <p>Eco_12</p>	Minor adverse
	<p>Increased mortality and disturbance to prey species reducing overall carrying capacity of land areas adjacent to new route.</p> <p>Magnitude: Low</p>	Moderate adverse	<p>Eco_21</p> <p>Eco_11</p>	Negligible
	<p>Increased levels of hybridisation as wildcats are forced to migrate or expand home ranges (due to lack of resource) into other areas with high density of feral/domestic cats.</p> <p>Magnitude: Medium</p>	Moderate adverse	<p>Eco_21</p> <p>Eco_12</p>	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Pine marten (Authority)	<p>Disturbance (light, noise, dust and vibration) during construction and operation reducing the suitability of locally important habitats.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_2 Eco_3 Eco_6 Eco_11 Eco_5 Eco_17	Negligible
	<p>Potential for direct mortality of pine marten due to collisions with construction traffic and entrapment in excavations.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_4 Eco_6 Eco_11 Eco_12 Eco_13 Eco_15	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Reduced individual fitness of local martens by severance of corridors within and between home ranges or territories. A barrier reducing the permeability of an animal's territory may isolate it from key foraging or denning habitats, or mates. The result will be expansion into less suitable or already occupied territories, or a reliance on a reduced prey/ den resource. Either way it is likely to cause a reduction in individual and population fitness.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_16 Eco_15 Eco_12 Eco_21	Minor adverse
	<p>Increased direct mortality through road traffic collisions during operation.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_14 Eco_15 Eco_12	Negligible
Breeding birds (excluding barn owl) (Regional)	<p>Potential for direct mortality of breeding birds due to vegetation clearance during the breeding season. Disturbance of nesting sites by site clearance or construction leading to nest/ egg abandonment.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_1 Eco_3 Eco_4 Eco_5 Eco_7	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Reduced individual and population fitness due to destruction and permanent loss of key foraging and breeding habitat during vegetation clearance and construction.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_6 Eco_21 Eco_4	Minor adverse
	<p>Potential for direct mortality of breeding birds due to collisions with traffic.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_14	Negligible
	<p>Changes in bird community associated with shifts in habitat type post construction.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_6 Eco_21	Negligible
Barn owl (Authority)	<p>Potential for direct mortality of barn owl through collisions with traffic.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_14	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Reduced individual and population fitness due to destruction and permanent loss of key foraging and breeding habitat during vegetation clearance and construction.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_6 Eco_21 Eco_4	Minor adverse
Wintering birds (International)	<p>Disturbance of foraging areas through construction noise, vibration and lighting potentially leading to abandonment.</p> <p>Magnitude: Low</p>	Moderate adverse	Eco_1 Eco_2 Eco_3 Eco_5 Eco_11	Negligible
	<p>Scheme potentially results in loss of foraging habitat either directly or through disturbance from traffic.</p> <p>Magnitude: Medium</p>	Major adverse	Eco_1 Eco_2 Eco_3 Eco_5 Eco_11 Eco_21	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Transfer of INNS (Regional)	<p>Introduction or transfer of invasive species during construction may result in loss or deterioration of native habitats/species.</p> <p>Magnitude: High</p>	Major adverse	Eco_9 Eco_10 Eco_12	Negligible
Fish (all species) (Authority)	<p>Potential for direct mortality of fish species during construction from pollution incident and in-stream work at crossing points.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Disturbance from noise, light and vibration during construction interfering with migration (including short term patterns of movement e.g. diurnal shifts in habitat)</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_1 Eco_2 Eco_3 Eco_5 Eco_11	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Siltation of spawning gravels leading to reduction in local recruitment.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_23 Eco_24	Negligible
	<p>Shifts in local flow regime or bed forms creating permanent barriers to migration resulting in lack of recruitment.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_19 Eco_20	Negligible
	<p>Land take results in permanent habitat loss at watercourse crossings or realignments including potentially at spawning areas resulting in lack of recruitment.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_6 Eco_19 Eco_21	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability with knock on effects reducing individual fitness.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_19 Eco_21 Eco_24	Negligible
<p>Freshwater macroinvertebrates (excluding FWPM) (Local)</p>	<p>Potential for direct mortality during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Permanent loss of suitable habitat through land take at watercourse crossing points or realignments.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_6 Eco_19 Eco_21	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Permanent shift in local sediment regime, pollution associated with operation of the new road or altered agricultural drainage increasing nitrogen, phosphorus and potassium (NPK) input leading to altered water quality and a change habitat suitability.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_19 Eco_21 Eco_24	Negligible
Aquatic macrophytes (Site)	<p>Potential for direct loss during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Permanent loss of suitable habitat through land take at watercourse crossing points or realignments.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_6 Eco_19 Eco_21	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Permanent shift in local sediment regime, pollution associated with operation of the new road or altered agricultural drainage increasing NPK input leading to altered water quality and a change habitat suitability.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_19 Eco_21 Eco_24	Negligible
Terrestrial invertebrates (Authority)	<p>Direct mortality during site clearance.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_6	Negligible
	<p>Permanent loss of habitat and the potential for a post-construction shift in the ratio of habitats. This would result in changes in the scheme-wide invertebrate community.</p> <p>Magnitude: Medium</p>	Moderate adverse	Eco_6 Eco_21 Eco_11 Eco_12 Eco_7 Eco_8	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	Risk of pollution associated with both construction and operation resulting in a reduction in habitat suitability. Magnitude: Medium	Moderate adverse	Eco_23 Eco_24	Negligible
	Direct mortality due to road traffic collisions. Magnitude: Low	Minor adverse	Eco_14	Negligible
GCN (National)	Potential for direct mortality of GCN due to collisions with construction traffic, destruction of hibernacula and entrapment in excavations. Magnitude: High	Major adverse	Eco_1 Eco_4 Eco_5 Eco_6	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Reduced individual and population fitness due to destruction of key hibernacula and foraging resources during construction.</p> <p>Magnitude: High</p>	Major adverse	Eco_1 Eco_4 Eco_5 Eco_6 Eco_16	Minor adverse
	<p>Increased direct mortality during operation due to collisions with traffic, entrapment within the drainage structure and pollution incidents.</p> <p>Magnitude: High</p>	Major adverse	Eco_14 Eco_24	Negligible
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat (removal of potential breeding ponds, foraging resource) and greater barriers to dispersal/ severance of dispersal routes.</p> <p>Magnitude: High</p>	Major adverse	Eco_6 Eco_21 Eco_11 Eco_12 Eco_15 Eco_16 Eco_19	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Amphibians (excluding GCN) (Local)	<p>Potential for direct mortality due to collisions with construction traffic, destruction of hibernacula and entrapment in excavations.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_1 Eco_4 Eco_5 Eco_6	Negligible
	<p>Reduced individual and population fitness due to destruction of key hibernacula and foraging resources during construction.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_1 Eco_4 Eco_5 Eco_6 Eco_16	Negligible
	<p>Increased direct mortality during operation due to collisions with traffic, entrapment within the drainage structure and pollution incidents.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_14 Eco_24	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat (removal of breeding ponds, foraging resource) and greater barriers to dispersal/ severance of dispersal routes.</p> <p>Magnitude: High</p>	Minor adverse	Eco_6 Eco_21 Eco_11 Eco_12 Eco_15 Eco_16 Eco_19	Negligible
Reptiles (Authority)	<p>Potential for direct mortality of reptiles due to collisions with construction traffic, destruction of hibernacula and entrapment in excavations.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_1 Eco_4 Eco_5 Eco_6	Negligible
	<p>Reduced individual and group fitness due to destruction of key hibernacula and foraging resources during construction.</p> <p>Magnitude: Medium</p>	Minor adverse	Eco_1 Eco_4 Eco_5 Eco_6 Eco_16	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Increased direct mortality during operation due to collisions with traffic.</p> <p>Magnitude: Low</p>	Minor adverse	Eco_14 Eco_24	Negligible
	<p>Damage to local population structure during operation and construction. Movement between suitable habitats will be diminished due to a reduction of overall area of suitable habitat and greater barriers to dispersal/ severance of dispersal routes.</p> <p>Magnitude: High</p>	Minor adverse	Eco_6 Eco_21 Eco_11 Eco_12 Eco_15 Eco_16 Eco_19	Negligible

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Overall landscape permeability (Authority)	<p>Cumulative impact of the removal or severance of small scale habitat or landscape features (hedges, treelines, walls, abandoned buildings, ditches, scrub etc) which contribute to habitat complexity and landscape permeability. This will lead to reduced individual and population fitness for all species, especially for those not afforded statutory legal protection and will contribute to an overall loss of biodiversity and system resilience.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_12 Eco_15 Eco_16 Eco_18 Eco_21	Minor adverse
Transfer of diseases (National)	<p>Poor biosecurity or transfer of invasive species during construction could result in death of plants/animals from transferable diseases (e.g. ash dieback, amphibian red-leg disease, <i>Phytophthora</i>).</p> <p>Magnitude: High</p>	Major adverse	Eco_10 Eco_11	Minor adverse
Air pollution of surrounding habitats (Local)	<p>Scheme is likely to result in air quality changes which could lead to deterioration and ultimately loss of sensitive habitats and vegetation communities in impacted locations.</p> <p>Magnitude: High</p>	Minor adverse	Eco_21 Eco_24	Minor adverse

Sub-topic/Criteria and Value	Predicted Effects and Magnitude	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Waterbodies (Authority)	<p>Land take will result in either direct loss or change in aquatic habitat for impacted watercourses. This is likely to alter the overall connectivity of the river network and how it interacts with adjacent terrestrial habitats.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_6 Eco_19 Eco_20	Minor adverse
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability, loss of richness, diversity and overall resilience.</p> <p>Magnitude: High</p>	Moderate adverse	Eco_24 Eco_21	Minor adverse
Hydrological connectivity/changes (Local)	<p>Scheme is likely to alter hydrological pathways which could result in loss of/change in habitat types (e.g. ground water dependant terrestrial ecosystems (GWDTE), wetland habitats, wet woodland, vegetated ditches), as well as loss of diversity within those habitats, and potentially impact upstream movement of species.</p> <p>Magnitude: High</p>	Minor adverse	Eco_19 Eco_20 Eco_21 W2 (Chapter 20)	Minor adverse

East of Huntly to Colpy

Cyan Route Option

- 18.6.5 The Cyan route option results in approximately 5km of construction within the Strathbogie WPA. Of this, approximately 3km is not directly associated with the existing A96 and is considered as new construction with respect to land take. The proximity to the existing A96 means that both construction and operational disturbance from the new road will continue in habitats already suffering similar disturbance from the current road. There are confirmed records of wildcat or high scoring hybrids¹⁹⁷ both within and to the east of the WPA, and badger, pine marten, red squirrel, bats and barn owl are known to be present within the study area of this route option. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases.
- 18.6.6 There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. This will adversely impact all species, especially in the short term before mitigation is fully established, but could have a significant long-term negative impact on vulnerable species such as the wildcat where the loss or reduced fitness of specific individuals (those identified as 'wildcat' rather than 'hybrids') represents significant damage to the species as a whole¹⁹⁷. Wildcat, pine marten, badger and barn owl are also known to suffer increased mortality associated with road developments, in addition to reduced areas of suitable habitat.^{198,199,200,201,202.}
- 18.6.7 The ecological landscape within this route option is relatively permeable, however, there would be an enlargement of the dispersal barrier created by the existing A96, along a habitat corridor connecting Hill of Tillymorgan to Gartly Forest. RTA data indicates that this habitat corridor is active at least for pine marten and badger, despite the existing A96 cutting through it. The additional distance and potential for a hard surfaced central reservation for this route option would further reduce the effectiveness of this habitat corridor leading to a reduction in genetic exchange and increased mortality of species moving or attempting to move along it.
- 18.6.8 This route option directly impacts one woodland to the east of St Sairs listed on the Ancient Woodland Inventory (AWI) as Long Established woodland of Plantation

¹⁹⁷ Wild living cats in Scotland exist as a 'hybrid swarm' consisting of animals which have differing levels of hybridisation. Cats exist along a continuum and are classed as domestic, hybrid or wildcat. Those described currently as 'wildcat' are thought to have a very high percentage of their ancestors which were pure breeding wildcat, hybrids have a variety of ancestral linages and domestic cats descend from domestic stock. The classification of a cat as wild/ hybrid/ domestic is most frequently done on pelage score (score derived from an assessment of wildcat vs domestic coat markings) but can also be done via a genetic test. This has led to identification of high scoring hybrids – those cats with pelage scores which do not conform to pure breeding wildcat but indicate a high percentage of wildcat ancestry. Please see Appendix A18.2: Valuation of Ecological Features for additional detail.

¹⁹⁸ Seiler A., Helldin J., Eckersten T. (2014) *Road mortality in Swedish badgers (Meles meles): Effect on population*. PhD thesis, Swedish University of Agricultural Sciences.

¹⁹⁹ Foreman R., Sperling D., Bissonette J., Clevenger A., Cutshall C., Dale V. (2003) *Road Ecology: Science and Solutions*. Island Press; Washington D.C.

²⁰⁰ Cresswell W., Birks J., Dean M., Pacheco M., Trehwella D., Wells D., Wray S. (ed.) (2012) *UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation*. The Mammal Society; Southampton.

²⁰¹ Barn Owl Trust (2003) *Barn Owls and Major Roads*. Available at: https://www.barnowltrust.org.uk/wp-content/uploads/Barn_Owls_and_Major_Roads.pdf

²⁰² Underhill E., Angold P. (2011) *Effects of roads on wildlife in an intensively modified landscape*. Environmental Reviews. 8: 21-39.

Origin (LEPO). As well as potentially supporting a more diverse flora and fungal community than other impacted habitats, this woodland is known to support red squirrel. It is also likely to support a greater diversity of invertebrates than other equivalent woodland habitats. The effects of the land take will be a permanent reduction in biodiversity at the local level and the associated knock on impacts of a reduction of potential colonists to rehabilitate sites of lower species richness. There are 2.4ha of woodland classified as either ancient or native within 100m of this route option, and 9.1ha within 200m. Contingent on the predominant mode of transport (e.g. a switch to electric cars may mitigate this - refer to Chapter 21, Climate) sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated with air pollution²⁰³. Those within 200m of the route option may show similar degradation depending on the predominant wind direction.

- 18.6.9 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.10 The River Urie is known to support otter and good stocks of both resident and anadromous trout. Smaller burns and drains impacted by this route option are also likely to support otter, may support water vole, and contribute to fry habitat for freshwater fish species. Where this route option crosses the River Urie, the river corridor is likely primarily to be used for foraging and commuting by otter with occasional couches. In contrast, the increased size of the River Urie at the location of the realignment and the greater frequency of riparian cover make it more suitable for supporting important territory features such as breeding holts or regularly used shelters. Disturbance or land take impacts at this location are, therefore, likely to have more significant effects. It is considered that scrub habitat at this location is likely to be suitable for a number of protected species (e.g. wildcat, badger) and this would be lost through the construction of this route option.
- 18.6.11 Farmland to the east of this route option has historically supported wintering geese²⁰⁴. Disturbance associated with construction and operation may result in the abandonment of feeding locations. This could lead to a decline in the fitness or recruitment of populations of Greylag goose and Pink-footed goose designated as qualifying features of the Loch of Skene (SPA and Ramsar), and the Ythan Estuary, Sands of Fovie and Meikle Loch (SPA and Ramsar) European designated sites.

²⁰³ Natural England Commissioned Report NECT199 (2016) *The ecological effects of air pollution from road transport: an updated review* ISBN 978-1-78354-291-8

²⁰⁴ NESBReC data request pre 2008 data.

Table 18.8 Predicted Ecological Effects-Cyan Route Option

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Strathbogie Wildcat Protection Area (National)	<p>Land take due to approximately 5km of construction within this identified management area. Of the total length of route option, approximately 3km within the WPA is not directly associated with the existing A96 and should be considered new construction. This will result in fewer, more fragmented habitats undermining management efforts to sustain this population of Wildcat.</p> <p>Magnitude: High, due to relative extent of habitat loss and fragmentation.</p>	Moderate adverse	Eco_6 Eco_18 Eco_21 Eco_12	Minor Adverse

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the direct loss of approximately 0.3ha of ancient woodland listed as long established of plantation origin from a wood to the west of Colpy. As well as the direct loss of habitat the associated edge effects on the small woodland (currently 5.4ha) will further reduce habitat functionality for some species.</p> <p>Magnitude: Medium, due to extent of habitat loss.</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
<p>Terrestrial habitats (Site)</p>	<p>Land take from a variety of terrestrial habitats including non-designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost, 0.2 ha is identified as Upland Birchwood on the native woodland inventory at NJ 63555 34541.</p> <p>Area loss per habitat type is detailed in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to extent of habitat loss.</p>	<p>Minor adverse</p>	<p>Eco_6 Eco_21 Eco_12</p>	<p>Minor adverse</p>
<p>Landscape permeability (Local)</p>	<p>Both construction and operational phases will result in a reduction of permeability and disturbance of a potential habitat corridor connecting Hill of Tillymorgan to Gartly Forest. Rather than creating a new severance point, the route option will expand the break formed by the existing A96. This will result in increased RTA related mortality for those species capable of crossing and a reduction in breeding population size for those species unable to cross the additional carriageway.</p> <p>Magnitude: Medium, due to expansion of existing severance.</p>	<p>Minor adverse</p>	<p>Eco_15 Eco_14 Eco_18</p>	<p>Minor adverse</p>

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with construction at the crossing of River Urie just upstream from Broom Hill.</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_23	Negligible
	<p>Potential local and downstream effects of operational runoff entering River Urie. Such pollution would reduce habitat quality (siltation, localised increases in salinity)</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_24	Minor adverse
	<p>Any realignment of River Urie at NJ 63612 34587 may result in a reduction of both habitat quality and quantity available for a variety of aquatic species as well as a reduction in both the biological and physical longitudinal connectivity.</p> <p>Magnitude: High, due to reduction in habitat quality and connectivity.</p>	Minor adverse	Eco_19 Eco_20 Eco_21	Minor adverse

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
FWPM (International)	<p>Potential for direct mortality of FWPM during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: High, due to potential loss of this species.</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability.</p> <p>Magnitude: High, due to reduction of habitat suitability for this species.</p>	Moderate adverse	Eco_19 Eco_24	Negligible
	<p>Changes in local fish community (richness, species present or movement due to introduced barriers) undermining FWPM recruitment leading to population decline.</p> <p>Magnitude: High, due to potential to lead to recruitment reduction.</p>	Moderate adverse	Eco_19 Eco_20 Eco_21	Negligible

Red Route Option

- 18.6.12 The Red route option requires approximately 6km of new construction within the Strathbogie WPA. There are confirmed records of wildcat or high scoring hybrids¹⁹⁷ both within and to the east of the WPA and badger, pine marten, red squirrel, bats, and barn owl are known to be present. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases, in addition to the loss of suitable habitat.
- 18.6.13 There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. This will negatively impact all species, especially in the short term before mitigation is fully established. Such disturbance or loss of habitat could have a significant long-term negative impact on vulnerable species such as the wildcat where the loss or reduced fitness of specific individuals (those identified as 'wildcat' rather than 'hybrids') represents significant damage to the species within the scheme area. Wide ranging carnivores such as wildcat, pine marten, badger, and birds, particularly barn owl are also known to suffer increased mortality associated with road developments^{198,199,200,201,202}.
- 18.6.14 The composition and arrangement of habitat elements indicate that the whole landscape under this route option is relatively permeable and RTA evidence shows the existing A96 does not form a complete barrier. Dualling in this area will create additional severance of habitat connecting woodland on the Hill of Tillymorgan across to Gartly Forest. This would create a significant barrier to species dispersing through this habitat corridor leading to a reduction in genetic exchange, as well as increased mortality. Although mitigation will reduce this severance impact, it is unlikely to remove it fully.
- 18.6.15 This route option directly impacts one woodland to the east of St Sairs listed on the Ancient Woodland Inventory (AWI) as LEPO. As well as potentially supporting a more diverse flora and fungal community than other habitats impacted by this route option, this woodland is known to support red squirrel. It is also likely to support a greater diversity of invertebrates than other equivalent woodland habitats. The effects of the land take will be a permanent reduction in biodiversity at the local level and a reduction of potential colonists to rehabilitate sites of lower species richness. There are 2.4ha of woodland classed as either ancient or native within 100m of this route option and 6.2ha within 200m. Contingent on the predominant mode of transport (e.g. a switch to electric cars in the medium to long-term would mitigate this) sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated with air pollution²⁰³. Those within 200m of the route option may show similar degradation depending on the prevailing wind direction.
- 18.6.16 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.17 The crossing point of River Urie is proposed as a large culvert. The River Urie and all of the smaller burns and drains impacted by this route option are also likely to support otter and may support water vole. The general lack of riparian cover means that the smaller watercourses will primarily be used for foraging and commuting by otter with occasional couches, rather than part of a territory containing breeding or main holts. There is also the potential for noise and light disturbance during both

construction and operation of the culvert which could cause the abandonment of any nearby shelter or indeed the direct loss of a shelter. Any disturbance effect is likely to be temporary as otter are known to habituate rapidly to construction disturbance²⁰⁵. A more significant effect would be any long-term decline in prey (primarily fish or amphibians) or a shift in channel form and function, for example, due to the installation of culverts. Both of these effects make river and stream habitats less suitable for otter by reducing function as a foraging resource and restricting / impeding access which may result in a contraction of otter habitat along this route option.

²⁰⁵ Bassett, S. and Wynn, J. (2010) *Otters in Scotland: How vulnerable are they to disturbance?* Published in: CIEEM (2010) *In Practice*. 70: 19-22. CIEEM; Winchester.

Table 18.9 Predicted Ecological Effects-Red Route Option

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Strathbogie Wildcat Protection Area (WPA) (National)	<p>Land take due to approximately 6km of new construction within this identified management area resulting in fewer, more fragmented habitats undermining management efforts to sustain the population of wildcat.</p> <p>Magnitude: High, due to relative extent of habitat loss.</p>	Moderate adverse	Eco_6 Eco_18 Eco_21 Eco_12	Minor adverse

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the direct loss of approximately 0.5 ha of long-established woodland of plantation origin (LEPO) ancient woodland to the west of Colpy. As well as the direct loss of habitat, the associated edge effects on the small woodland (currently 5.4ha) will further reduce habitat functionality for some species.</p> <p>Magnitude: Medium, due to extent of habitat loss and reduction in functionality</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Terrestrial habitats (Site)	<p>Land take from a variety of terrestrial habitats including non-designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost, 0.6 ha is classified as unidentified native woodland on the native woodland inventory at NJ 62624 33732.</p> <p>Area of loss per habitat type is identified in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to extent of habitat loss.</p>	Minor adverse	Eco_6 Eco_21 Eco_12	Minor adverse
Landscape permeability (Local)	<p>Both construction and operational phases will result in a severance and disturbance of a potential habitat corridor connecting Hill of Tillymorgan to Gartly Forest. This will result in increased RTA related mortality for those species using the habitat corridor and a reduction in breeding population size for those species unable to continue to use it.</p> <p>Magnitude: High, due to severance of potential habitat corridor and resulting effects on some species.</p>	Minor adverse	Eco_15 Eco_14 Eco_18	Minor adverse
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with construction at the crossing of River Urie, just upstream from Broom Hill.</p> <p>Magnitude: Medium, due to reduction in habitat quality.</p>	Minor adverse	Eco_23	Negligible

Sub-topic/Criteria and Value	Predicted Impacts/Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Potential local and downstream effects of operational runoff entering River Urie. Such pollution would reduce habitat quality (siltation, localised increases in salinity).</p> <p>Magnitude: Medium, due to reduction in habitat quality.</p>	<p>Minor adverse</p>	<p>Eco_24</p>	<p>Minor adverse</p>
	<p>Loss of aquatic habitat as a result of installation of culverts at crossing points of River Urie and its tributaries. This will reduce population of aquatics species (macroinvertebrates, macrophytes, fish, riparian mammals).</p> <p>Magnitude: High, due to loss of habitat.</p>	<p>Minor adverse</p>	<p>Eco_19 Eco_20 Eco_21</p>	<p>Minor adverse</p>

Colpy to Pitcaple

Pink Route Option

- 18.6.18 The Pink route option primarily crosses arable fields and improved grassland, although it also bisects two significant blocks of woodland; a LEPO ancient woodland around Gallows Hill, and a plantation woodland at Thorpville. There are confirmed records of wildcat or high scoring hybrids along with badger, pine marten, red squirrel, bats and barn owl within the study area of this route option. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases.
- 18.6.19 There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. This will negatively impact all species, especially in the short term before mitigation is fully established. This could also have a significant long-term negative impact on vulnerable species such as the wildcat where the loss or reduced fitness of specific individuals (those identified as 'wildcat' rather than 'hybrids') represents significant damage to the species as a whole. Wildcat, pine marten, badger and barn owl are also known to suffer increased mortality associated with road developments^{198,199,200,201,202}.
- 18.6.20 This route option will result in severance of a habitat corridor linking Logie Woodlands to riparian woodland along the River Urie. The effects of this severance are likely to be a reduction in genetic exchange and increased mortality for a variety of species using this habitat corridor.
- 18.6.21 This route option cuts through the middle of one large woodland block (32ha) identified as LEPO on the AWI (Gallows Hill). As well as potentially supporting a more diverse flora and fungal community than other habitats impacted, the woodland block is also likely to support a greater diversity of invertebrates compared to other equivalent woodlands. The effects of the land take will be a reduction in the function of the woodland as it transitions from a single connected block to two smaller blocks. There is also likely to be loss of species strongly associated with closed canopy woodland (e.g. Blackcap (*Sylvia atricapilla*), wood warbler (*Phylloscopus sibilatrix*) and Hawfinch (*Coccothraustes coccothraustes*)^{206,207}). Areas currently in the centre of the woodland will be converted into edge habitats by the works with an associated change in physico-chemical conditions. There are 15.0ha of woodland classed as either ancient or native within 100m of this route option, and 29.9ha within 200m of the route option. Contingent on the predominant mode of transport (e.g. a switch to electric cars would mitigate this), sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated air pollution. Those within 200m of the

²⁰⁶ Broome, A.; Bellemy, R. J.; Eichhorn, M.P.; Gill, R. M. A.; Harmer, R.; Kerr, G.; and Siriwardena, G. M., (2017) *Implications of lowland broadleaved woodland management for the conservation of target species*, Forestry Commission Research Note FCRN028

²⁰⁷ Calladine, J.; Bray, J.; Broome, A.; Fuller, R. J. (2015) *Comparison of breeding bird assemblages in conifer plantations managed by continuous cover forestry and clear-felling*. Forest Ecology and Management, 344, 20-29.

route option may show similar degradation depending on the predominant wind direction.

- 18.6.22 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.23 The River Urie supports otter and good stocks of resident and anadromous trout. Smaller burns and drains impacted by this route option are also likely to support otter, may support water vole and contribute to fry habitat for freshwater fish species. The location where this route option crosses the River Urie is likely to be primarily used by otter for foraging and commuting with occasional couches given the simple, relatively homogenous channel and limited riparian cover. There is the potential for noise and light disturbance during construction and operation which could cause the abandonment of any shelter or the direct loss of a shelter. The disturbance effect is likely to be temporary as otter are known to habituate rapidly to such disturbance²⁰⁵. A more significant effect would be any long-term local decline in prey (primarily fish or amphibians) or a shift in channel form and function, for example, due to the installation of culverts in the wider channel network. Both of these effects make river and stream habitats less suitable for otter by reducing value as a foraging resource and restricting/impeding access and may result in a reduction of otter habitat due to this route option.

Table 18.10 Predicted Ecological Effects-Pink Route Option

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the direct loss of approximately 5.5ha of ancient woodland listed as long established of plantation origin from woodland to the south of Durno. As well as the direct loss of habitat, the associated edge effects on the remaining woodland patches will further reduce habitat functionality for some species.</p> <p>Magnitude: High, due to loss of ancient woodland and effects on functionality.</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
<p>Terrestrial habitats (Site)</p>	<p>Land take from a variety of terrestrial habitats including non-designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost 0.4ha is listed on the native woodland inventory; <0.1ha is identified as Upland Birchwood (NJ 63756 34622) and 0.4ha of unidentified native woodland (NJ 64288 31076).</p> <p>Area loss per habitat type is detailed in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to habitat loss.</p>	<p>Minor adverse</p>	<p>Eco_6 Eco_21 Eco_12</p>	<p>Minor adverse</p>

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Landscape permeability (Local)	<p>Both construction and operational phases will result in a reduction of permeability and disturbance of a potential habitat corridor connecting Logie Woodlands to the River Urie. This will result in increased RTA related mortality for those species capable of crossing the new gap and a reduction in breeding population size for those species isolated by the road.</p> <p>Magnitude: High, due to disturbance to a potential wildlife corridor.</p>	Minor adverse	Eco_15 Eco_14 Eco_18	Minor adverse
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with bridge construction at the crossings over the River Urie and Bonnyton Burn and Burn of Durno.</p> <p>Magnitude: Medium, due to reduction in habitat quality.</p>	Minor adverse	Eco_23	Negligible

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Potential local and downstream effects of operational runoff entering the River Urie, Bonnyton Burn and Burn of Durno. Such pollution would reduce habitat quality (siltation, localised increases in salinity).</p> <p>Magnitude: Medium, due to reduction in habitat quality.</p>	Minor adverse	Eco_24	Minor adverse
FWPM (International)	<p>Potential for direct mortality of FWPM during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: High, due to potential loss of this species.</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability.</p> <p>Magnitude: High, due to reduction in habitat suitability for this species.</p>	Moderate adverse	Eco_19 Eco_24	Negligible

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Changes in local fish community (richness, species present or movement due to introduced barriers) undermining FWPM recruitment leading to population decline.</p> <p>Magnitude: High, due to potential reduction in species recruitment.</p>	<p>Moderate adverse</p>	<p>Eco_19 Eco_20 Eco_21</p>	<p>Negligible</p>

Brown Route Option

- 18.6.24 The Brown route option cuts through five blocks of LEPO woodland listed on the AWI and two blocks of native woodland which total 12.1ha. The cumulative impact of the direct land take from these habitats and the associated disturbance from both construction and operation will degrade the overall ecological functionality of this area. This will lead to reduced connectivity, a reduction in both species richness and diversity and, linked to these, a reduction in resilience. There are 26.0ha of woodland classed as either ancient or native within 100m of this route option and 58.1ha within 200m of the route option. Contingent on the predominant mode of transport (e.g. a switch to electric cars would mitigate this) sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated air pollution. Those within 200m of the route option may show similar degradation depending on the prevailing wind direction.
- 18.6.25 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.26 There are confirmed records of badger, red squirrel, bats and barn owl within the study area of this route option. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases. There is also evidence that wildcat, or high scoring hybrids, and pine marten are active in habitat which is functionally connected to this route option.
- 18.6.27 There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. This will adversely impact all species, especially in the short term before mitigation is fully established and could have a significant long-term negative impact on vulnerable species. Wildcat, pine marten, badger and barn owl are also known to suffer increased mortality associated with road developments^{198,199,200,201,202}.
- 18.6.28 This route option will result in severance of a habitat corridor linking Logie Woodlands to riparian woodland along the River Urie. The effects of this severance are likely to be a reduction in genetic exchange and increased mortality for a variety of species using the corridor. In contrast to the Pink route option which cuts across a single large woodland block at the northern extent of this habitat corridor, the Brown route option cuts through multiple woodland blocks, including riparian habitat further south where the habitat corridor is much broader and incorporates a greater range of habitat types.
- 18.6.29 The River Urie supports otter and good stocks of resident and anadromous trout. The Shevock Burn, The Kellock, and Burn of Durno also have the potential to support protected or notable species and function as ecological corridors. Smaller burns and drains impacted by this route option are also likely to support otter, may support water vole and contribute to fry habitat for freshwater fish. The crossings of the River Urie, Shevock Burn, The Kellock, and Burn of Durno will all be bridge structures and, therefore, should not result in any severance of hydrological connectivity. It is also anticipated these structures will be set back, retaining riparian connectivity for mammals and other species. As the specific design of and associated earthworks required for these structures has yet to be confirmed. It has been assumed they will still have a small negative impact on species movement along the riparian corridor. There is the potential for noise and light disturbance

during both construction and operation which could cause the abandonment of any shelter or the direct loss of a shelter used by otter. Any disturbance effect is likely to be temporary as otter are known to habituate rapidly to such disturbance. A more significant effect would be a long-term decline in local fish stocks or a shift in channel morphology (e.g. as a result of installing culverts) within the wider stream network.

Table 18.11 Predicted Ecological Effects-Brown Route Option

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the total direct loss of approximately 11.5ha of ancient woodland listed as long established of plantation origin from five woodland blocks. Of these, two are large (36.9ha and 30.6ha) continuous blocks which the route option splits through the middle. As well as the direct loss of habitat the associated edge effects on the remaining areas of woodland will further reduce habitat functionality for some species.</p> <p>Magnitude: High, due to habitat loss and the reduction in functionality.</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Terrestrial Habitats (Site)	<p>Land take from a variety of terrestrial habitats including non-designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost 1.4ha is listed as unidentified native woodland and <0.1ha is listed as upland birch wood from five blocks (NJ 69158 26786, NJ 71377 26925, NJ 69525 26695, NJ 72585 27480, NJ 64382 31066) on the native woodland inventory. Area loss per habitat type is detailed in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to habitat loss.</p>	Minor adverse	Eco_6 Eco_21 Eco_12	Minor adverse
Landscape permeability (Local)	<p>Both construction and operational phases will result in a reduction in permeability and disturbance of a potential habitat corridor connecting Logie Woodlands to the River Urie. This will result in increased RTA related mortality for those species capable of crossing the new gap and reduction in breeding population size for those species isolated by the route option.</p> <p>Magnitude: High, due to disruption of potential habitat corridor.</p>	Minor adverse	Eco_15 Eco_14 Eco_18	Minor adverse

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with construction at the crossing of the River Urie, The Kellock, The Shevock Burn and Burn of Durno.</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_23	Negligible
	<p>Potential local and downstream effects of operational runoff entering the River Urie, The Kellock, the Shevock Burn and Burn of Durno at the crossing points. Such pollution would reduce habitat quality (siltation, localised increases in salinity).</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_24	Minor adverse
FWPM (International)	<p>Potential for direct mortality of FWPM during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: High, due to potential loss of this species.</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Permanent loss of suitable habitat though land take at watercourse crossing points or realignments.</p> <p>Magnitude: High, due to loss of habitat,</p>	Moderate adverse	Eco_19 Eco_21	Negligible

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability.</p> <p>Magnitude: High, due to reduction of habitat suitability.</p>	Moderate adverse	Eco_19 Eco_24	Negligible
	<p>Changes in local fish community (richness, species present or movement due to introduced barriers) undermining FWPM recruitment leading to population decline.</p> <p>Magnitude: High, to due potential population decline.</p>	Moderate adverse	Eco_19 Eco_20 Eco_21	Negligible

Pitcaple to Kintore

Violet Route Option

- 18.6.30 The Violet route option crosses one LNCS, four small blocks of LEPO ancient woodland and one small block of woodland which is Ancient of Semi-Natural Origin (ASNO) and results in the loss of approximately 2.3ha of native woodland. There are 14.1ha of woodland classed as either ancient or native within 100m of the centreline of this route option and 24.4ha within 200m of the route option. Contingent on the predominant mode of transport (e.g. a switch to electric cars would mitigate this) sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated air pollution. Those within 200m of the route option may show similar degradation dependent on the predominant wind direction.
- 18.6.31 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.32 Pitscurry Moss LNCS supports a diverse and locally rare flora reliant in large part on site-specific hydrological pathways. Given the direct land take proposed and the associated loss of hydrological connectivity, the LNCS will effectively be lost and any mitigation will need to be delivered off site. The loss of wet woodland and meadow associated with the site will result in a loss of richness and diversity of the local invertebrate community, and any associated ornithological interest.
- 18.6.33 There are confirmed records of badger, red squirrel and bats within 500m of the route option and it is also likely that barn owl are present given the habitats encountered. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases. There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. Badger and barn owl are also known to suffer increased mortality associated with road developments^{198,201,202}.
- 18.6.34 Large numbers of geese are known to have winter feeding grounds in arable fields all along this route option. As well as the direct loss of feeding resource through land take for the route option, disturbance associated with construction and operation may also result in the abandonment of feeding locations. This may result in a decline in the fitness or recruitment of populations of Greylag goose and Pink-footed goose designated as qualifying features of the Loch of Skene (SPA and Ramsar), and the Ythan Estuary, Sands of Fovie and Meikle Loch (SPA and Ramsar) European designated sites.
- 18.6.35 Both the River Don and Lochter Burn/ Kings Burn support otter as well as resident and migratory salmonids. Smaller burns and field drains impacted by the route option are also likely to support otter and may support water vole and contribute to fry habitat. The crossings of the River Don and Lochter Burn/ Kings Burn will both be bridges so should not result in any severance of hydrological connectivity although the specific design and associated earthworks may interrupt movement along the riparian corridor. There is the potential for noise and light disturbance to otter during both construction and operation which could cause the abandonment of any shelter or indeed the direct loss of a shelter, but the disturbance effect is likely to be temporary as otter are known to habituate rapidly to such

disturbance²⁰⁵. A more important effect would be a long-term decline in local fish stocks or a shift in channel morphology (e.g. the installation of culverts) in the wider stream network potentially removing unidentified but still important seasonal foraging resources, especially as some of these channels will be subject to very significant realignments.

Table 18.12 Predicted Ecological Effects-Violet Route Option

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
<p>Pitscurry Moss LNCS (Authority)</p>	<p>Direct land take of approximately 1.68ha from Pitscurry Moss LNCS (total area approximately 7.5ha). This local conservation site is noted as a wet meadow and wet woodland complex likely to be reliant on its hydrological regime to maintain the '<i>good diversity of plant species, including some locally uncommon species</i>'. Construction of this route option effectively results in the loss of this LNCS. Construction will remove over half of the area of the site leaving only two small patches of isolated habitat at the northern and southern extents of the current LNCS.</p> <p>Magnitude: High, due to habitat loss and loss of functionality.</p>	<p>Major adverse</p>	<p>Eco_22</p>	<p>Major adverse</p>

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the total direct loss of approximately 2.2ha of ancient woodland listed as long established of plantation origin and 0.2ha listed as ancient of semi-natural origin (ASNO) from five woodland blocks. Of these blocks, two (11.6ha and 2.0ha) are dissected by the route option. As well as the direct loss of habitat, the associated edge effects on the remaining woodland patches will further reduce habitat functionality for some species.</p> <p>Magnitude: High, due to habitat loss and loss of functionality.</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse
Terrestrial habitats (Site)	<p>Land take from a variety of terrestrial habitats including non- designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost (that is not listed on the AWI) 0.4ha is listed as unidentified native woodland (NJ 80334 21986, NJ 73139 27345 and NJ 79337 17862), 1.7ha as upland birchwood (NJ 73145 27345) and 0.2ha as native pinewood (NJ 79346 17896) on the native woodland inventory (2.3ha total).</p> <p>Area loss per habitat type is detailed in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to habitat loss.</p>	Minor adverse	Eco_6 Eco_21 Eco_12	Minor adverse

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with construction at the crossing of the River Don and Lochter Burn/ Kings Burn.</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_23	Negligible
	<p>Potential local and downstream effects of operational runoff entering the River Don and Lochter Burn / Kings Burn. Such pollution would reduce habitat quality (siltation, localised increases in salinity).</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_24	Minor adverse
FWPM (International)	<p>Potential for direct mortality of FWPM during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: High, due to potential loss of this species.</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible
	<p>Permanent loss of suitable habitat though land take at watercourse crossing points or realignments.</p> <p>Magnitude: High, due to loss of suitable habitat</p>	Moderate adverse	Eco_19 Eco_21	Negligible

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability.</p> <p>Magnitude: High, due to reduction in habitat suitability.</p>	Moderate adverse	Eco_19 Eco_24	Negligible
	<p>Changes in local fish community (richness, species present or movement due to introduced barriers) undermining FWPM recruitment leading to population decline.</p> <p>Magnitude: High, due to reduction in recruitment ability.</p>	Moderate adverse	Eco_19 Eco_20 Eco_21	Negligible

Orange Route Option

- 18.6.36 There are two habitat types associated with the Orange route option. Habitats to the north of the River Don crossing are primarily arable or improved grassland except for Pitscurry Moss LNCS. To the south of the River Don crossing the habitats can best be described as a matrix of woodland, arable and improved grassland including significant areas of woodland listed on both the AWI and NWI.
- 18.6.37 Ancient woodland potentially supports a more diverse flora and fungal community than other habitats impacted. The effects of the loss of identified ancient and native woodland will be a reduction in species richness and a reduction of each woodland's capacity to provide useful ecological functions and services. This loss will be reflected in a loss of ecological function within the whole route option corridor.
- 18.6.38 Pitscurry Moss LNCS supports a diverse and locally rare flora reliant in large part on site specific hydrological pathways. Given the direct land take proposed and the associated loss of hydrological connectivity the LNCS will effectively be lost and any mitigation will need to be delivered off site. The loss of wet woodland and meadow associated with the site will result in a loss of richness and diversity of the local invertebrate community.
- 18.6.39 There are confirmed records of badger, red squirrel, pine marten and bats within 500m of the route option and it is also likely that barn owl are present given the habitats encountered. All these species will be subject to increased noise, light and dust disturbance during construction and operational phases. There is the potential for loss of breeding, foraging and resting locations for all species present as well as a shift in the integrity of the current territorial boundaries. Badger, pine marten and barn owl are also known to suffer increased mortality associated with road developments^{198,199,201,202}.
- 18.6.40 Geese are known to use arable fields along this route option for winter forage. As well as the direct loss of feeding resource through land take for the route option, disturbance associated with construction and operation may also result in the abandonment of feeding locations. This may result in a decline in the fitness or recruitment of populations of greylag goose and pink-footed goose designated as qualifying features of the Loch of Skene (SPA and Ramsar), and the Ythan Estuary, Sands of Fovie and Meikle Loch (SPA and Ramsar) European designated sites.
- 18.6.41 Both the Rivers Urie and Don support otter and good salmonid fish stocks. Smaller burns and drains impacted by the route option are also likely to support otter and may support water vole and contribute to fry habitat. The proposed crossings of the River Urie and River Don are both bridges and should not result in any severance of hydrological or riparian connectivity, although the effectiveness of this connectivity will be dependent on the crossing design. There is the potential for noise and light disturbance to otter during both construction and operation which could cause the abandonment of any shelter or indeed the direct loss of a shelter. The disturbance effect is likely to be temporary at these crossing points as otter are known to habituate rapidly to such disturbance²⁰⁵. A more important effect would be a long-term decline in local fish stocks or a shift in channel morphology (e.g. culverts) of the wider stream network potentially removing unidentified but still important seasonal foraging resources.
- 18.6.42 The route option severs a habitat corridor formed by woodland to the south of Inverurie extending along the River Don's riparian corridor west towards Bennachie. The effects of this severance are likely to be a reduction in genetic exchange and increased mortality for a variety of species using the road corridor.

- 18.6.43 There are 34.7ha of woodland classed as either ancient or native within 100m of the centreline of this route option and 65.9ha within 200m of the route option. Contingent on the predominant mode of transport (e.g. a switch to electric cars would mitigate this) sensitive habitats within 100m of the route option are likely to show some changes in ground flora due to nutrient enrichment associated air pollution. Those within 200m of the route option may show similar degradation dependent on the predominant wind direction.

Table 18.13 Predicted Ecological Effects-Orange Route Option

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Pitscurry Moss LNCS (Authority)	<p>Direct land take of approximately 4.8ha from Pitscurry Moss LNCS (total area approximately 7.5ha). This local conservation site is noted as a wet meadow and wet woodland complex likely to be reliant on its hydrological regime to maintain the <i>'good diversity of plant species, including some locally uncommon species'</i>²⁰⁸. Construction of this route option effectively results in the loss of this LNCS. Construction will remove over half of the area of the site leaving only two small patches of isolated habitat at the northern and southern extents of the current LNCS.</p> <p>Magnitude: High, due to habitat loss and loss of functionality.</p>	Major adverse	Eco_22	Major adverse

²⁰⁸ Pitscurry Moss Local Nature Conservation Sites Review (2009) Available at: <https://www.aberdeenshire.gov.uk/media/11083/Incssites61to79.pdf>

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Loss of Ancient Woodland (National)	<p>Land take results in the total direct loss of approximately 9.5ha of ancient woodland listed as long established of plantation origin from six woodland blocks. Of these blocks, four are part of a large woodland complex split by areas of arable/ rough grazing. The total area and shape of the woodland complex means they are likely to support a greater diversity of flora and fauna than equivalent sized isolated blocks. The cumulative loss of ecological function is therefore likely to be elevated. As well as the direct loss of habitat, the associated edge effects on the remaining woodland areas will further reduce habitat functionality for some species.</p> <p>Magnitude: High, due to habitat loss and loss of functionality.</p>	Major adverse	Eco_6 Eco_21 Eco_12	Major adverse

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
Terrestrial Habitats (Site)	<p>Land take from a variety of terrestrial habitats including non-designated woodland, arable, improved and semi-improved grassland, and scrub. Of the woodland lost (not included on the AWI) 7.5ha is listed on the native woodland inventory. Of this 1.2ha is identified as lowland mixed deciduous woodland (three blocks NJ 77879 18452; NJ 73716 26183; NJ 77652 19141), 4.9 ha is upland birch wood (six blocks NJ 76777 19428; NJ 75351 20001; NJ 73145 27345; NJ 73942 26152; NJ 76459 19682; NJ 77766 19714), 0.2ha is native pinewood (NJ 75943 19645), 1.1ha is unidentified native woodland (two blocks NJ 77848 17929, NJ 72574 27466) and <0.1ha is listed as nearly native woodland (NJ 76125 19662).</p> <p>Area loss per habitat type is detailed in Volume 4b, Appendix A18.4, Habitat Loss Calculations.</p> <p>Magnitude: High, due to habitat loss.</p>	Minor adverse	Eco_6 Eco_21 Eco_12	Minor adverse
Watercourse crossings (Local)	<p>Potential pollution and disturbance reducing habitat quality associated with construction at the crossing points of the River Urie and River Don.</p> <p>Magnitude: Medium, due to reduction of habitat quality.</p>	Minor adverse	Eco_23	Negligible

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Potential local and downstream effects of operational runoff entering the River Urie and River Don. Such pollution would reduce habitat quality (siltation, localised increases in salinity)</p> <p>Magnitude: High, due to reduction of habitat quality.</p>	Minor adverse	Eco_24	Minor adverse
Landscape permeability (Local)	<p>Both construction and operational phases will result in a reduction in permeability and disturbance of a potential habitat corridor connecting the south of Inverurie to Bennachie. This will result in increased RTA related mortality for those species capable of crossing the severed habitat corridor and a reduction in breeding population size and fitness for those species isolated by the route option.</p> <p>Magnitude: High, due to potential fragmentation of habitat corridor.</p>	Minor adverse	Eco_15 Eco_14 Eco_18	Minor adverse
FWPM ²⁰⁹ (International)	<p>Potential for direct mortality of FWPM during construction from pollution and in-stream work at crossing points.</p> <p>Magnitude: High, due to potential loss of this species.</p>	Moderate adverse	Eco_4 Eco_5 Eco_6	Negligible

²⁰⁹ Included following precautionary principle, not included in direct route option comparisons.

Sub-topic/Criteria and Value	Predicted Impacts and Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects Following Mitigation (Significance)
	<p>Permanent loss of suitable habitat through land take at watercourse crossing points or realignments.</p> <p>Magnitude: High, due to loss of suitable habitat for this species.</p>	Moderate adverse	Eco_19 Eco_21	Negligible
	<p>Shift in local sediment regime and pollution associated with operation of the new road leading to reduced habitat suitability.</p> <p>Magnitude: High, due to reduction of habitat suitability for this species.</p>	Moderate adverse	Eco_19 Eco_24	Negligible
	<p>Changes in local fish community (richness, species present or movement due to introduced barriers) undermining FWPM recruitment leading to population decline.</p> <p>Magnitude: High, due to reduction in recruitment ability.</p>	Moderate adverse	Eco_19 Eco_20 Eco_21	Negligible

18.7 Cumulative Effects

- 18.7.1 The Aberdeenshire LDP identifies potential locations for development up to 2021. When these are considered in conjunction with the scheme and along with other private developments, they have the potential to result in an increased, cumulative effect upon nature conservation features.
- 18.7.2 The current status of the proposed developments has been considered along with the location, designation and condition of the key nature conservation features, as well as the legislation and guidance on assessment, mitigation and consent required for the development proposals relating to nature conservation, including both planning policies and key legislation.

East of Huntly to Colpy

- 18.7.3 There are currently a small number of planning applications between East of Huntly and Colpy. These are predominantly for individual dwellings or farm outbuildings. An increase in the number of residential dwellings could result in an elevated population of domestic cats, which in turn may increase the chances of hybridisation with any potential local wildcat population and increased cat predation of breeding birds, red squirrel, reptiles and other species^{210,211}. The effect of these potential impacts is not considered to significantly elevate the overall effect on the local wildcat population, or other ecological features associated with the Red or Cyan route options.

Colpy to Pitcaple

- 18.7.4 There are no planned or proposed developments which are considered to have any significant cumulative effects along or near to the Pink route option or the Brown route option.

Pitcaple to Kintore

Violet Route Option

- 18.7.5 There is a large, phased housing development to the north-east of Inverurie which is located just to the south of the Violet route option. The location of this development and the habitats impacted, which are dominated by arable and low value grassland mean that this is not considered to have any significant cumulative effects. None of the other planned or proposed developments along or near the route option are considered to have any significant cumulative effects.

Orange Route Option

- 18.7.6 Although located around 2km from the Orange route option, the planned loss of approximately 22ha of LEPO up to and including the year 2042 associated with mineral works at Tom's Forest Quarry (NJ 76134 17475) could result in a significant cumulative impact. The cumulative extent of woodland removal from quarry workings and works associated with the Orange route option may have a negative impact on wider-ranging woodland species. The overall effect on these species will be related to the timing of tree removal; concurrent removal will have

²¹⁰ Woods M., McDonald R., Harris S. (2016) *Domestic Cat Predation on Wildlife*. Available at: <https://www.mammal.org.uk/wp-content/uploads/2016/03/Domestic-Cat-Predation-on-Wildlife.pdf>

²¹¹ Loss S., Will T., Marra P. (2013) *The impact of free-ranging domestic cats on wildlife of the United States*. Nature Communications 4: 1396.

additional impacts as there will be disturbance zones from which animals are excluded beyond the simple habitat loss, meaning that displaced animals may have less alternative habitat to disperse to. The worst-case scenario where woodland clearance for this route option is undertaken together with that at Tom's Forest would elevate residual effects on bats, pine marten and potentially red squirrel. Apart from the mineral works, none of the other planned or proposed developments along or near the Orange route option are considered to have any significant cumulative effects.

18.8 Summary of Effects

18.8.1 This section sets out a summary of the key findings of the assessment of each route option based on the predicted significant residual effects. Effects common to all route options have been excluded. The summaries are presented in Tables 18.14 to 18.16.

East of Huntly to Colpy

Table 18.14 Summary of Predicted Ecological Effects for East of Huntly to Colpy

Sub-topic/Criteria	Predicted Residual Effects	
	Cyan Route Option	Red Route Option
Strathbogie Wildcat Protection Area	Minor adverse – approximately 3km of new construction is within the WPA of which a large proportion is associated with the existing A96.	Minor adverse – approximately 6km of new construction within the WPA.
Loss of Ancient Woodland ¹⁸⁵	Major adverse - direct loss of approximately 0.3ha of LEPO ancient woodland.	Major adverse - direct loss of approximately 0.4ha of LEPO ancient woodland.
Terrestrial habitats	Minor adverse due to habitat loss which includes 0.2ha of woodland listed on the native woodland ¹⁸⁵ inventory.	Minor adverse due to habitat loss which includes 0.6ha of woodland listed on the native woodland ¹⁸⁵ inventory.
Landscape permeability	Minor adverse due to impact on potential habitat corridor connecting Hill of Tillymorgan to Gartly Forest.	Minor adverse due to impact on potential habitat corridor connecting Hill of Tillymorgan to Gartly Forest.
Watercourse crossings	Minor adverse due to operational runoff potentially entering the River Urie and the long-term impact of realignment and installation of culverts along the River Urie	Minor adverse due to operational runoff potentially entering River Urie and construction of additional culverts.

18.8.2 Both route options lead to new construction within the WPA, however, the extent of encroachment and potential interaction with wildcat both during construction and operation is much greater for the Red route option.

18.8.3 Both route options cut through a potential wildlife corridor associated with the River Urie. The Red route option adds an additional break to the wildlife corridor whereas the Cyan route option widens the existing break formed by the existing A96. There

is also the potential for the Cyan route option to increase the effectiveness of the wildlife corridor and reduce RTA through mitigation (e.g. an underpasses/green bridge).

- 18.8.4 The Cyan route option incorporates a realignment of the River Urie presenting significant risk with respect to ecological re-instatement given the current quality of the watercourse. Impacts on the water environment for the Red route option are restricted to culverts on larger watercourses although there are long realignments of some smaller streams.
- 18.8.5 Both route options have a similar impact on native and ancient woodland features although the impact of the Red route option on other semi-natural habitats, including small scale elements of the landscape (e.g. treelines, hedges, patches of scrub) which provide cover and connectivity, is larger.
- 18.8.6 Both route options are predicted to have roughly equivalent minor adverse effects on terrestrial native woodland habitats and moderate adverse effects on ancient woodland. The Red route option has a greater overall impact on terrestrial habitats and on the WPA. It is also anticipated that the Red route option will have a greater adverse effect on habitat connectivity as a result of its alignment across the northern slopes of the Hill of Foudland and its general deviation from the existing A96 route.
- 18.8.7 Overall, the Cyan route option is predicted to have fewer negative effects on nature conservation features due to the lesser impact upon the WPA and the lesser level of fragmentation caused.

Summary: Colpy to Pitcaple

Table 18.15 Summary of Predicted Ecological Effects for Colpy to Pitcaple

Sub-topic/Criteria	Predicted Residual Effects	
	Pink Route Option	Brown Route Option
Loss of Ancient Woodland ¹⁸⁵	Major adverse - direct loss of approximately 5.5ha of LEPO ancient woodland	Major adverse - direct loss of approximately 11.5ha of LEPO ancient woodland
Terrestrial habitats	Minor adverse due to habitat loss including 0.4ha listed on the native woodland ¹⁸⁵ inventory.	Minor adverse due to habitat loss including 1.4ha listed on the native woodland ¹⁸⁵ inventory.
Landscape permeability	Minor adverse due to severance of a potential habitat corridor along the River Urie.	Minor adverse due to severance of a potential habitat corridor along the River Urie.
Water crossings	Minor adverse due to operational runoff potentially entering the River Urie crossing and at the crossings of the Bonnyton Burn and Burn of Durno.	Minor adverse due to operational runoff potentially entering the River Urie crossing and at the crossings of the Shevock Burn, The Kellock and Burn of Durno.

- 18.8.8 The Pink route option cuts through the middle of a single, 32ha LEPO ancient woodland block. Land take from the Brown route option impacts five ancient

woodland blocks, two of which are large (36.9ha and 30.6ha) continuous blocks in which the route option is aligned through the middle.

- 18.8.9 The Brown route option follows the existing A96 more closely. However, where it deviates from the existing A96, the ecological value of the habitats it crosses are greater than those crossed by the Pink route option which predominantly impacts arable land (with the notable exception of Logie Woodlands).
- 18.8.10 A potential habitat corridor is formed by woodland blocks extending from Bennachie northwards to the woodland at Durno. There is recent evidence of pine marten, wildcat and red squirrel activity within this area. Both route options are aligned across this habitat corridor reducing habitat connectivity and affecting the protected species present. The Pink route option takes a more direct path through this habitat corridor affecting a single woodland block at the northern extent of the habitat corridor. In contrast, the Brown route option takes a longer route through the habitat corridor and it is aligned across the corridor further south, potentially isolating a much larger area of woodland habitat.
- 18.8.11 Neither route option results in realignments of anything other than small, heavily impacted watercourses. The number of tributaries of the River Urie crossed in close proximity to their confluence with the main channel, as well as a crossing of the River Urie itself, is likely to result in greater adverse effects on the water environment resulting from construction and operation of the Brown route option when compared to the Pink route option.
- 18.8.12 The Brown route option is predicted to have greater adverse effects on both ancient and native woodland and impacts more valuable non-woodland habitats. It is also predicted to have greater adverse effects on overall habitat connectivity and protected species as it severs an important habitat corridor at a more sensitive location.
- 18.8.13 Overall the Pink route option is predicted to have fewer negative effects on nature conservation features due to its likely lesser impacts on ancient woodland and non-woodland habitats of ecological value, and a more favourable crossing point of the River Urie.

Summary: Pitcaple to Kintore

Table 18.16 Summary of Predicted Ecological Effects for Pitcaple to Kintore

Sub-topic / Criteria	Predicted Residual Effects	
	Violet Route Option	Orange Route Option
Pitscurry Moss LNCS	Major adverse as irreparable damage to wetland LNCS.	Major adverse as irreparable damage to wetland LNCS, and effective loss of site due to land take of central section of site.
Loss of Ancient Woodland ¹⁸⁵	Major adverse due to loss of approximately 2.2ha of LEPO and 0.2ha ASNO ancient woodland.	Major adverse due to loss of approximately 9.5ha of LEPO ancient woodland.
Terrestrial Habitats	Minor adverse due to habitat loss including 2.3ha listed on the native woodland ¹⁸⁵ inventory.	Minor adverse due to habitat loss including 7.5ha listed on the native woodland ¹⁸⁵ inventory.

Sub-topic / Criteria	Predicted Residual Effects	
	Violet Route Option	Orange Route Option
Landscape permeability	Negligible and no predicted impact on habitat corridors.	Minor adverse due to severance of a potential habitat corridor associated with the River Don.
Water crossings	Minor adverse due to operational runoff potentially entering the River Don and Lochter Burn/ Kings Burn.	Minor adverse due to operational runoff potentially entering the River Urie and River Don.

- 18.8.14 Both route options have residual impacts on nature conservation features. Of greatest note, the Orange route option would result in the loss of Pitscurry Moss LNCS. The Violet route option would result in the direct loss of part of this LNCS and the likely loss of the ecological functionality of this site.
- 18.8.15 The Orange route option has a much larger impact on non-plantation woodland, including both ancient LEPO and native woodland. Much of the woodland impacted by this route option is located to the south-west of Inverurie and connects to a potential habitat corridor along the River Don.
- 18.8.16 There are likely to be significant protected species issues associated with both route options, especially with respect to badger, bats, otter and water vole. Species typically more closely associated with woodland (e.g. pine marten, red squirrel) are likely to suffer greater negative effects from the Orange route option, especially given the potential cumulative interaction with mineral extraction at Tom’s Forest.
- 18.8.17 Both route options have the potential for long and short-term negative effects on wintering geese populations (qualifying species for local SPAs) which exploit agricultural land within the study area for both route options during the winter months. Of the two route options, the Violet route option affects areas with a greater number of historic goose records, although where geese forage at a local scale is likely to be heavily influenced by annual agricultural land management.
- 18.8.18 The Orange route option is predicted to have greater adverse effects on both ancient and native woodland, and it impacts more valuable non-woodland habitats. It is also predicted to have greater adverse effects on overall habitat connectivity and protected species as it crosses an important habitat corridor associated with the River Don.
- 18.8.19 Overall the Violet route option is predicted to have fewer negative effects on nature conservation features due to its likely lesser impacts on ancient woodland, habitat connectivity and protected species.

18.9 Scope of DMRB Stage 3 Assessment

- 18.9.1 An assessment of the effects on nature conservation will be undertaken during DMRB Stage 3 in accordance with the New Guidance.
- 18.9.2 The following are the anticipated ecological surveys likely to be required to inform the assessment, however, the final requirement for and scope of the surveys will be agreed with SNH during DMRB Stage 3 and it should be noted that this is not a finalised list:

- Botanical and habitat surveys – updates to Phase 1 habitat surveys conducted to date and more detailed National Vegetation Classification (NVC) surveys where it is considered additional botanical or habitat data is required. This may be necessary to identify or give a better representation of ground water dependant terrestrial ecosystems (GWDTE), ancient woodland and other notable semi-natural habitats.
- Watercourse surveys – surveys such as pond, ditch and River Corridor Surveys (RCS) or equivalent to determine the capacity of waterbodies and watercourses to support ecologically significant species.
- Bird surveys – wintering bird surveys to assess use of scheme footprint and adjacent land by geese from SPAs within the region; general breeding bird surveys; certain species-specific surveys (e.g. Schedule 1 species such as barn owl and kingfisher).
- Protected species – surveys of protected species will investigate the distribution and population of these species within the study area. Anticipated species surveys include:
 - Badger – surveys to determine sett locations, social group territories and commuting routes;
 - Bats – surveys of foraging areas, commuting routes and potential roost sites;
 - Reptiles – surveys to determine presence in suitable habitat;
 - Riparian mammal – surveys along watercourses and in suitable adjacent habitat to assess use by otter and water vole, especially at locations of watercourse crossings;
 - Red squirrel – surveys to determine extent of species within the study area;
 - Pine marten – surveys to determine extent of the species within the study area and to locate any impacted den sites;
 - Wildcat – surveys to determine extent of species within the study area and to locate any impacted den sites;
 - Great Crested Newt – surveys to determine extent of species within the study area;
 - Invertebrates (aquatic and terrestrial) – surveys to determine presence of protected invertebrate species within suitable habitat and where relevant to inform biodiversity value of key habitats to be lost;
 - Fish – surveys to determine presence of species within watercourses to be impacted, particularly by realignments; and
 - Freshwater Pearl Mussel – surveys to determine presence in suitable habitat within the study area, especially at locations of watercourse crossings.

- 18.9.3 Where required, further hydrogeological investigation will be undertaken to determine potential effects on wetland habitats and guide development of site specific mitigation measures. This will include an assessment of GWDTEs²¹².
- 18.9.4 Potential construction and operational impacts (and mitigation) on wintering geese will be considered in detail in the DMRB Stage 3 assessment report. The need for an Appropriate Assessment will be discussed with SNH at the start of DMRB Stage 3 as there is potential for likely significant effects (LSE) on the following European designated sites:
- Ythan Estuary, Sands of Forvie and Meikle Loch (SPA including potential Special Protection Area extension and Ramsar); and
 - Loch of Skene (SPA and Ramsar).

²¹² SEPA, *Land Use Planning System SEPA Guidance Note 31 – Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems* (2017)

19 Geology, Soils, Contaminated Land and Groundwater

19.1 Introduction

19.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the predicted impacts on geology, soils and groundwater for the route options. It also includes an assessment of contaminated land constraints affecting the route options.

19.1.2 The assessment includes the following:

- Baseline conditions within the study area, relating to geology, soils, contaminated land, and groundwater including abstractions;
- Potential impacts of each route option with regard to the identified geology and soils baseline conditions;
- Potential impacts of each route option on hydrogeology and groundwater abstractions including private water supplies;
- Assessment of contamination and contaminated land; and
- Anticipated mitigation measures that might be developed at DMRB Stage 3 for the Preferred Option.

19.2 Approach to Assessment

Introduction

19.2.1 This assessment has been undertaken with reference to guidance provided in DMRB (Volume 11, Section 3, Part 11, Geology and Soils²¹³), taking into account contaminated land risk assessment guidance including Construction Industry Research and Information Association (CIRIA) C552²¹⁴, and Scottish Environment Protection Agency (SEPA) guidance relating to groundwater abstraction²¹⁵. The assessment of contaminated land also incorporates risk assessment best practice from Part IIA of the Environment Protection Act 1990²¹⁶, BS5930²¹⁷ and BS10175²¹⁸. The assessment of impacts on Private Water Supplies (PWS) has taken into consideration The Water Environment Controlled Activities (Scotland) Regulations²¹⁹. The new DMRB guidance LA 109 has not been used in this assessment, and is discussed in sections 19.2.24 to 19.2.30. Detailed assessment of effects on groundwater Dependent Terrestrial Ecosystems (GWDTEs) has been scoped out of the DMRB Stage 2 assessment. Refer to Chapter 18, Nature Conservation, for scheme-wide effects on GWDTEs.

²¹³ Design Manual for Roads and Bridges (DMRB), *Volume 11, Section 3, Part 11, Geology and Soils*; (The Highways Agency et al., 1993)

²¹⁴ CIRIA C552, *Contaminated Land Risk Assessment: A guide to good practice*; (Rudland et al., 2001)

²¹⁵ SEPA Regulatory Method WAT-RM-11: *Licensing Groundwater Abstractions including Dewatering*; (SEPA, 2017)

²¹⁶ Environmental Protection Act 1990 – *Part IIA Contaminated Land: Statutory Guidance*

²¹⁷ BS5930:2015, *Code of Practice for Site Investigations*; (British Standards Institute, 2015)

²¹⁸ BS10175:2011+A2:2017, *Investigation of Potentially Contaminated Sites*; (British Standards Institute, 2011)

²¹⁹ SEPA, *General Binding Rule 15, The Water Environment (Controlled Activities) (Scotland) Regulations 2011*, (“CAR”); (SEPA, Version 8, 2018)

Baseline Information

- 19.2.2 Baseline conditions have been determined through consultation with statutory and non-statutory bodies, a desk-based study and from site survey information. The main study area used for the geology and soils assessment is generally based on a one-kilometre buffer applied to the outer most edge of the route options i.e. top/toe of the earthworks slope, however where other study areas have been used this is defined within the relevant section of the chapter.
- 19.2.3 The following sources of information have been reviewed in the desk-based study:
- British Geological Survey (BGS) data, including:
 - 1:50,000 scale digital geology web-mapping services;
 - 1:50,000 scale published drift and solid geology maps ²²⁰;
 - Hydrogeological maps;
 - Published memoirs, regional guides and sheet descriptions;
 - Historic borehole logs;
 - Correspondence with BGS specialists;
 - BGS lexicon of named units; and
 - Recorded Mineral Sites.
 - Current and historic Ordnance Survey (OS) maps, dating back to 1869;
 - SEPA and BGS Groundwater Vulnerability and Aquifer Productivity maps;
 - Macaulay Land Use Research Institute (MLURI) Agricultural Land Classification maps, published by the James Hutton Institute (JHI);
 - Environmental GIS data from Landmark Information Group, including historic tanks and fuel storage locations; and
 - Results of previous Preliminary Source Studies completed by Jacobs UK Ltd²²¹.
- 19.2.4 Baseline data has also been obtained through consultation with the following organisations:
- Aberdeenshire Council, for information on former contaminative land-use, Private Water Supplies (PWS), fuel storage and any additional relevant information;
 - SEPA, for information on groundwater abstractions and contaminated land; and
 - Scottish Natural Heritage (SNH), for information on environmental sensitivities and geological designations.

²²⁰ Sheet 76E Inverurie, Sheet 76W Alford, Sheet 86E Turriff, Sheet 86W Huntly

²²¹ Jacobs UK Ltd, *A96 Dualling Preliminary Sources Study Reports: Huntly to Adamston (PSSR05), Adamston to Old Rayne (PSSR06), Old Rayne to Kintore (PSSR07), Kintore to AWPR (PSSR08)*, March 2015

Assessment Methodology – Geology and Soils

- 19.2.5 The assessment of impacts and changes to baseline geology and soil conditions includes an assessment of the following:
- Impact on designated geological sites such as Sites of Special Scientific Interest (SSSI), Geological Conservation Review Sites (GCR) and Local Nature Conservation Sites (LNCS);
 - Impact on mineral resources including safeguarded areas;
 - Impact on agricultural soil resources;
 - Impact on other soils and geological formations such as peat, carbon rich soils, and sand and gravel resources; and
 - Opportunities for geological formations of scientific interest to be exposed and studied.
- 19.2.6 Geology and soil features that are potentially affected by the development have been given scores for sensitivity (importance of feature) and magnitude (severity) of impact, to determine the overall impact significance.
- 19.2.7 Tables 19.1 to 19.3 show the criteria for sensitivity and magnitude scoring for geology and soils.

Table 19.1 Sensitivity Criteria for Geology & Soils Assessment

Sensitivity	Description
High	Geological exposures/features or rock/soil resources which are unique, rare, or of national importance. Geological sites with statutory designation, such as SSSIs or areas of safeguarded minerals.
Medium	Regionally important rock or soil resources or geological exposures/features with educational, scientific or aesthetic significance. Geological sites with non-statutory designation, such as GCRs and geological features within LNCSs.
Low	Geological features/exposures not currently protected, or rock/soil resources which are widespread regionally.
Negligible	Rock or soil resources which are not currently protected, are widespread regionally, and have no economic/exploitable value.

Table 19.2 Magnitude Criteria for Geology & Soils Assessment

Magnitude	Description
High	Partial (>50%) loss of a site/feature/resource, or where complete severance would make site/feature/resource inaccessible and remove its value.
Medium	Partial (15% to 50%) loss of a site, considerable severance, or other substantial effect.
Low	Minor effect on site (<15% loss) or minor severance issues.
Negligible	Very slight change from baseline condition.

19.2.8 The impact of the route options on geology and soils resources has been assessed by determining the percentage of the resource or site that is lost from the wider study area. The study area used for the impact assessment of geology and soils resources is defined by a 1km buffer around the route options.

Table 19.3 Impact Significance for Geology & Soils Assessment

IMPACT SIGNIFICANCE MATRIX		Sensitivity			
		High	Medium	Low	Negligible
Magnitude	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Moderate	Minor
	Low	Moderate	Moderate	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible
	Benefit	Negligible	Negligible	Negligible	Negligible

Assessment Methodology – Groundwater

19.2.9 The assessment of impact and changes to baseline groundwater conditions includes an assessment of the following:

- Impact of earthworks on groundwater table, and subsequent impact on available yield for abstractions, including PWS from wells, pumps, boreholes and springs;
- Impact of road construction and operation (a potential source of contamination) on quality of water in abstractions.

19.2.10 Groundwater abstractions and resources that are potentially affected by the development have been given scores for sensitivity and magnitude of impact, to determine overall impact significance.

19.2.11 DMRB (HD 45/09²²² Table A4.3) includes criteria for assessing the sensitivity of groundwater resources on a road scheme. These criteria have been departed from during the DMRB Stage 2 assessment of impacts on groundwater on the scheme, due to the following scheme specific baseline conditions:

- All bedrock formations within study area are defined by the BGS as ‘Low Productivity’ aquifers;
- There are no groundwater abstractions for public supply within the study area;
- There are no Source Protection Zones (SPZs) within the study area; and
- PWS relating to groundwater within the study area are anticipated to abstract water from localised groundwater bodies in permeable drift deposits and localised zones of higher-permeability bedrock.

19.2.12 For the reasons outlined in Paragraph 19.2.10, it is considered that the DMRB criteria for estimating the importance of water environment attributes and receptors would not have been appropriate for assessing the impacts on specific

²²² Design Manual for Roads and Bridges (DMRB) HD 45/09 Environmental Assessment Techniques, Road Drainage and the Water Environment; (The Highways Agency et al., 2009)

groundwater regimes and groundwater abstractions within the current study area. Had the DMRB criteria been used, the assessment would have determined all route options to have an insignificant impact on groundwater, and that it would not have been possible to compare the route options.

- 19.2.13 PWS (abstracting groundwater) have been considered individually, and potential draw-down, severance, or disruption to local groundwater regimes due to earthworks construction has been considered in relation to PWS on a case-by-case basis.
- 19.2.14 An 850m buffer applied to the outer most edge of the route options i.e. top/toe of the earthworks slope has been used to identify potentially impacted PWS on this scheme, in accordance with SEPA Regulatory Method WAT-RM-11²⁰¹. It is noted that the SEPA Guidance Note 31²²³ recommends assessing the impacts on PWS using buffers of 100m and 250m around the schemes being considered. It is considered that for this scheme these buffers are not appropriate for assessing impacts of the route options, due to the potential size of earthworks.
- 19.2.15 The potential for routine surface run-off from the route options to infiltrate into the groundwater and migrate to other receptors has been assessed with reference to SEPA and BGS' Groundwater Vulnerability data²²⁴, which provides information on the permeability of superficial deposits.
- 19.2.16 Tables 19.4 to 19.6 show the criteria for sensitivity and magnitude scoring of groundwater impacts overall. Volume 4b, Appendix A19.1 shows the criteria that have been used for detailed assessment of impacts on individual groundwater abstractions.

Table 19.4 Sensitivity of Groundwater Resources

Sensitivity	Description
High	Local aquifer with high quality or yield, or local groundwater regime extensively exploited and supporting multiple abstractions.
Medium	Exploitation of local aquifer is less extensive and supports some PWS. Wider groundwater regime potentially susceptible to contamination, being classed as a 'Minor or Moderately Permeable Aquifer'.
Low	Exploitation of local aquifer is not extensive and supports a limited number of PWS. Groundwater quality impaired by some other factor. Wider groundwater regime unlikely to be susceptible to contamination, being classed as a 'None or Weakly Permeable Aquifer'.
Negligible	Groundwater not exploited, and wider groundwater regime unlikely to be susceptible to contamination, being classed as a 'None or Weakly Permeable Aquifer'.

- 19.2.17 The magnitude of impact on availability, yield or quality of PWS will be based on the type and geometry of earthworks adjacent to the PWS, in relation to existing topography and groundwater table(s). Detailed criteria for the assessment of

²²³ Scottish Environment Protection Agency, Land Use Planning System Guidance Note 31, *Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems*; (SEPA, 2017)

²²⁴ SEPA & BGS, *Groundwater Vulnerability (Scotland)*; (British Geological Survey, 2018)

impacts on groundwater at individual abstraction points is provided in Volume 4b, Appendix A19.1.

Table 19.5 Magnitude of Impact on Groundwater Resource

Magnitude	Description
High	Significant permanent change to groundwater regime (yield, quality, and/or water table level) irreparably impacting upon or removing an existing abstraction. Abstraction potentially requiring replacement.
Medium	Changes to groundwater regime pose a slight impact on existing abstractions.
Low	Changes to groundwater levels or quality that will not impact on existing abstractions.
Negligible	Baseline conditions only very slightly affected. No existing abstractions.

Table 19.6 Impact Significance for Groundwater Assessment

IMPACT SIGNIFICANCE MATRIX		Sensitivity			
		High	Medium	Low	Negligible
Magnitude	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Moderate	Minor
	Low	Moderate	Moderate	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible

Assessment Methodology – Contaminated Land

- 19.2.18 The assessment of contamination and contaminated land includes the following:
- Potential for road construction and maintenance works to cause the ground to become contaminated;
 - Potential for existing contaminated land (natural or man-made) to constrain or impact development; and
 - Assessment of pollutant pathways created from construction works in existing contaminated soils.
- 19.2.19 Potential sources of contamination and potential receptors have been identified through the baseline study. Conceptual site models have been developed for the route options, identifying potential receptors, and the pathways through which they could be exposed to contamination at various stages of the project. Potential risks have been described in terms of 'likelihood of occurrence' and 'magnitude of consequence'.
- 19.2.20 A qualitative assessment of contaminated land has been undertaken in accordance with CIRIA C552. In the absence of ground investigation information or geoenvironmental testing results, professional judgement has been used to determine the likelihood and magnitude of contaminated land impacts.

19.2.21 The classification of likelihood (probability) is shown in Table 19.7 and the definitions have been taken from Table 6.4 of CIRIA C552.

Table 19.7 Likelihood/Probability Criteria for Contaminated Land Assessment

Likelihood	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long term.

19.2.22 The classification of consequences (magnitude) is shown in Table 19.8 and the definitions have been taken from Table 6.3 of CIRIA C552.

Table 19.8 Magnitude/Consequence Criteria for Contaminated Land Assessment

Magnitude	Definition
Severe	<ul style="list-style-type: none"> Short-term (acute) risk to human health likely to result in 'significant harm' Short-term risk of pollution of sensitive water resource Catastrophic damage to buildings or property Short-term risk to a particular ecosystem or organism
Medium	<ul style="list-style-type: none"> Chronic/long-term damage to human health ('significant harm') Pollution of sensitive water resources A significant change in a particular ecosystem or organism
Mild	<ul style="list-style-type: none"> Pollution of non-sensitive water resources Significant damage to crops, buildings, structures and services ('significant harm') Damage to sensitive buildings/structures/services

Magnitude	Definition
Minor	<ul style="list-style-type: none"> Harm, although not necessarily significant harm, which may result in financial loss, or expenditure to resolve Non-permanent health effects on human health (which can be easily prevented) Easily repairable effects of damage to buildings, structures and services

19.2.23 The classifications of likelihood and magnitude are shown in Table 19.9 and have been used to indicate the overall risk posed by each pollutant linkage, following Table 6.5 of C552.

Table 19.9 Impact Significance for Contaminated Land

IMPACT SIGNIFICANCE MATRIX		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate Risk
	Likely	High Risk	Moderate Risk	Moderate Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	Unlikely	Moderate Risk	Low Risk	Very Low Risk	Very Low Risk

Assumptions and Limitations

New Guidance

19.2.24 The DMRB Volume 11, Section 3, Part 11 'Geology and Soils' (Withdrawn Guidance) was superseded by LA 109 'Geology and soils' (New Guidance) in October 2019. However, the decision was made following discussion with Transport Scotland not to use LA 109 for the assessment, as this guidance was released after the DMRB Stage 2 environmental assessment work had commenced. To support this decision, a comparison exercise between DMRB Volume 11, Section 3, Part 11 and LA109 has been undertaken to understand if the New Guidance would have significantly amended/changed the assessment outcomes.

19.2.25 In comparison to DMRB Volume 11 Section 3 Part 11, LA 109 presents several changes to the methodology for assessing impacts and determining magnitude criteria in a Geology and Soils assessment, however, the fundamentals of the assessment process remain the same in terms of the receptors to be included. The exception to this is the assessment of effects on mineral deposits as a resource. In accordance with LA 109, the assessment of impact on mineral resources is not included in the remit of a Geology and Soils chapter. It instead falls under the

Materials assessment in Chapter 14 and the assessment is covered by LA 110 'Material assets and waste'.

- 19.2.26 Other changes set out in the New Guidance include the impact magnitude criteria for agricultural soil resources. The Scotland National Application Annex to LA 109 states that any loss of agricultural soils greater than two hectares for prime agricultural land or 10 hectares for other agricultural land should be classed as a major impact. If these criteria had been used for the DMRB Stage 2 assessment, all six of the route options would have been determined as a major impact on agricultural soils, as more than two hectares of prime agricultural land would have been impacted by all route options. The assessment of agricultural soils has focussed on the impact on Land Capability for Agriculture (LCfA) classes 1 to 3.1 ('Prime Agricultural Land') due to the prevalence and importance of this soil resource at a local and regional level. As the Withdrawn Guidance did not provide specific area 'hectarage' criteria, the assessment of impact on agricultural land has been undertaken by determining the proportion of prime agricultural land that would be lost. This approach to the assessment of agricultural land has allowed for greater differentiation between route options, and due to the length of the scheme and the size of the study area, this is considered to have been the most appropriate approach for assessing the impacts of the Scheme. Whilst the impact magnitudes may have changed if the New Guidance had been adopted in relation to the assessment of impact on agricultural soils, the outcome of the route option assessment would not have changed.
- 19.2.27 The New Guidance also presents a different approach to the assessment of contaminated land, and states that the magnitude criteria are to be based on recorded contaminant concentrations in relation to screening levels. As there has been very limited previous ground investigations, and in most areas of the A96 East to Huntly to Aberdeen section there has been no previous ground investigations or environmental soils testing, it would not have been possible to assign magnitude criteria to the potential contaminated land sources that were identified in the Geology and Soils baseline condition section. The DMRB Stage 2 assessment of contaminated land has assigned magnitude ratings by determining the severity of the harm/damage that could be caused, in accordance with Construction Industry Research and Information Association (CIRIA) C552. These magnitude ratings are provided based on previous experience of the contaminants and concentrations associated with the different contaminative land uses and potentially contaminated sites on the scheme.
- 19.2.28 The DMRB criteria for groundwater in the DMRB Volume 11, Section 3, Part 11 were departed from and a new methodology was developed. This methodology is based on the assessment of impacts on groundwater with respect to the scheme-specific groundwater regimes and groundwater abstractions that were identified. LA 109 presents a more simplified methodology for the assessment of impact on groundwater, in which groundwater is only considered as a receptor to contamination and the potential impacts on yield and availability of groundwater are not included. The completed DMRB Stage 2 assessment presents a more detailed analysis of impact on groundwater by assessing the potential for impact on groundwater quality and availability at individual receptors and abstractions which would not have been considered in accordance with LA 109.

Effects of the New Guidance

- 19.2.29 The DMRB Stage 2 assessment of Geology, Soils, Contaminated Land and Groundwater that has been undertaken has included relevant receptors from both the Withdrawn and New Guidance, and additional receptors have been included in

the assessment with respect to scheme-specific baseline conditions. It is considered that the assessment presented within the chapter is, therefore, more detailed than an assessment that would have been undertaken if the New Guidance had been used in isolation, and that the completed assessment is suitably robust in terms of the breadth of information that has been reviewed and the range of receptors that have been assessed.

- 19.2.30 A sensitivity review of the Geology and Soils assessment has been completed in respect of the New Guidance. Whilst the significance some of individual impact ratings may have changed, the overall outcome of the assessment of Geology and Soils would not have changed and the outcome of the route option assessment for the scheme would remain the same.
- 19.2.31 At subsequent reporting stages, the impact of the Preferred Option on Geology, Soils, Contaminated Land and Groundwater will be assessed in accordance with the New Guidance. During DMRB Stage 3, a more detailed assessment of contaminated land will be undertaken for the Preferred Option using the methodology from the New Guidance and incorporating the findings of the ground investigation works and results of environmental testing and monitoring. The DMRB Stage 2 assessment of impact on agricultural soils did not use the methodology from the New Guidance and allowed for greater differentiation between the different route options, however, the DMRB Stage 3 assessment of impact on agricultural soils will be undertaken in accordance with the New Guidance.
- 19.2.32 As described in Paragraph 19.2.27, some of the assessments undertaken at DMRB Stage 2 are more detailed than required under the New Guidance, such as the assessment of impact on Groundwater. Further detailed assessments beyond the scope of the New Guidance may also be undertaken at DMRB Stage 3, in consideration of scheme specific baseline conditions.

Other Assumptions and Limitations

- 19.2.33 A 1km buffer around the route options has been taken as the 'study area' for the DMRB Stage 2 Assessment of Geology, Soils, Contaminated Land and Groundwater. It is considered that this represents an appropriate study area in which the features and characteristics of the Geology, Soils, Contaminated Land and Groundwater in relation to the route options can be assessed in the context of features and characteristics of the surrounding area. The 1km study area is considered to lie between a "local" and "regional" scale study area, and is consistent with the study areas used in the DMRB Stage 2 Assessments of other Environmental topics.
- 19.2.34 The extent, volume and nature of contaminated land cannot be determined from desk-based reviews. The sources of information listed in Section 19.2 can identify possible major sources of contamination, however, other potential sources are likely to exist, and cannot be determined without intrusive site investigation and chemical analyses. Intrusive investigation may also reveal additional sensitive receptors not identified by the desk-based study, such as peat and sensitive groundwater bodies.
- 19.2.35 The list of PWS provided by Aberdeenshire Council shows the location of the properties which use PWS, and not the source/abstraction point of the water supply itself. For the DMRB Stage 2 assessment, the licence points shown within the Aberdeenshire Council dataset are assumed to be the source of the abstraction, as no other data is available. A more detailed assessment of impact on PWS and

the feasibility of mitigation measures, will be completed through landowner consultation at DMRB Stage 3.

- 19.2.36 The identification of features such as quarries from historic maps is based on the maps that were available at the time of writing. It is possible that other constraints or constrained areas may be present as a result of historic activities which took place between map publications or prior to the earliest available historic maps. Historic wells, pumps and springs (identified on historic maps) have been reviewed as part of the PWS impact assessment, and a degree of rationalisation and aggregation of well locations has been undertaken to account for inaccuracies in historic mapping.
- 19.2.37 This assessment has been undertaken with reference to guidance provided in DMRB (Volume 11, Section 3, Part 11, Geology and Soils). The guidance contained within the updated DMRB document LA 109 Geology and Soils has not been used during the Stage 2 assessment of the A96 Dualling East of Huntly to Aberdeen, as LA 109 was released after the Stage 2 assessment work of the route options had been completed. A sensitivity review of the two guidance documents has been completed and it is not anticipated that the outcome of the Stage 2 assessment of Geology and Soils would change as a result of the updated guidance.

19.3 Baseline

- 19.3.1 Existing baseline conditions have been determined using desk-based information, as detailed in Paragraph 19.2.3, including data gathered from available historical OS Mapping, geological mapping, historical ground investigation data and through consultation.
- 19.3.2 The baseline information presented below provides a general overview of likely geology, soils, contaminated land and groundwater conditions for the study area.
- 19.3.3 Detailed baseline conditions for route options are presented on Figures 19.1 to 19.13 (Volume 5). Solid (Bedrock) Geology Maps for the route options are presented in Figures 5.10 to 5.13, Figures 6.9 to 6.12, and Figures 7.13 to 7.17 (Volume 5). Superficial (Drift) Geology Maps for the route options are shown in Figures 5.6 to 5.9, Figures 6.5 to 6.8, and Figures 7.8 to 7.12 (Volume 5).

Bedrock Geology

- 19.3.4 Bedrock geology within the study area comprises a range of Igneous and Metamorphic rocks:
- The western part of the study area is underlain by metamorphic rocks of the Macduff Formation, comprising psammite, semi-pelite, pelite and metaconglomerate. Along the geological contact with the Inch Pluton, the metasedimentary deposits have been hornfelsed.
 - The central part of the study area is underlain by the Inch Pluton, which is a layered cumulate intrusion with variable composition including ultramafic/ultrabasic rocks such as peridotites and harzburgites, mafic/basic rocks such as gabbro, and intermediate rocks such as syenite and monzonite; and
 - Metamorphosed Dalradian Rocks of the Aberdeen Formation are present in the east of the study area, comprising psammite, semi-pelite and pelite;

- Granitic rocks of the Kemnay Pluton underlie Kintore and parts of the existing A96 in the east of the study area;

19.3.5 Deep weathering is understood to be commonly developed in this area of north-east Scotland, particularly in granites, mafic igneous rocks, and psammites²²⁵. Thickness of weathered material is expected to vary across the study area due to glacial erosion. Depth to bedrock is also anticipated to vary across the study area, with rock at or close to the surface in some locations, and in excess of 15m below ground level in river floodplains and other areas with thick superficial deposits.

Radon

19.3.6 The Health Protection Agency (HPA) Indicative Atlas of Radon in Scotland²²⁶ presents an overview of the results of detailed mapping of radon potential in Scotland, defined as the estimated percentage of homes in an area at or above the radon action level. The maps show that the majority of the study area is a lower probability area (<1% of homes above action level) or intermediate probability area (1%-3% of homes above action level). Small areas of higher probability (10%-30% of homes above action level) exist within the study area in the vicinity of the Brown route option but are not directly beneath this route option. Risks from radon should be assessed at a later stage of the project, in respect to design proposals for enclosed spaces, and considering short-term and long-term receptors.

Extraction of Rock

19.3.7 There are two active quarries within the study area:

- Pitcaple Quarry/Pitscurry Quarry, extracting Norite and Gabbronorite from the middle zone of the Inch Intrusion; and
- Kemnay Quarry/Tom's Forest Quarry, extracting Muscovite-Biotite Granite from the Kemnay Pluton.

19.3.8 A review of historical maps, dated 1869 to present, shows that rock has historically been extracted from a number of other locations within the study area. Of note is the extensive extraction of slate from the Hill of Foudland, Hill of Skares and Hill of Tillymorgan, which form part of a range of hills in the west of the study area known locally as 'The Slate Hills'.

19.3.9 Information about slate at the Hill of Foudland is included in a research report produced by Historic Scotland²²⁷. Quarrying was concentrated around the tops of these hills, and large mounds of spoil and quarry waste are present on hilltops and slopes.

19.3.10 Four areas of rock within the study area are included in the Aberdeenshire Local Development Plan²²⁸ (LDP) as 'Areas Safeguarded or Identified as Areas of Search for Minerals Development' under policy PR1, and are summarised below (full details about the mineral areas are included in Appendix 6 of the LDP²²⁹);

²²⁵ British Geological Survey, *Cainozoic Geology and Landscape Evolution in North-East Scotland* (2003)

²²⁶ Health Protection Agency (HPA) *Indicative Atlas of Radon in Scotland*; (2011)

²²⁷ Joan Walsh, Historic Scotland, *Macduff Slate: Extraction and testing of slate from the Hill of Foudland, Aberdeenshire* (2008)

²²⁸ Aberdeenshire Council, *Aberdeenshire Local Development Plan* (2017)

²²⁹ Aberdeenshire Council, *Aberdeenshire Local Development Plan; Areas Safeguarded or Identified as Areas of Search for Minerals Development* (2017)

- Foudland: Large deposits of slate available for further exploitation;
- Skares: Large deposits of slate available for further exploitation;
- Pitcaple: Active quarry producing crushed rock aggregate from norite and gabbronorite of the Inch mass; and
- Tom's Forest: Active quarry producing crushed rock aggregate from foliated muscovite-biotite granite.

19.3.11 Active quarries and safeguarded areas are shown on Figures 19.1 to 19.13 (Volume 5).

Superficial Geology

19.3.12 A range of glacial superficial deposits can be found within the study area, including coarse grained and fine grained glacial tills, glaciofluvial deposits, moraine formations, hummocky (moundy) glacial deposits and glaciolacustrine deposits. The glacial deposits and formations within the study area are associated with both upland and lowland glacial and peri-glacial environments²³⁰. Post-glacial superficial deposits include river terrace and alluvial deposits, lacustrine deposits, head deposits, alluvial fan deposits, and peat.

Extraction of Superficial Deposits

19.3.13 Many exploitable deposits of sand and gravel exist within the southern part the study area^{231,232}, consisting mostly of broad spreads of glaciofluvial deposits along the Rivers Don and Urie floodplains. Sandy gravelly tills and weathered granites are also a potential sand and gravel resource, but with a limited range of uses²³³. In the north of the study area, sand and gravel resources are much less abundant and are restricted to localised pockets in river valleys²³⁴.

19.3.14 A review of historical maps, dated 1869 to present, shows that extraction of sand and gravel has taken place within the valley of the River Don, particularly to the west of Kintore, with the main extractions appearing to be from Glaciofluvial Sheet Deposits. Many small sand and gravel pits are also shown across the study area, including small pits at farms and rural properties.

19.3.15 The Directory of Mines and Quarries²³⁴ does not include any active sand and gravel quarries within the study area, although active quarries exist elsewhere in Aberdeenshire. The Aberdeenshire LDP does not identify any protected areas of sand and gravel within the study area.

²³⁰ British Geological Survey, *Engineering Geology (Superficial) Map of the United Kingdom*, 1: 1,000,000 Series; (2011)

²³¹ British Geological Survey, *Chapter 12, Geology of the Country around Inverurie and Alford, Memoir for Geological Sheets 76E and 76W (Scotland)*; (1997)

²³² Sand and Gravel Resources of the Grampian Region, Natural Environment Research Council. Institute of Geological Sciences, Report No. 77/2.; (NERC, 1977)

²³³ British Geological Survey, Chapter 4 & 9, *Geology of the Huntly and Turriff Districts, Sheet Description for Geological Sheets 86W and 86E* (2015)

²³⁴ British Geological Survey, *Directory of Mines and Quarries*, Tenth Edition; (2014)

Geological Receptors and Designated Geological Sites

- 19.3.16 There are three geological and/or geomorphological SSSIs within the study area:
- Pittodrie: 8km to the north-west of Inverurie, the exposure at the site is an important example of glacial deposits and deeply weathered granite bedrock^{235,236};
 - Pitcaple and Legatesden Quarries: 1km north of Pitcaple and 6km north-west of Inverurie, the site provides excellent exposure of two different varieties of gabbro from the Inch intrusion²³⁷; and
 - Hill of Barra: 1km south of Oldmeldrum, the rocks at the hill typify the silica-poor ultramafic rocks unit found in the Inch intrusion and other basic intrusions in the north-east Grampian highlands²³⁸.
- 19.3.17 Other SSSIs with important flora or fauna, are present within the study area, and are described and assessed in Chapter 18, Nature Conservation.
- 19.3.18 GCRs contain features of national or international importance that are considered to qualify for designation as SSSIs. Many GCRs have statutory protection through designation as SSSIs, however, 'unnotified GCR sites', without SSSI designation and protection also exist²³⁹. All three GCRs within the study area are designated as SSSIs, and there are no 'unnotified' GCRs.
- 19.3.19 There are three LNCSs²⁴⁰ within the study area are designated as LNCSs partly or wholly due to geodiversity and the presence of geological or geomorphological features:
- Cairnhill, Culsalmond: Disused quarry with a good exposure of metamorphic rock;
 - Foudland: Conservation site covers a large area of the Glens of Foudland and includes disused slate quarries on 'the slate hills', and glaciofluvial features (mainly meltwater channels) on northern slopes; and
 - Govals: Good exposures of igneous rocks within disused quarry.
- 19.3.20 Other LNCS with important flora or fauna or other features important for nature conservation, are present within the study area, and are described in Chapter 18, Nature Conservation.
- 19.3.21 Geological geomorphological SSSIs, GCR sites, and LNCS (geological/geomorphological) are shown on Figure 19.1 to 19.13 (Volume 5).

²³⁵ Scottish Natural Heritage, *Pittodrie Site of Special Scientific Interest, Site Management Statement* (2007)

²³⁶ Scottish Natural Heritage, *Pittodrie Site of Special Scientific Interest, Description* (2011)

²³⁷ Scottish Natural Heritage, *Pitcaple and Legatesden Quarries Site of Special Scientific Interest, Site Management Statement* (2002)

²³⁸ Scottish Natural Heritage, *Hill of Barra Site of Special Scientific Interest, Description* (2011)

²³⁹ Scottish Natural Heritage, *Geological Conservation Review Sites* – webpage available at:

<https://www.nature.scot/landforms-and-geology/protecting-our-geodiversity/places-and-plans-safeguard-geodiversity/geological-conservation-review-sites> (2018)

²⁴⁰ Scottish Natural Heritage, *Local Nature Conservation Sites* – webpage available at:

<https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/local-designations/local-nature-conservation-sites> (2018)

Soil Classification

19.3.22 The soil classification information presented below is taken from the James Hutton Institute (JHI) 'Scottish Soil Classification' 1:25,000 soil maps:

- The majority of soils in the central part of the study area are classed as 'Brown Soils', typically described as 'freely drained shallow topsoil derived from gabbros and basic igneous rocks';
- To the west of Inch, the predominant soil type is 'Humus-iron Podzols', typically described as 'freely drained shallow topsoil derived from slates, phyllites and other weakly metamorphosed argillaceous rocks';
- To the east of Inverurie, the predominant soil type is 'Humus-iron Podzols', typically described as 'freely drained, derived from granites and granitic rocks', or 'glaciofluvial deposits of sands and gravels derived from acid rocks';
- Other major soil groups are present within the study area, including alluvial soils, mineral gleys, mineral podzols, montane soils, peat, peaty gleys, and peaty podzols; and
- Unclassified soil types are present in areas of known shallow rock, beneath urban areas such as Inverurie, in quarries and quarry spoil such as on the Hill of Foudland, and in the channels of rivers and other watercourses.

Land Capability for Agriculture

19.3.23 The Macaulay Land Use Research Institute has produced a series of maps that show 'Land Capability for Agriculture' (LCfA) in Scotland²⁴¹. The LCFa shown within the study area by the 1:25,000 scale map, can be summarised as follows:

- Class 2 and 3.1 (Land capable of supporting Arable Agriculture, also referred to as 'Prime Agricultural Land') is present within some parts of the study area and is mostly found in lowland areas to the north of the existing A96, between Colpy and Inverurie. These soils are described as deep, easily workable and free-draining;
- Class 3.2 to 4.2 (Land capable of supporting Mixed Agriculture) is the most extensively distributed soil group across the study area, occupying almost all of the study area with exception areas of Class 2 to 3.1 soils and poorer classes of soils in upland areas. These soils are described as forming on slopes up to 15°, and exhibiting some drainage limitations;
- Class 5.1 to 5.3 (Land capable of supporting Improved Grassland) occurs on hill-slopes in upland areas, and within some of the peaty soil described in Paragraph 19.3.22. These soils are described as being sub-optimal due to a number of possible factors, including climate, slope, and wetness;
- Class 6.2 to 6.3 (Land capable of supporting only Rough Grazing) occurs on hilltops in upland areas, such as on the Hill of Foudland. These areas are described as being severely limited in their agricultural capability due to steepness, poor drainage, acidity, poor climate, or thin soil cover; and

²⁴¹ Land Capability for Agriculture in Scotland (The James Hutton Institute)

- There are no Class 1 or Class 7 soils within the study area. Class '888' soils are shown beneath towns and other urban areas, including Inverurie, Kintore, Inch and Huntly. Class '999' soils are shown in the channel of the River Don.

19.3.24 Areas of Class 2 to Class 3.1 Prime Agricultural Land (PAL) are shown on Figures 19.1 to 19.13 (Volume 5).

Peat and Carbon-Rich Soils

19.3.25 Across the study area, peat is present as basin infill in lowland areas, and blanket peat is also present over plateaus and hilltops in higher ground. BGS literature²²⁵ states that spreads of hill peat are often covered in forestry or may contain roots and stumps of former trees, and that basin peats occur in the sites of former lochans, ice-scoured hollows, or kettleholes²³¹.

19.3.26 In the study area, many areas of blanket peat on the hills have been removed, however, basin peats (although often partially excavated down to the water table²³⁴) still exist, the largest being Pitscurry Moss at Pitcapple, and a wetland area adjacent to Lochter Burn to the west of Oldmeldrum. In addition, many areas of peat have been exploited or reclaimed for agriculture²²⁵, although moderately sized areas of peat exist at Rack Moss and Newton Moss.

19.3.27 A Map of Carbon Rich Soils and Peatland is published by SNH²⁴². Carbon-rich soils identified by this dataset, within the study area, include the following categories:

- Bogs (Basin, Eroded, Flat, Raised, Flushed Blanket, Unflushed Blanket);
- Gleys (Ground-water Gley, Peaty Surface-water Gley, Surface-water Gley);
- Other Soils (Ironpan, Littoral, Brown, Skeletal, Podzols, Valley Complex Soils); and
- Man-made Soil.

19.3.28 It should be noted that the areas of peat identified by the BGS are typically different in shape and extent to the areas of peat and peaty soils shown on the JHI soil maps, however there is considerable overlap between the two datasets. .

19.3.29 Areas of peat, and peaty soils from the JHI and BGS mapping are shown on Figures 19.1 to 19.13 (Volume 5). These two datasets have been combined for the DMRB Stage 2 Assessment of impacts on peat.

Artificial Ground and Anthropogenic Soils

19.3.30 BGS 1:50,000 digital mapping of Artificial Ground²⁴³ shows small areas of the following types of artificial ground, within the southern part of the study area²⁴⁴:

- Made Ground: Man-made deposits such as embankments and spoil heaps on the natural ground surface;
- Worked Ground: Areas where the ground has been cut away, such as quarries and road cuttings; and

²⁴² Scottish Natural Heritage, Carbon and Peatland Map (2016)

²⁴³ British Geological Survey, Artificial Ground 1: 50,000 theme (2018)

²⁴⁴ It is possible that Artificial Ground has not been mapped or recorded on geological map sheets 86E and 86W in the north of the study area.

- Infilled Ground: Areas where the ground has been cut away and then wholly or partially backfilled.

19.3.31 Other areas of Artificial Ground such as landfills and railway earthworks are known to exist within the study area and are also discussed in Paragraphs 19.3.42 to 19.3.45.

Aquifer Characteristics and Usage

19.3.32 The Hydrogeological Map of Scotland²⁴⁵ shows that the majority of the study area is underlain by 'pre-cambrian and intrusive impermeable rocks, generally without groundwater except at shallow depths'. Small areas of 'Locally Important Aquifers' exist within river valleys, where aquifers in Quaternary sands and gravels are described as having 'significant intergranular flow'.

19.3.33 The BGS aquifer classification maps²⁴⁶ class all bedrock within the study area as 'Low Productivity'. Most superficial geology within the study area is also 'Low Productivity', although some areas are shown as 'Unproductive', and some areas in river valleys are shown as 'Moderate to High Productivity'. Groundwater flow through superficial deposits is shown to be intergranular.

19.3.34 The BSG Groundwater Vulnerability map²⁴⁷ shows the tendency and likelihood for general contaminants to be able to move vertically through the unsaturated zone and reach the water table. The majority of the study area is shown as being 'None or Weakly Permeable', meaning that underlying groundwater is less vulnerable, whilst areas of 'Minor or Moderately Permeable' materials are present in floodplains and low-lying areas infilled with fluvial deposits, such as in the valley of the River Don.

19.3.35 The BGS memoir for Inverurie and Alford²³¹ states that limited quantities of water suitable for domestic use by individual farms are obtained from wells sunk in the fractured igneous and metamorphic rocks of the district.

19.3.36 The BGS sheet description for Huntly and Turriff²³³ states that the 'Dalradian metasedimentary rocks (such as the Aberdeen and Macduff Formations) have negligible intergranular porosity, and that groundwater flow in bedrock is invariably fracture and fissure controlled. As a result, groundwater flowpaths are widely varying and complex, and are influenced not only by the direction of the hydraulic gradient, but by structural features such as faults, joints and fracture zones. Zones of higher permeability are common within 10m of the surface where weathering processes have increased void space in the rock mass. Deep boreholes drilled into Dalradian rocks are not more than 30m in depth and supply individual properties with domestic water²³³.

19.3.37 'Superficial deposits, particularly sands and gravels form more permeable local aquifers, but are discontinuous and contain only small amounts of groundwater. Springs are numerous and commonly used for water supply²³³. Where natural occurrences of groundwater were absent historically, shallow wells were constructed for private supply, commonly to depths of between 4 and 10m²²⁵. Farms with private wells 'typically exploit water from gravelly layers in glacial till, or from permeable zones at rockhead²²⁵.

²⁴⁵ British Geological Survey, *Hydrogeological Map of Scotland* (1988)

²⁴⁶ British Geological Survey, Web-Mapping Services, GeolIndex Hydrogeology theme (2018)

²⁴⁷ British Geological Survey, *Groundwater Vulnerability Map* (2018)

- 19.3.38 There are no large-scale groundwater abstractions for public supply within the study area.

Groundwater Abstraction

- 19.3.39 There are 354 PWS recorded in the Aberdeenshire Council PWS dataset within 850m of the route options. Of these, 113 are stated to be from a groundwater source, such as a well or borehole, and the remaining 241 PWS are from an unknown source.
- 19.3.40 There are 600 wells, pumps or springs shown on the current and historic Ordnance Survey maps within 850m of the route options.
- 19.3.41 There are 365 SEPA Controlled Activities Regulation (CAR) licences for Groundwater Abstractions within 850m of the route options.

Contaminated Land

- 19.3.42 The study area is predominantly rural, with developed land around the towns of Inverurie, Port Elphinstone, Kintore, and smaller settlements. A review of datasets provided by Landmark Information Group²⁴⁸ and of historic maps dated 1869 to present, at scales of 1: 2,500 and 1: 10,000, has identified a number of industrial activities around these settlements, including gas works, locomotive works, paper manufacturing and other manufacturing processes.
- 19.3.43 Other potentially contaminative activities and sites within the study area include quarrying, landfilling, sewage works, railways, timber works, cemeteries, mills, tanks and fuel storage. Areas of infilled ground, such as backfilled ponds, canals and pits, and made ground in spoil heaps and embankments also present a potential contamination risk.
- 19.3.44 Farmland is also a potential source of contamination. Potentially contaminative agricultural activities include fuel tanks, pesticide use and storage, and unrecorded burial of waste in pits.
- 19.3.45 No chemical testing of soils or groundwater has been undertaken in the study area during DMRB Stage 2.

Summary of Baseline: East of Huntly to Colpy

- 19.3.46 A summary of the geology, soils, contaminated land and hydrogeology baseline for East of Huntly to Colpy (Cyan and Red route options) is presented in Table 19.10 and Table 19.11. The geology and soils summary includes the area (in m² or hectares) of the different geology and soils that are beneath the footprint of the Cyan or Red route options. This footprint includes the earthworks, junctions, side-roads and attenuation basins associated with each route option, as well as the main carriageway. For the purpose of comparison, the footprints include a nominal maintenance strip of minimum 3m width which incorporates specific areas that are likely to be required for maintenance or construction works. The actual land take for the Preferred Option will be determined throughout DMRB Stage 3.
- 19.3.47 The geology and soils summary also includes geological and geomorphological sites that are within or in close proximity of the route option footprints. The contaminated land baseline summary identifies key potential sources of contamination within a 50m buffer zone of the route option footprint. The summary

²⁴⁸ Landmark Information Group, Historical and Environmental Land Use Data; (2018)

of groundwater abstractions is based on an 850m buffer around each route option footprint.

Table 19.10 Baseline Environment: East of Huntly to Colpy (Cyan Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 2.0 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 155.3 ha of land suitable for Mixed Agriculture • 3.1 ha of land classed as Improved Grassland
Peat	<ul style="list-style-type: none"> • Peat (BGS) at Rack Moss • Peaty Gleyed Podzols (JHI) at Ordiesnaught • Total: 7.4 ha of peat beneath route option footprint
SSSI and LNCS	<ul style="list-style-type: none"> • Route option passes through the centre of the Foudland LNCS
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> • Route option is 125m from Skares area of safeguarded slate
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> • Bedrock within the Cyan route option is shown as a Low Productivity Aquifer • Groundwater Vulnerability: Shallow geology shown as a Non or Weakly Permeable Aquifer
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> • 59 CAR licensed groundwater abstractions within 850m • 32 PWS from a groundwater source within 850m • 42 PWS from an unknown source within 850m • 139 historic wells, pumps or springs within 850m
Contaminated Land	
Key Sources of Contamination	<ul style="list-style-type: none"> • Multiple pits, quarries and ponds infilled with unknown material • Historic mill used for natural and man-made textile products • Agricultural Land – Farming Activities
Key Receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

Table 19.11 Baseline Environment: East of Huntly to Colpy (Red Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 2.0 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 146.8 ha of land suitable for Mixed Agriculture • 10.7 ha of land classed as Improved Grassland • 4.6 ha of land classed as Rough Grazing
Peat	<ul style="list-style-type: none"> • Peat (BGS) at Rack Moss • Peaty Gleyed Podzols (JHI) at Ordiesnaught • Peaty Gleyed Podzols (JHI) at top of Hill of Foudland • Total: 15.6 ha of peat beneath route option footprint
SSSI and LNCS	<ul style="list-style-type: none"> • Route option passes through the centre of the Foudland LNCS
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> • Route option footprint intersects the Foudland area of safeguarded slate
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> • Bedrock within the Red route option is shown as a Low Productivity Aquifer • Groundwater Vulnerability: Shallow geology shown as a Non or Weakly Permeable Aquifer
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> • 61 CAR licensed groundwater abstractions within 850m • 30 PWS from a groundwater source within 850m • 40 PWS from an unknown source within 850m • 125 historic wells, pumps or springs within 850m
Contaminated Land	
Key Sources of Contamination	<ul style="list-style-type: none"> • Multiple pits, quarries and ponds, including a large group of quarries known as the Foudland Quarries, potentially infilled with unknown material. • Former distillery site (Jericho), including tanks (contents unknown) • Agricultural Land – Farming Activities
Key Receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

Summary of Baseline: Colpy to Pitcaple

19.3.48 A summary of the geology, soils, contaminated land and hydrogeology baseline for Colpy to Pitcaple (Pink and Brown route options) is presented in Table 19.12 and Table 19.13.

Table 19.12 Baseline Environment: Colpy to Pitcaple (Pink Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 41.7 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 50.8 ha of land suitable for Mixed Agriculture
Peat	<ul style="list-style-type: none"> • No Peat or Peaty Soils beneath Pink route option
SSSI and LNCS	<ul style="list-style-type: none"> • No sites in close proximity to footprint
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> • No sites in close proximity to footprint
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> • Bedrock within the Pink route option is shown as a Low Productivity Aquifer • Groundwater Vulnerability: Shallow geology shown as a Non or Weakly Permeable Aquifer along majority of route option. Small area south of Durno shown as Minor or Moderately permeable
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> • 86 CAR licensed groundwater abstractions within 850m • 10 PWS from a groundwater source within 850m • 48 PWS from an unknown source within 850m • 146 historic wells, pumps or springs within 850m
Contaminated Land	
Key Sources of Contamination	<ul style="list-style-type: none"> • Multiple pits and quarries, potentially infilled with unknown material • Historic corn mill (Mill of Bonnyton) • Historic railway line crosses the route option footprint to the southeast of Durno • Agricultural Land – Farming Activities
Key Receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

Table 19.13 Baseline Environment: Colpy to Pitcaple (Brown Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 61.2 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 45.5 ha of land suitable for Mixed Agriculture
Peat	<ul style="list-style-type: none"> • Small area of peat (11m²) clipped by route option footprint at one location south of Old Rayne • Total: <0.1 ha of peat beneath route option footprint
SSSI and LNCS	<ul style="list-style-type: none"> • No sites in close proximity to footprint
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> • No sites in close proximity to footprint
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> • Bedrock within the Brown route option is shown as a Low Productivity Aquifer • Groundwater Vulnerability: Shallow geology shown as a Non or Weakly Permeable Aquifer along majority of route option. Minor or Moderately permeable areas shown in valley of River Urie at Old Rayne, and south of Durno
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> • 69 CAR licensed groundwater abstractions within 850m • 15 PWS from a groundwater source within 850m • 51 PWS from an unknown source within 850m • 110 historic wells, pumps or springs within 850m
Contaminated Land	
Key Sources of Contamination	<ul style="list-style-type: none"> • Multiple pits, quarries and ponds infilled with unknown material • Historic mill (Mill of Pitmedden) • Historic railway line crosses the route option footprint to the southeast of Durno • Agricultural Land – Farming Activities
Key Receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

Summary of Baseline: Pitcapple to Kintore

19.3.49 A summary of the geology, soils, contaminated land and hydrogeology baseline for Pitcapple to Kintore (Violet and Orange route options) is presented in Table 19.14 to 19.15.

Table 19.14 Baseline Environment: Colpy to Pitcapple (Violet Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 52.8 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 127.4 ha of land suitable for Mixed Agriculture • 3.6 ha of land classed as Improved Grassland • 0.2 ha of land unsuitable for agriculture (River)
Peat	<ul style="list-style-type: none"> • Peat (BGS) and Basin Peats (JHI) at Pitscurry Moss • Peat (BGS) and Basin Peats (JHI) at Gunhill • Peaty Gleys (JHI) at Hillhead of Lethenty • Total: 4.6 ha of peat beneath route option footprint
SSSI and LNCS	<ul style="list-style-type: none"> • No sites in close proximity to footprint
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> • Route option footprint 13m from Area of Safeguarded Minerals at Pitcapple
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> • Bedrock within the Violet route option is shown as a Low Productivity Aquifer • Groundwater Vulnerability: Majority of route option shown as a Non or Weakly Permeable area. Minor or Moderately permeable areas shown where the route option crosses the Lochter Burn at Lethenty, and around the River Don at Kintore.

Sub-topic	Summary of Baseline Conditions
Hydrogeology and Groundwater Abstractions	
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> • 154 CAR licensed groundwater abstractions within 850m • 28 PWS from a groundwater source within 850m • 81 PWS from an unknown source within 850m • 235 historic wells, pumps or springs within 850m
Contaminated Land	
Key Sources of Contamination	<ul style="list-style-type: none"> • Multiple pits, quarries and ponds infilled with unknown material. • Agricultural Land – Farming Activities • Historical industrial land uses including saw mill and timber yard, road haulage and poultry houses. • Historic Alford Valley railway line crosses through the route option north of Bridgend, south of Kintore Business Park and west of Hillcrest. • Tanks of unknown contents located at Hillcrest. • Cemetery adjacent to existing A96 at Tavelty • Historic foot and mouth pit located within land between Kinmuck and Isaacstown, exact location unknown. • Landfill located at Kintore Business Park adjacent to route option.
Key Receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

Table 19.15 Baseline Environment: Pitcaple to Kintore (Orange Route Option)

Sub-topic	Summary of Baseline Conditions
Geology and Soils	
Agricultural Soils	<ul style="list-style-type: none"> • 18.5 ha of land suitable for Arable Agriculture (Prime Agricultural Land) • 153.3 ha of land suitable for Mixed Agriculture

Sub-topic	Summary of Baseline Conditions
	<ul style="list-style-type: none"> 6.5 ha of land classed as Improved Grassland 0.2 ha of land unsuitable for agriculture (River)
Peat	<ul style="list-style-type: none"> Peat (BGS) and Basin Peats (JHI) at Pitscurry Moss Peat (BGS) beneath side-road at Middleton Peaty Gleys (JHI) at Dubston Total: 7.9 ha of peat beneath route option footprint
SSSI and LNCS	<ul style="list-style-type: none"> Route option footprint skirts the boundary of the Pitcaple and Legatesden Quarries Geological SSSI
Areas of Safeguarded Minerals	<ul style="list-style-type: none"> Route option footprint skirts the boundary of the Area of Safeguarded Minerals (norite and gabbronorite) at Pitcaple
Hydrogeology and Groundwater Abstractions	
Aquifer Characteristics	<ul style="list-style-type: none"> Bedrock within the Orange route option is shown as a Low Productivity Aquifer Groundwater Vulnerability: Minor or Moderately permeable areas shown in valley of River Urie and River Don. Non or Weakly Permeable areas shown to west of Inverurie and at Pitscurry
CAR Licensed Abstractions, Private Water Supplies and Other Potential Groundwater Abstractions	<ul style="list-style-type: none"> 94 CAR licensed groundwater abstractions within 850m 37 PWS from a groundwater source within 850m 65 PWS from an unknown source within 850m 128 historic wells, pumps or springs within 850m
Contaminated Land	
Key sources of contamination	<ul style="list-style-type: none"> Landfills²⁴⁹. The route option footprint passes through landfills at the Kintore Business Park and west of Kirkwood Commercial Park, and passes near to a landfill to the south of Kirkwood Commercial Park

²⁴⁹ Department of Environment Industry Profile for Landfills available at: <https://webarchive.nationalarchives.gov.uk/20140328161336/http://cdn.environment-agency.gov.uk/scho0195bjll-e-e.pdf>

Sub-topic	Summary of Baseline Conditions
	<ul style="list-style-type: none"> • Multiple pits, quarries and ponds infilled with unknown material • Railway land associated with line crossing through the route option to the north of Milton of Inveramsay • Historical industrial land-uses including saw mills and laundry works • Current land-uses including motor vehicle garage • Tanks of unknown contents, associated with Thainstone Agricultural Centre • Agricultural Land – Farming Activities
Key receptors	<ul style="list-style-type: none"> • Construction and maintenance workers • End users of the A96 • Adjacent site users

19.4 Potential Impacts

19.4.1 This section presents the potential impacts of the route options, on existing geology, soils, and hydrogeological conditions, and on receptors to potential contamination and contaminated land.

Geology and Soils

19.4.2 Impact on geology and soils has been determined by assessing the areas of peat, agricultural soils, geological sites and protected resources that are potentially affected by each of the route options and comparing these to the geology and soils conditions within the study area which is the boundary defined by a 1km buffer around the route options.

19.4.3 The magnitude of impact of each route option on specific geology and soils features is presented in Table 19.16 and Table 19.19.

Table 19.16 Impact on Peat (Sensitivity=Medium¹)

Route Option	Area of Peat Impacted by Route Option	Area of Peat within wider Study Area	Magnitude of Impact	Explanation
Cyan	7.4 ha	417.3 ha of peat	Low	Peat impacted is around 2% of total peat within the study area

Route Option	Area of Peat Impacted by Route Option	Area of Peat within wider Study Area	Magnitude of Impact	Explanation
Red	15.6 ha		Low	Peat impacted is around 4% of total peat within the study area
Pink	None		No Impact	No peat within route option footprint
Brown	<0.1 ha		Negligible	Peat impacted is <0.1% of total peat within the study area. Negligible area of peat.
Violet	4.6 ha		Low	Peat impacted is <1% of total peat within the study area
Orange	7.9 ha		Low	Peat impacted is around 2% of total peat within the study area

¹ Peat is considered to have a ‘Medium’ sensitivity due to its environmental significance and carbon-storing potential

Table 19.17 Impact on Prime Agricultural Land (PAL)¹ (Sensitivity=Medium²)

Route Option	Area of Prime Agricultural Land Impacted by Route Option	Area of Prime Agricultural Land within wider Study Area	Magnitude of Impact	Explanation
Cyan	2.0 ha	3,027.5 ha of PAL	Negligible	PAL impacted is <0.1% of total PAL within the study area
Red	2.0 ha		Negligible	PAL impacted is <0.1% of total PAL within the study area
Pink	41.7 ha		Low	PAL impacted is approximately 1.4% of total PAL within the study area
Brown	61.2 ha		Low	PAL impacted is approximately 2.0% of total PAL within the study area
Violet	52.8 ha		Low	PAL impacted is approximately 1.7% of total PAL within the study area

Route Option	Area of Prime Agricultural Land Impacted by Route Option	Area of Prime Agricultural Land within wider Study Area	Magnitude of Impact	Explanation
Orange	18.5 ha		Negligible	PAL impacted is approximately 0.6% of total PAL within the study area

¹ Prime Agricultural Land is land with an LCfA Class between 1 and 3.1

² PAL is considered to have a 'Medium' sensitivity due to its regional importance as a soil resource

Table 19.18 Impact on Geological Sites

Route Option	Site Name, Sensitivity and Total Size	Area of Geological Site Impacted by Route Option	Magnitude of Impact	Explanation
Cyan	Foudland LNCS, Medium = 1,325.4 ha	83.4 ha	Low	Area impacted is approximately 6.3% of total area of the Foudland LNCS and DMRB Stage 3 will identify any impacts on specific features of interest within the LNCS
Red		72.2 ha	Low	Area impacted is approximately 5.4% of total area of the Foudland LNCS and DMRB Stage 3 will identify any impacts on specific features of interest within the LNCS
Pink	No geological sites impacted by route option			
Brown	No geological sites impacted by route option			
Violet	No geological sites impacted by route option			
Orange	Pitcaple and Legatesden SSSI (Legatesden part of Site), High = 1.1 ha	0.03 ha	Low	Small area (2.6%) of SSSI site is taken up by a side road which skirts the boundary, and by the buffer around the highway earthworks footprint.

Table 19.19 Impact on Geological or Mineral Resources

Route Option	Site Name, Sensitivity and Total Size	Area of Geological Site Impacted by Route Option	Magnitude of Impact	Explanation
Cyan	No geological or mineral resource areas impacted by route option			
Red	Foudland Area of Safeguarded Minerals, High = 176.4 ha Total area of Safeguarded Slate in study area = 199.0 ha	9.0 ha	Low	Area impacted is approximately 4.5% of total Area of Safeguarded Slate within the wider study area
Pink	No geological or mineral resource areas impacted by route option			
Brown	No geological or mineral resource areas impacted by route option			
Violet	Pitcaple Area of Safeguarded Minerals, High = 38.9 ha	No direct loss of site area	None	Route option will not result in severance or disruption
Orange		0.01 ha	None	Area of safeguarded minerals taken up by the buffer around the highway earthworks footprint. Route option will not result in severance or disruption

Groundwater Abstractions

- 19.4.4 Impact on PWS and other groundwater abstractions has been assessed by determining the potential impact that the proposed earthworks of the different route options could have on the availability (yield) and quality of groundwater at each abstraction.
- 19.4.5 Impact on groundwater aquifers as a whole has not been assessed in this section, as the baseline assessment determined that all aquifers were of low productivity. The assessment of individual PWS is considered to form a suitably robust hydrogeological impact assessment.
- 19.4.6 The following criteria were used to assess the potential impact on yield and quality of groundwater at each abstraction:
- Distance between abstraction point and the route option;
 - Proposed height of embankments and cuttings in vicinity of abstractions;
 - The relative ground level at the abstraction in relation to the proposed carriageway level; and
 - Nearby surface water features, such as rivers, burns, streams and ponds.

19.4.7 The following assumptions have been made during the assessment of the potential impact on groundwater abstractions:

- All PWS, CAR Licensed abstractions, wells, pumps and springs within 850m of the route options have the potential to be impacted;
- All PWS where the source is stated to be a well, borehole or spring are assumed to be abstracting groundwater;
- All PWS where the source is stated to be 'unknown' are potentially abstracting groundwater, and have been regarded as groundwater abstractions during the assessment;
- All wells, pumps and springs shown on the historic maps are assumed to still be present and could be actively used for private water supplies;
- Whilst some PWS and historic wells/pumps appear at similar locations, none appear at identical locations so have been regarded as separate abstractions for the purposes of this assessment;
- Cuttings excavated below the groundwater table will require dewatering, and this will cause localised lowering of the groundwater table; and
- Construction and operation of the route options could increase the likelihood for reduced water quality at the abstractions, through potential migration of contaminants through the ground. For the purposes of the assessment it has been assumed that contaminants can migrate vertically and laterally within the groundwater.

19.4.8 The assessment is subject to the following limitations:

- The groundwater table has conservatively been modelled at the surface, as depth to groundwater at each abstraction and beneath the route options is unknown at this stage due to limited ground condition and hydrogeological information;
- The depth of wells and pumps is unknown, and water is therefore potentially abstracted from any depth below the surface;
- The PWS data provided by Aberdeenshire Council is understood to show the location of addresses with PWS, and not the location of the abstraction point itself. The exact location of abstraction points is currently unknown, and the assessments are therefore based on the location of the licence point;
- It is acknowledged that there may be overlap between the different groundwater abstraction datasets that have been assessed;
- Unregistered PWS may be present within the assessment boundary; and
- Potential hydrogeological properties of individual ground conditions have not been taken into account. No adjustments have been made to reflect the potential permeability of particular strata and groundwater flow is assumed to be uniform for all ground conditions due to the limited data available at this stage.

19.4.9 Table 19.20 to Table 19.25 present the results of the impact assessments for groundwater abstractions within 850m of the route options. The detailed

methodology and criteria for determining the impact on each abstraction is described in Volume 4b, Appendix A19.1: Methodology for Detailed Assessment of Groundwater Abstractions.

Table 19.20 Potential Impacts on Groundwater Abstractions (Cyan Route Option)

Impact Magnitude	Number of Abstractions			
	PWS – Groundwater Source	PWS – Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	19	21	25	33
Low	9	17	66	24
Medium	4	3	31	2
High	0	1	17	0

Table 19.21 Potential Impacts on Groundwater Abstractions (Red Route Option)

Impact Magnitude	Number of Abstractions			
	PWS – Groundwater Source	PWS – Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	24	20	15	36
Low	6	18	66	23
Medium	0	2	26	2
High	0	0	18	0

Table 19.22 Potential Impacts on Groundwater Abstractions (Pink Route Option)

Impact Magnitude	Number of Abstractions			
	PWS – Groundwater Source	PWS – Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	3	29	23	57
Low	6	13	81	28
Medium	1	6	24	1
High	0	0	18	0

Table 19.23 Potential Impacts on Groundwater Abstractions (Brown Route Option)

Impact Magnitude	Number of Abstractions			
	PWS Groundwater Source	PWS Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	9	22	15	47
Low	5	22	62	16
Medium	1	7	25	6
High	0	0	8	0

Table 19.24 Potential Impacts on Groundwater Abstractions (Violet Route Option)

Impact Magnitude	Number of Abstractions			
	PWS Groundwater Source	PWS Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	8	34	56	88
Low	14	43	140	64
Medium	6	4	24	2
High	0	0	15	0

Table 19.25 Potential Impact on Groundwater Abstractions (Orange Route Option)

Impact Magnitude	Number of Abstractions			
	PWS Groundwater Source	PWS Unknown Source	Historic Well, Pump or Spring	CAR Licensed Groundwater Abstraction
Negligible	8	24	22	64
Low	22	27	55	30
Medium	7	14	35	0
High	0	0	16	0

Contaminated Land

- 19.4.10 The dualling of the A96 from East of Huntly to Aberdeen is likely to cause disturbance of baseline conditions, in particular as a result of:
- Cut and fill works required to accommodate the route options;
 - Construction of any foundations;
 - Excavation of trenches for below-ground utilities and drainage; and
 - Road operation and maintenance.
- 19.4.11 The key potential impacts of the above activities are considered to be impacts on human health as a result of potential localised soil contamination and ground gas. Impacts on the water environment are discussed in the groundwater sections of this chapter, and in Chapter 20, Road Drainage and Water Environment.
- 19.4.12 A number of possible sources of contamination and potentially impacted receptors have been identified along each route option as part of the baseline assessment. Receptors are potentially impacted by contamination sources through the human health pollutant pathways detailed in Table 19.26.

Table 19.26 Potential Pollutant Pathways

Possible Receptor	Potential Pollutant Pathway
Construction	
Construction and maintenance workers	<ul style="list-style-type: none"> • Dermal contact with soils • Ingestion and inhalation of soils and dust • Migration of ground gas into excavations, confined spaces or site infrastructure
Adjacent site users including local residents, road users	<ul style="list-style-type: none"> • Dermal contact with soils • Ingestion and inhalation of soils and dust • Migration of ground gas into nearby buildings
Operational	
Construction and maintenance workers	<ul style="list-style-type: none"> • Dermal contact with soils • Ingestion of soils and dust • Migration of ground gas into confined spaces
Site end users	<ul style="list-style-type: none"> • Dermal contact with soils • Ingestion of soils and dust
Adjacent site users	<ul style="list-style-type: none"> • Dermal contact with soils • Ingestion and inhalation of soils and dust • Migration of soil gas into nearby buildings

- 19.4.13 The receptors and potential pollutant pathways are deemed to be applicable to all route options.
- 19.4.14 At this stage, impacts on human health during construction and impacts during operation are considered to be the same, as the majority of the construction impacts are likely to continue in the operational phases of the development unless mitigated.
- 19.4.15 The review of each route option identified potential sources of contamination within 50m, as detailed in Paragraphs 19.3.42 to 19.3.45. Each potential source has been assessed against the impact assessment criteria set out in the assessment methodology for contaminated land (Paragraphs 19.2.17 to 19.2.22). A qualitative risk assessment has been undertaken and the potential impact significance risk rating determined based on the likelihood of occurrence and magnitude of consequence criteria.
- 19.4.16 The impact assessment is based on worst-case in the absence of a full understanding of the contaminative status of the route options. An intrusive ground investigation including geo-environmental sampling and testing would be required to determine the full extent of any contamination present, which will be progressed at DMRB Stage 3.
- 19.4.17 The key potential unmitigated impacts associated with the potential for soil contamination and ground gas are summarised in Table 19.27 with Contaminated Land Source (CLS) location IDs as shown on Figures 19.1 to 19.13 (Volume 5).

Table 19.27 Contaminated Land Impact Assessment

Route Option	Potential Source of Contamination	Likelihood/Probability of pollutant linkages occurring	Magnitude/Consequence	Significance	Contaminated Land Source (CLS) Figure ID(s)
Cyan	Potentially infilled pits, quarries and ponds	Low likelihood	Medium	Moderate Risk	CLS001, CLS002, CLS003, CLS004, CLS005, CLS006, CLS007, CLS008, CLS009, CLS014, CLS064
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Low likelihood	Medium	Moderate Risk	n/a
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a
	Historical Mill used for natural and man-made textile products	Low likelihood	Minor	Very Low Risk	CLS008
Red	Potentially infilled pits and quarries	Low likelihood	Medium	Moderate Risk	CLS001, CLS010, CLS011, CLS013, CLS014, CLS064
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Low likelihood	Medium	Moderate Risk	n/a
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a

Route Option	Potential Source of Contamination	Likelihood/Probability of pollutant linkages occurring	Magnitude/Consequence	Significance	Contaminated Land Source (CLS) Figure ID(s)
Pink	Potentially infilled pits and quarries	Low likelihood	Medium	Moderate Risk	CLS015, CLS016, CLS017, CLS018, CLS020
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Low likelihood	Medium	Moderate Risk	n/a
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a
	Historic railway land	Low Likelihood	Medium	Moderate Risk	CLS021
	Historic corn mill	Low likelihood	Minor	Very Low Risk	CLS019
Brown	Potentially infilled pits, quarries and ponds	Low likelihood	Medium	Moderate Risk	CLS022, CLS023, CLS025
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Low likelihood	Medium	Moderate Risk	n/a
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a
	Historic railway land	Low Likelihood	Medium	Moderate Risk	CLS021
	Historic mill	Low likelihood	Minor	Very Low Risk	CLS024
Violet	Landfills	Likely	Medium	Moderate Risk	CLS034

Route Option	Potential Source of Contamination	Likelihood/Probability of pollutant linkages occurring	Magnitude/Consequence	Significance	Contaminated Land Source (CLS) Figure ID(s)
	Potentially infilled pits, quarries and ponds	Low likelihood	Medium	Moderate Risk	CLS026, CLS030, CLS032, CLS035, CLS038, CLS040, CLS041, CLS066
	Tanks of unknown contents located at Hillcrest	Low Likelihood	Medium	Moderate Risk	CLS029
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Low Likelihood	Medium	Moderate Risk	CLS031
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a
	Current and historic railway land	Low Likelihood	Medium	Moderate Risk	CLS027, CLS033, CLS036
	Historic sawmill and timber yard, road haulage and poultry houses	Low likelihood	Minor	Very Low Risk	CLS028, CLS039
	Cemetery	Low likelihood	Minor	Very Low Risk	CLS035
Orange	Landfills	Likely	Medium	Moderate Risk	CLS047, CLS050, CLS034
	Potentially infilled pits and quarries	Low likelihood	Medium	Moderate Risk	CLS037, CLS046, CLS047, CLS048, CLS051, CLS052, CLS055, CLS056, CLS057, CLS058, CLS059, CLS062, CLS062, CLS063, CLS065

Route Option	Potential Source of Contamination	Likelihood/Probability of pollutant linkages occurring	Magnitude/Consequence	Significance	Contaminated Land Source (CLS) Figure ID(s)
	Tanks of unknown contents associated with Thainstone Agricultural Centre	Low Likelihood	Medium	Moderate Risk	CLS044, CLS045
	Agricultural activities which may include fuel tanks, pesticide use and storage and unknown burial pits	Unlikely	Medium	Low Risk	n/a
	Road infrastructure including existing A96	Unlikely	Minor	Very Low Risk	n/a
	Current railway land	Low Likelihood	Medium	Moderate Risk	CLS060
	Historic sawmill, mill and laundry works	Low likelihood	Minor	Very Low Risk	CLS043, CLS049, CLS061
	Motor vehicle garage	Low likelihood	Minor	Very Low Risk	CLS053
	Cemetery	Low likelihood	Minor	Very Low Risk	CLS054

Potential Overall Impacts – East of Huntly to Colpy

19.4.18 The potential overall impacts predicted for the East of Huntly to Colpy route options are presented in Table 19.28 and Table 19.29.

Table 19.28 Potential Overall Impacts for East of Huntly to Colpy (Cyan Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Peat	Impact	Medium	Low	Moderate
Permanent Loss of Agricultural Soils	Impact	Medium	Negligible	Minor
Permanent Impact on Geological Sites	Impact	Medium	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Low	Low	Minor
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk

Table 19.29 Potential Overall Impacts for East of Huntly to Colpy (Red Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Peat	Impact	Medium	Low	Moderate
Permanent Loss of Agricultural Soils	Impact	Medium	Negligible	Minor
Permanent Loss of Protected Geological/Mineral Resources	Impact	High	Low	Moderate
Permanent Impact on Geological Sites	Impact	Medium	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Low	Low	Minor
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk

Potential Overall Impacts – Colpy to Pitcaple

19.4.19 The potential overall impacts predicted for the Colpy to Pitcaple route options are presented in Table 19.30 to Table 19.31.

Table 19.30 Potential Overall Impacts for Colpy to Pitcaple (Pink Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Agricultural Soils	Impact	Medium	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Low	Low	Minor
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk

Table 19.31 Potential Overall Impacts for Colpy to Pitcaple (Brown Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Peat	Impact	Medium	Negligible	Minor
Permanent Loss of Agricultural Soils	Impact	Medium	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Low	Low	Minor
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk

Potential Overall Impacts – Pitcaple to Kintore

19.4.20 The potential overall impacts predicted for the Pitcaple to Kintore route options are presented in Table 19.32 to Table 19.33.

Table 19.32 Potential Overall Impacts for Pitcaple to Kintore (Violet Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Peat	Impact	Medium	Low	Moderate
Permanent Loss of Agricultural Soils	Impact	Medium	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Medium	High	Major
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk
Contaminated Land: Landfills ²⁵⁰	Impact	Likely	Medium	Moderate Risk

Table 19.33 Potential Overall Impacts for Pitcaple to Kintore (Orange Route Option)

Potential Impact	Impact or Benefit	Sensitivity	Magnitude	Significance
Permanent Loss of Peat	Impact	Medium	Low	Moderate
Permanent Loss of Agricultural Soils	Impact	Medium	Negligible	Minor
Permanent Impact on Geological Sites	Impact	High	Low	Moderate
Permanent Impact on Groundwater Abstractions	Impact	Medium	Medium	Moderate
Contaminated Land	Impact	Unlikely to Low Likelihood	Minor to Medium	Very Low to Moderate Risk
Contaminated Land: Landfills	Impact	Likely	Medium	Moderate Risk

²⁵⁰ Landfill is considered a particularly important potential source of contamination affecting the Violet and Orange route options, and it presents a significant geotechnical and geoenvironmental challenge.

19.5 Mitigation

19.5.1 It is assumed in this assessment that the following actions and investigations will be undertaken (GS1 to GS5) and that they will inform any possible mitigation measures. They will be undertaken at DMRB Stage 3:

- GS1: Peat and carbon-rich/peaty soils that are predicted to be impacted by the Preferred Option will be subject to ground investigation at DMRB Stage 3 to assess the extent, thickness and properties of these soils. This information will aid in the development of a materials management plan and/or peatland management plan and a design that minimises the impact on peat as much as is possible and will assess options for peat to be reused within the scheme;
- GS2: Ground investigation will allow for embankment, cut-slope and junction design to be optimised, to reduce the footprint of the earthworks as much as possible. This can minimise the potential impact on PAL, and geological sites, and also limit the quantity of contaminated land that is encountered;
- GS3: Potentially contaminated land will be subject to ground investigations and more detailed risk assessments, to determine the impacts on receptors, and to identify suitable remediation and mitigation measures that could be implemented;
- GS4: More information will be sought on the recorded groundwater abstractions within the study area, in particular, the exact locations of the abstraction sources. The hydrogeological regime within the study area will be investigated so that impacts on groundwater can be assessed in more detail and mitigated against. Consultations will be undertaken with landowners to identify any unrecorded groundwater abstractions that could be impacted and if necessary, an alternative abstraction will be provided; and
- GS5: Consultation with Aberdeenshire Council and SNH will be undertaken to obtain more information on geological and geomorphological SSSIs and LNCSSs that are potentially impacted by the Preferred Option, particularly to identify the locations of specific features of interest within these sites. This information can be used to minimise the impact on these geological sites, and to identify possible mitigation measures such as alternative access arrangements and replacement of exposures. Opportunities to enhance and improve designated geological sites should also be explored.

19.6 Predicted Environmental Effects

19.6.1 This section presents the key predicted environmental effects of the route options in relation to geology, soils, groundwater and contaminated land. Predicted effects have been assessed prior to mitigation, and the residual effects then evaluated following assumed mitigation. Significant effects are major or moderate and are shown in bold. All effects are adverse unless stated otherwise.

19.6.2 The predicted effects of each of the route options is presented in Table 19.34 to Table 19.39.

Table 19.34 Predicted Environmental Effects: East of Huntly to Colpy (Cyan Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Peat	Loss or disturbance of 7.4 ha of peat within footprint of the route option	Moderate	GS1 / GS2	Minor adverse residual effects
Agricultural Soils	No significant effects predicted on agricultural soils	Minor	GS2	No residual effects
Geological Sites	Partial loss of land within Foudland LNCS	Moderate	GS5 / GS2	No residual effects
Groundwater Abstractions	Minor overall impact predicted on Private Water Supplies	Minor	GS4	Minor adverse residual effects
Contaminated Land	Risk to human health due to contaminated soils and ground gas associated with infilled quarries, historic mills, and farming activities	Very Low to Moderate Risk	GS2 / GS3	Low residual risk

19.6.3 In summary, it is considered that the Cyan route option will not have any residual effects on agricultural soils or geological sites. It is considered that the Cyan route option will have overall minor residual effects on peat and groundwater abstractions, and that there is a low residual risk to human health from contaminated land.

Table 19.35 Predicted Environmental Effects: East of Huntly to Colpy (Red Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Peat	Loss or disturbance of 15.6 ha of peat within footprint of the route option	Moderate	GS1 / GS2	Minor adverse residual effects
Agricultural Soils	No significant effects predicted on agricultural soils	Minor	GS2	No residual effects
Protected Geological/Mineral Resources	Loss of protected areas of slate at the Hill of Foudland	Moderate	GS2	Moderate adverse residual effects
Geological Sites	Partial loss of land within Foudland LNCS	Moderate	GS5 / GS2	No residual effects
Groundwater Abstractions	No significant impacts predicted on Private Water Supplies overall	Minor	GS4	Minor adverse residual effects
Contaminated Land	Risk to human health due to contaminated soils and ground gas associated with infilled quarries and farming activities	Very Low to Moderate to Risk	GS2 / GS3	Low residual risk

19.6.4 In summary, it is considered that the Red route option will not have any residual effects on agricultural soils or geological sites. It is considered that the Red route option will only have minor residual effects on peat and groundwater abstractions, but potentially significant adverse residual effects on geological resources due to the loss of protected areas of slate at the Hill of Foudland. It is considered that there is a low residual risk to human health from contaminated land in relation to the Red route option.

Table 19.36 Predicted Environmental Effects: Colpy to Pitcaple (Pink Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Agricultural Soils	Loss of 42 ha of prime agricultural land	Moderate	GS2	Minor adverse residual effects
Groundwater Abstractions	Minor overall impact predicted on Private Water Supplies	Minor	GS4	Minor adverse residual effects
Contaminated Land	Risk to human health due to contaminated soils and ground gas associated with infilled quarries, historic mills, railways and farming activities	Very Low to Moderate Risk	GS2 / GS3	Low residual risk

19.6.5 In summary, it is considered that the Pink route option will have minor adverse residual effects on groundwater abstractions and agricultural soils, and that there is a low residual risk to human health from contaminated land.

Table 19.37 Predicted Environmental Effects: Colpy to Pitcaple (Brown Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Peat	Loss or disturbance of a small area of peat	Minor	GS2	No residual effects
Agricultural Soils	Loss of 61 ha of prime agricultural land	Moderate	GS2	Minor adverse residual effects
Groundwater Abstractions	No significant impacts predicted on Private Water Supplies overall	Minor	GS4	Minor adverse residual effects
Contaminated Land	Risk to human health due to contaminated soils and ground gas associated with infilled quarries, historic mills, railways and farming activities	Very Low to Moderate Risk	GS2 / GS3	Low residual risk

19.6.6 In summary, it is considered that the Brown route option will not have any residual effects on peat. It is considered that the Brown route options will have minor residual effects on agricultural soils and groundwater abstractions, and that there is a low residual risk to human health from contaminated land.

Table 19.38 Predicted Environmental Effects: Pitcaple to Kintore (Violet Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Peat	Loss or disturbance of 4.5 ha of peat	Moderate	GS1 / GS2	Minor adverse residual effects
Agricultural Soils	Loss of 53 ha of prime agricultural land	Moderate	GS2	Minor adverse residual effects
Groundwater Abstractions	Notable overall impact predicted on Private Water Supplies	Major	GS4	Minor adverse residual effects
Contaminated Land (including Landfill)	Risk to human health due to contaminated soils and ground gas associated with landfills, infilled quarries, buried tanks of unknown contents, mills, timber works, railways, cemeteries and farming activities including historic burial pits	Very Low to Moderate Risk	GS2 / GS3	Low residual risk

19.6.7 In summary, it is considered that the Violet route option will have minor residual effects on peat and agricultural soils, and a potentially significant adverse residual effect on groundwater abstractions. It is considered that there is potentially low residual risk to human health from contaminated land assuming mitigation measures are adopted during construction.

Table 19.39 Predicted Environmental Effects: Pitcaple to Kintore (Orange Route Option)

Sub-topic/Criteria	Predicted Effects	Significance of Predicted Effects	Assumed Mitigation	Predicted Residual Effects (and Significance)
Peat	Loss or disturbance of 7.9 ha of peat within footprint of the route option	Moderate	GS1 / GS2	Minor adverse residual effects
Agricultural Soils	Loss of 18 ha of prime agricultural land	Minor	GS2	Minor adverse residual effects
Geological Sites	Possible severance of access to the Legatesden part of the Pitcaple and Legatesden SSSI	Moderate	GS5 / GS2	No residual effects
Groundwater Abstractions	Moderate overall impact predicted on Private Water Supplies	Moderate	GS4	Minor adverse residual effects
Contaminated Land (including Landfill)	Risk to human health due to contaminated soils and ground gas associated with landfills, infilled quarries, buried tanks of unknown contents, vehicle repair garages, railways, cemeteries and farming activities	Very Low to Moderate Risk	GS2 / GS3	Low residual risk

19.6.8 In summary, it is considered that the Orange route option will not have any residual effects on geological sites. It is considered that the Orange route option will have minor residual effects on peat and agricultural soils, and a potentially significant adverse residual effect on groundwater abstractions. It is considered that there is potentially low residual risk to human health from contaminated land assuming mitigation measures are adopted during construction.

19.7 Cumulative Effects

- 19.7.1 Following the identification and implementation of mitigation measures, the effects on geology, soils and groundwater abstractions, are considered unlikely to be significant. Following identification of remediation and mitigation measures for contaminated land, it is considered unlikely that there will be any significant effects on human health. As such, it is not predicted that there will be any significant cumulative effects from identified future developments.

19.8 Summary of Effects

- 19.8.1 This section sets out a summary of the key findings of the route option assessments based on the predicted significant residual effects on geology, soils, groundwater and contaminated land with the assumed mitigation. The summaries are presented in Table 19.40 to Table 19.42.

Summary: East of Huntly to Colpy

Table 19.40 Summary of Predicted Environmental Effects: East of Huntly to Colpy

Predicted Residual Effects for the Cyan Route Option	Predicted Residual Effects for the Red Route Option
<ul style="list-style-type: none"> • No residual effects on agricultural soils or geological sites • Minor adverse residual effect on peat and groundwater abstractions • Low adverse residual risk to human health from contaminated land 	<ul style="list-style-type: none"> • Significant adverse residual effects on geological resources • No residual effects on agricultural soils or geological sites • Minor adverse residual effects on peat and groundwater abstractions • Low residual risk to human health from contaminated land

19.8.2 The Red route option is predicted to have no residual effects on agricultural soils, or on Foudland LNCS. Minor adverse residual effects are predicted on peat and groundwater abstractions, and significant adverse residual effects are predicted on geological resources, specifically the Foudland area of safeguarded slate.

19.8.3 The Cyan route option is predicted to have no residual effects on agricultural soils, or on the Foudland LNCS. Minor adverse residual effects are predicted on peat and groundwater abstractions overall.

19.8.4 Potentially contaminated land on both the Red and Cyan route options is considered to present a low risk to human health.

19.8.5 Overall, the Cyan route option is predicted to have less impact on geology, soils, groundwater and contaminated land.

Summary: Colpy to Pitcaple

Table 19.41 Summary of Predicted Environmental Effects: Colpy to Pitcaple

Predicted Residual Effects for the Pink Route Option	Predicted Residual Effects for the Brown Route Option
<ul style="list-style-type: none"> • Minor adverse residual effects on agricultural soils and groundwater abstractions • Low adverse residual risk to human health from contaminated land 	<ul style="list-style-type: none"> • No residual effects on peat • Minor adverse residual effects on agricultural soils and groundwater abstractions • Low residual risk to human health from contaminated land

- 19.8.6 The Pink route option is predicted to have minor adverse residual effects on groundwater abstractions and agricultural soils. Without mitigation measures, 41.7 ha of Prime Agricultural Land is potentially impacted.
- 19.8.7 The Brown route option is predicted to have no residual effects on peat and minor adverse residual effects on groundwater abstractions and agricultural soils. Without mitigation measures, 61.2 ha of Prime Agricultural Land is potentially impacted.
- 19.8.8 Potentially contaminated land on both the Pink and Brown route options is considered to present a low risk to human health.
- 19.8.9 Overall, the Pink route option is predicted to have slightly less impact on geology, soils, groundwater and contaminated land.

Summary: Pitcaple to Kintore

Table 19.42 Summary of Predicted Environmental Effects: Pitcaple to Kintore

Predicted Residual Effects for the Violet Route Option	Predicted Residual Effects for the Orange Route Option
<ul style="list-style-type: none"> • Minor adverse residual effects on peat, agricultural soils and on groundwater abstractions • Low residual risk to human health from contaminated land (including landfill) 	<ul style="list-style-type: none"> • No residual effects on geological sites • Minor adverse residual effects on peat, agricultural soils and on groundwater abstractions • Low residual risk to human health from contaminated land (including landfill)

- 19.8.10 The Violet route option is predicted to have minor adverse residual effects on peat, agricultural soils and groundwater abstractions. Without mitigation measures, 52.8 ha of Prime Agricultural Land and 4.6 ha of peat are potentially impacted.
- 19.8.11 Following mitigation, the Orange route option is predicted to have no residual effect on geological sites (Pitcaple and Legatesden SSSI). The Orange route option is predicted to have minor adverse residual effects on peat, agricultural soils and groundwater abstractions. Without mitigation measures, 18.5 ha of Prime Agricultural Land and 7.9 ha of peat are potentially impacted.
- 19.8.12 Both route options are predicted to encounter historic landfills, which are considered to be moderate risk sources of contamination. After mitigation, potentially contaminated land on both the Orange and Violet route options is considered to present a low risk to human health.
- 19.8.13 Overall, the Orange route option is considered to have less impact on geology, soils, groundwater and contaminated land.

19.9 Scope of the DMRB Stage 3 Assessment

19.9.1 The DMRB Stage 3 assessment of Geology, Soils, Contaminated Land and Groundwater will be undertaken in accordance with DMRB (LA 109 Geology and Soils). The assessment of contaminated land will take into account relevant contaminated land risk guidance, including Part IIA of the Environmental Protection Act (1990), the Contaminated Land (Scotland) Regulations 2005, Construction Industry Research and Information Association (CIRIA) C552, the Water Supply and Water Quality Regulations (Scotland) 2001, SEPA WAT-PS-10-01, SEPA supporting guidance WAT-SG-53, CIRIA C665, and BS8485:2015.

19.9.2 The DMRB Stage 3 assessment would include more detailed assessment of the Preferred Option, and would include the following:

- Review of geo-environmental ground investigation information including results of chemical analyses undertaken for the Preferred Option at DMRB Stage 3, and incorporation into further assessment;
- Further consultation with landowners regarding potential sources and areas of contamination associated with farming activities, and incorporation of this information into detailed human health risk assessment;
- Further consultation with landowners to obtain information on active groundwater abstractions and incorporation of this information into a detailed assessment, completed in line with the Water Environment Controlled Activities (Scotland) Regulations;
- Review of hydrogeological intrusive investigation information which will be undertaken for the Preferred Option at DMRB Stage 3, and incorporation into the detailed assessment of impact on groundwater abstractions for the Preferred Option;
- Further consultation with statutory bodies and regulators to obtain additional information on the identified geological sites and protected resources, and incorporation of this information into the assessment of the Preferred Option; and
- Following the above actions, determine specific details of the proposed mitigation required for predicted significant effects on geology, soils, groundwater and contaminated land.

20 Road Drainage and the Water Environment

20.1 Introduction

20.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the predicted effects of the route options on the Road Drainage and the Water Environment (RDWE). The assessment reported within this chapter focuses on surface water receptors and encompasses potential effects on hydrology and flood risk, fluvial geomorphology and water quality. Potential effects on groundwater receptors, including groundwater abstractions, are reported in Chapter 19, Geology, Soils, Contaminated Land and Groundwater. Chapter 18, Nature Conservation includes potential effects on aquatic ecology and Groundwater Dependent Terrestrial Ecosystems (GWDTEs).

20.1.2 This chapter is supported by Figures 20.1 to 20.13 (Volume 5) and the following appendices (Volume 4b):

- Appendix A20.1: RDWE Assessment Methodology;
- Appendix A20.2: Baseline Conditions;
- Appendix A20.3: Predicted Environmental Effects; and
- Appendix A20.4: Flood Risk Simple Assessment.

Policy Context

20.1.3 The national, regional and local planning policies relevant to RDWE are summarised within this section.

National Planning Policy

20.1.4 Scotland's Third National Planning Framework²⁵¹ (NPF3) supports a catchment-wide approach to sustainable flood risk management. The spatial strategy aims to increase the resilience of urban areas to climate change and encourage sustainable rural land management. It recognises the increase in flood risk that will arise in parts of Scotland as a result of climate change.

20.1.5 Scottish Planning Policy²⁵² (SPP) sets out national planning policies covering the operation of the planning system, development and land use. The key principles outlined in SPP of relevance to the RDWE chapter are as follows:

- The planning system should promote the protection and improvement of the water environment;
- A precautionary approach should be taken to flood risk from all sources, including the predicted impacts of climate change;
- Floodplain storage and conveyance capacity should be safeguarded by avoiding development within or piecemeal reduction of functional floodplains; and

²⁵¹ Scotland's Third National Planning Framework 3 was laid in the Scottish Parliament on June 23, 2014. <https://www.gov.scot/publications/national-planning-framework-3/>

²⁵² The Scottish Government, *Scottish Planning Policy*, 2014.

- Increases in surface water flood risk should be avoided through the implementation of Sustainable Drainage Systems (SuDS).

20.1.6 SPP sets out a flood risk framework and guidance on how it should be applied and this guidance has been followed for assessing flood risk as a result of the scheme.

20.1.7 The Scottish Government has also published a number of Planning Advice Notes (PANs) of relevance to road drainage and the water environment:

- PAN 61: Planning and Sustainable Urban Drainage Systems;
- PAN 79: Water and Drainage; and
- Online Planning Advice on Flood Risk (2015).

Regional and Local Planning Policy

20.1.8 The Aberdeen City and Shire Strategic Development Plan²⁵³ outlines the strategy for growth in the North East region. The Aberdeenshire Local Development Plan 2017 (LDP)²⁵⁴ provides further detail about how this strategy will be realised. Aspects of these regional and local plans of relevance to the RDWE chapter are summarised in Table 20.1.

Table 20.1 Regional and Local Planning Policy Relevant to RDWE Chapter

Plan	Key Aspects Relevant to RDWE Chapter
Aberdeen City and Shire Strategic Development Plan	<ul style="list-style-type: none"> • Sets targets for the quality of the environment, including avoiding new development which could prevent water bodies achieving 'good ecological status' under the Water Framework Directive (WFD). • Sustainable development should be facilitated through approaches including avoiding development on land which is at unacceptable risk of flooding, except in exceptional circumstances.
Aberdeenshire LDP	<p>Policy PR1 Protecting important resources:</p> <ul style="list-style-type: none"> • Developments will not be approved that have a negative effect on important environmental resources, including those associated with the water environment. • Development should not prejudice water quality or flow rates, or waterbodies ability to achieve or maintain good ecological status under the WFD. <p>Policy C4 Flooding:</p> <ul style="list-style-type: none"> • Consistent with principles of SPP. <p>Policy RD1 Providing suitable services:</p> <ul style="list-style-type: none"> • Surface water drainage must use an integrated SuDS to avoid pollution and flooding.

²⁵³ Aberdeen City and Shire Strategic Development Planning Authority, *Aberdeen City and Shire Strategic Development Plan*, 2014.

²⁵⁴ Aberdeenshire Council, *Aberdeenshire Local Development Plan*, 2017.

20.2 Approach to Assessment

20.2.1 The following section describes the methodology used in the assessment of potential effects of the scheme on the RDWE, including any assumptions and limitations of the approach. Tables detailing the criteria used to define receptor sensitivity, impact magnitude and significance of effects are provided in Volume 4b, Appendix A20.1: RDWE Assessment Methodology.

Sources of Information

20.2.2 The following sources of information and guidance have been used in the assessment:

- Flood Estimation Handbook (FEH)²⁵⁵;
- National Library of Scotland Map images²⁵⁶;
- Engineering in the water environment: good practice guide – River crossings²⁵⁷;
- Technical Flood Risk Guidance for Stakeholders – SEPA requirements for undertaking a Flood Risk Assessment²⁵⁸;
- SEPA Water Classification Hub²⁵⁹;
- 1D-2D hydraulic models prepared for the proposed Inch, Port Elphinstone and Inverurie flood prevention schemes²⁶⁰;
- Aberdeenshire Council (AC) records of private water supplies;
- 25cm aerial photography;
- Ordnance Survey (OS) digital datasets:
 - OS 1:25,000 scale mapping;
 - OS Terrain 5 digital terrain model (DTM);
 - AddressBase Plus; and
 - OS Open Rivers.
- SEPA digital datasets, provided for use in this project:
 - Flood extents (river, surface water, groundwater), as shown on SEPA's flood maps at <http://map.sepa.org.uk/floodmap/map.htm>;
 - Flood economic and environmental impact data layers;

²⁵⁵ Flood Estimation Handbook (FEH) Web Service, available at: <https://fehweb.ceh.ac.uk/>;

²⁵⁶ National Library of Scotland Map images, available at: <https://maps.nls.uk/>;

²⁵⁷ Scottish Environment Protection Agency (SEPA) *Engineering in the water environment: good practice guide – River crossings (WAT-SG-25)*, 2nd edition (2010);

²⁵⁸ SEPA, *Technical Flood Risk Guidance for Stakeholders – SEPA requirements for undertaking a Flood Risk Assessment*, Version 10 (2018);

²⁵⁹ SEPA Water Classification Hub, available at: <https://www.sepa.org.uk/data-visualisation/water-classification-hub/>;

²⁶⁰ Interim 1D-2D hydraulic models prepared for the proposed Inch, Port Elphinstone and Inverurie flood prevention schemes (issued to AmeyArup March 2019 from Aberdeenshire Council);

- Historic flood data;
 - Natural Flood Management opportunity data layers, as shown on SEPA's flood maps at <http://map.sepa.org.uk/floodmap/map.htm>;
 - Morphological pressures dataset;
 - Water body catchments;
 - Natural features polyline dataset; and
 - Controlled Activities Regulations (CAR) licenced abstractions and discharges.
- Land Capability for Agriculture (1:50k), James Hutton Institute (JHI) digital dataset²⁶¹.

Consultation

- 20.2.3 Consultation has been carried out with AC and SEPA regarding certain aspects of the DMRB Stage 2 RDWE assessment including the approach to the assessment of flood risk and the use of the Highways Agency Water Risk Assessment Tool (HAWRAT). The outcomes of this consultation are summarised in Table 20.2. Lessons learned from other A96 Dualling Programme scheme assessments have also been taken into account.

²⁶¹ The James Hutton Institute, 2013, *1:250,000 & 1:50,000 Land Capability for Agriculture Data*, user licence no. JHI/2013/394.

Table 20.2 Summary of Consultation for RDWE Chapter

Topic	Summary of Consultation and Outcomes
Road drainage	<ul style="list-style-type: none"> • SEPA indicated they would prefer the 'levels of treatment' approach to be used, as set out in the previous edition of the SuDS Manual (C697)²⁶², as opposed to the risk-based approach included in the latest edition (C753)²⁶³. • AC and SEPA agreed that two levels of treatment will generally be acceptable, with three levels only required if the sensitivity of the receptor is particularly high. This approach was verified using HAWRAT and agreed with SEPA. • Design criteria and discharge limits agreed with AC.
Flood risk	<ul style="list-style-type: none"> • SEPA emphasised that a sequential approach should be taken to the development of options: avoid, reduce, mitigate. • AC confirmed that two Flood Prevention Scheme (FPS) feasibility studies are on-going within the study area and that they would share the outputs from these studies, including the hydraulic models, with AmeyArup. • SEPA stated that flood modelling would be expected at DMRB Stage 2 to support proposals for large crossings of the River Don and Urie to demonstrate that any increase in flood risk is mitigatable. • SEPA and AC agreed in principle with the proposed approach for a simple flood risk assessment and flood modelling proposals. • SEPA indicated that the suitability of the Revitalised Flood Hydrograph model (ReFH2)²⁶⁴ for estimating peak design flows should be verified and the results presented to SEPA prior to use, due to evidence that this method underestimates peak flows in other parts of the north-east of Scotland. This exercise will be undertaken to inform the hydrological assessment at DMRB Stage 3. • It was agreed with SEPA that a climate change uplift of 20% will be added to existing fluvial flows for the DMRB Stage 2 assessment. The climate change allowance will be revisited at DMRB Stage 3 and a climate change uplift will be agreed following consultation with SEPA and AC.
Watercourse diversions	<ul style="list-style-type: none"> • SEPA confirmed that the sequential approach (avoid, reduce, mitigate) also applies to watercourse diversions and other engineering interventions.

²⁶² Woods-Ballard, B. *et al*, *The SuDS manual CIRIA C697*, 2007.

²⁶³ Woods-Ballard, B. *et al*, *The SuDS manual CIRIA C753*, 2015.

²⁶⁴ Revitalised Flood Hydrograph model (ReFH2) <https://www.hydrosolutions.co.uk/software/refh-2/>

Assessment Methodology

Overview

- 20.2.4 The RDWE assessment has been undertaken in accordance with the principles of DMRB (Volume 11, Section 3, Part 10, HD 45/09 Road Drainage and the Water Environment) referred to in the following sections as HD 45/09, and industry standard guidance, including CIRIA guidance and Pollution Prevention Guidance (PPGs) and Guidance for Pollution Prevention (GPPs).
- 20.2.5 DMRB HD 45/09 describes a series of methods for assessing impacts of road schemes on the water environment. Details regarding the methods applied for each of the sub-topics (hydrology and flood risk, fluvial geomorphology and water quality) are provided below.
- 20.2.6 The study area for the fluvial geomorphology and water quality baseline assessments extends for 500m from the outer edge of the route options (i.e. top/toe of the earthworks slopes). An 850m buffer was used to identify PWS and CAR licenced abstractions sourced from surface water for consistency with the approach taken for groundwater sourced supplies, as per Chapter 19, Geology, Soils, Contaminated Land and Groundwater. For hydrology and flood risk, the study area was determined based on the size of the catchments and character of the watercourses to ensure that any potential upstream and downstream impacts were captured.
- 20.2.7 The baseline conditions have been informed primarily by desk-based assessments and supported by reconnaissance level field surveys. The field surveys were targeted at proposed crossings of more sensitive watercourses and were undertaken January 2019 to March 2019.
- 20.2.8 A sequential approach to the development of the route options was followed, with the aim of avoiding potential impacts on the water environment where possible. It is not possible to avoid all potential impacts given the nature of the development and the study area. In these cases, the design aims to reduce the impact, for example, through minimising encroachment on the floodplain. Mitigation is proposed where predicted effects remain. The sequential approach will continue to be applied through design development at DMRB Stage 3.
- 20.2.9 Construction impacts have been scoped out at this stage due to insufficient information on the design detail and construction methods and since construction impacts are likely to be similar for all route options. The DMRB Stage 2 assessment therefore focuses on operational impacts of the route options to inform the selection of the Preferred Option. Construction impacts will be assessed at DMRB Stage 3.
- 20.2.10 The impact assessment considers the type and extent of engineering works within the channel and floodplain, including proposed crossings, channel realignments and encroachment of earthworks or other infrastructure into the floodplain. The drainage design is at an early stage and is subject to change. However, the impact assessment has considered the watercourses likely to receive runoff from the road drainage system.
- 20.2.11 All watercourses in the study area have been assessed to determine baseline sensitivity, impact magnitude and significance of effects in the absence of mitigation.
- 20.2.12 All receptors are included in the baseline conditions reported in Section 20.3 and Volume 4b, Appendix A20.2: Baseline Conditions. These receptors include

watercourses, floodplains, built receptors (adjacent and upstream), critical infrastructure and high grade or prime agricultural land. To ensure a proportionate approach to reporting, only those receptors for which significant effects are predicted are reported in Section 20.4 and Volume 4b, Appendix A20.3: Predicted Environmental Effects. There are instances where a watercourse may be affected in more than one location by one of the route options. The impact assessment was undertaken for each location and the worst case reported within Section 20.4.

Hydrology and Flood Risk

- 20.2.13 Baseline sensitivity for flood risk has been assigned according to the number and type of receptors currently at flood risk, including residential and commercial properties, critical infrastructure and high-grade agricultural land (see Volume 4b, Appendix A20.1: RDWE Assessment Methodology, Table 1.1). The potential flood alleviation benefits provided by the floodplain, for example, through floodplain storage or conveyance, have also been taken into account.
- 20.2.14 SEPA's fluvial flood extent map (medium likelihood) was used to define baseline flood risk. SEPA's flood maps are provided for catchments that are greater than 3km² and professional judgement was used to assign baseline sensitivity for watercourses with a catchment area of less than 3km².
- 20.2.15 A qualitative assessment has been undertaken of potential impacts on catchment hydrology and the flow regime of the watercourses within the study area, which could lead to effects on flood risk, water-dependent habitats (including GWDTEs) or abstractions. Potential changes to the hydrological functioning of Pitscurry Moss LNCS have not been assessed due to the loss of physical habitat associated with the route option being considered (see Chapter 18, Nature Conservation for further details).
- 20.2.16 A qualitative assessment was undertaken for all locations where the route option being considered could impact upon fluvial flood risk, including proposed crossings, encroachment into the functional floodplain (associated with the 1 in 200-year return period flood extent) and channel realignments (Volume 4b, Appendix A20.4). The impact magnitude was assigned based on potential for increased flood depths and extents, and/or loss of floodplain storage capacity (Volume 4b, Appendix A20.1: Table 1.2).
- 20.2.17 A quantitative assessment of the impact of proposed bridge crossings was undertaken at two locations which were determined as being of high sensitivity due to the width of the floodplain and/or the number of potential receptors (Orange route option crossing of the River Urie at Pitcaple and Violet route option crossing of the River Don at Kintore).
- 20.2.18 AC have commissioned two FPS feasibility studies within the study area and hydraulic models (1D-2D) have been developed for both these studies:
- The Inch FPS model includes the Shevock and Valentines Burns; and
 - The Inverurie, Port Elphinstone and Kintore FPS model incorporates the River Urie, extending from upstream of the confluence with Shevock Burn to the confluence with the River Don, and the River Don from Burnhervie to Dyce.
- 20.2.19 AC provided an interim version of these hydraulic models to AmeyArup for use within the DMRB Stage 2 assessment. Following a review of these models, several changes to the Inverurie FPS model were proposed and SEPA confirmed that it was appropriate for AmeyArup to update the baseline model to improve its suitability for use in the DMRB Stage 2 assessment. It was updated to exclude

extensive downstream sections of the River Don outwith the study area and improved representation of the River Urie by incorporating LiDAR Data.

20.2.20 The proposed viaduct structures for the Orange route option crossing of the River Urie at Pitcaple and the Violet route option crossing of the River Don at Kintore were incorporated into the updated hydraulic models. Model runs were undertaken for the 1 in 200-year return period flood event, with sensitivity testing undertaken by increasing this peak flow by 20% as an allowance for climate change. Further details are provided in Volume 4b, Appendix A20.4.

20.2.21 Fluvial flooding is the dominant flood mechanism within the study area. The study area is underlain by a low productivity aquifer indicating a low potential for groundwater flooding. An assessment of the impact of the route options on other sources of flood risk has therefore been scoped out at this stage. A high-level review of other sources of flood risk (surface water, groundwater and infrastructure failure) has been undertaken to inform the preliminary drainage assessment for the route options and is included in Volume 4b, Appendix A20.4.

Fluvial Geomorphology

20.2.22 DMRB HD 45/09 does not include a method for assessing potential impacts on fluvial geomorphology. Baseline sensitivity for fluvial geomorphology has been assigned according to WFD morphological status and the extent to which natural morphological features and processes have been modified (see Volume 4b, Appendix A20.1: Assessment Methodology, Table 1.1). The baseline character of the watercourses was determined from review of current and historic mapping, aerial photography, topographic data, historical photographs provided by the public and SEPA datasets on floodplain width, morphological pressures and sediment management. The desk-based assessment was verified through targeted reconnaissance level field surveys.

20.2.23 A qualitative assessment was made of the potential impact of the route options on morphological forms and processes. The assessment was informed by SEPA's Morphological Impact Assessment System (MImAS)²⁶⁵ and focussed on the type and extent of engineering modifications proposed to the channel, banks and floodplain, and the predicted effects of these modifications on the existing channel processes. The assessment considered all engineering interventions on a single watercourse or WFD water body for each route option, for example, multiple new crossings on the same watercourse resulted in a higher impact magnitude than a single crossing.

Water Quality

20.2.24 Baseline sensitivity for surface water quality has been assigned according to the assessment methodology in Volume 4b, Appendix A20.1, Table 1.1 and has considered:

- WFD status (specifically, physico-chemical and biological elements);
- Potential pollutant sources identified within the River Basin Management Planning (RBMP)²⁶⁶, land use (from digital datasets) or from SEPA's datasets;

²⁶⁵ SEPA's Morphological Impact Assessment System https://www.sepa.org.uk/media/152194/wat_sg_21.pdf

²⁶⁶ SEPA. River Basin Management Planning. Available: <https://www.sepa.org.uk/environment/water/river-basin-management-planning/>

- Surface water abstractions; and
- Ecological designations on or adjacent to the watercourse (for example, Local Nature Conservation Sites).

20.2.25 The capacity of the watercourse for pollutant dilution and sediment dispersal has also been estimated, primarily based on the catchment size and watercourse character.

20.2.26 Watercourses have been assigned as being potential sources for PWS where these are recorded as being from an ‘unknown’ source and are located downstream of the route options (further information regarding the limitations of the PWS dataset is provided in Paragraph 20.2.44).

20.2.27 A qualitative assessment of impact magnitude has been undertaken, due to the detailed drainage design not being available at this stage of the project. This approach was verified by using the HAWRAT tool to demonstrate that any potentially significant effects on water quality from routine runoff can be mitigated with appropriate SuDS (a mandatory requirement in Scotland). The results of this verification were provided to SEPA.

20.2.28 The qualitative assessment followed the principles of the methods in HD 45/09 and considered the traffic flows, locations of the proposed drainage infrastructure, river engineering works relevant to the operational phase (for example, channel realignments that could change the sediment dynamics of the river) and the potential effects on the existing water quality attributes of the watercourses.

20.2.29 Several watercourses within the study area currently receive runoff from the existing A96, which is unlikely to undergo any treatment prior to discharge. All the WFD-monitored watercourses are currently at ‘Good’ or ‘High’ status for biological or physico-chemical attributes. A conservative approach has therefore been taken by assuming that road runoff from the scheme without mitigation will result in adverse impacts on water quality compared to existing conditions.

20.2.30 Potential impacts on the surface water quality at Pitscurry Moss LNCS have not been assessed due to the loss of physical habitat associated with the footprint of the route option being considered (see Chapter 18, Nature Conservation).

Significance of Effects

20.2.31 The significance of a predicted effect is a function of the sensitivity of the receptor and the magnitude of the potential impact, as summarised in Table 20.3 (informed by Table A4.5, Appendix IV of DMRB HD 45/09). The potential effects could be beneficial, neutral or adverse. Professional judgement has been used to assign a single significance level where two alternatives are given in Table 20.3. For the purposes of this assessment, predicted effects of Moderate and above are considered to be ‘significant’ and therefore most likely to inform the selection of the Preferred Option.

Table 20.3 Estimating the Significance of Effects

Receptor Sensitivity	Impact Magnitude			
	Negligible	Minor	Moderate	Major
Very High	Neutral	Moderate/ Large	Large/ Very Large	Very Large

Receptor Sensitivity	Impact Magnitude			
	Negligible	Minor	Moderate	Major
High	Neutral	Slight/ Moderate	Moderate/ Large	Large/ Very Large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight/ Moderate

Assumptions and Limitations

New Guidance

- 20.2.32 An update to the Road Drainage and the Water Environment assessment methodology (hereafter referred to as the 'New Guidance') outlined in the DMRB was released in August 2019. The DMRB Stage 2 environmental assessment for this scheme had commenced at the time of the release of the New Guidance and this followed a structure outlined in the previous published DMRB guidance²⁶⁷, (hereafter referred to as the 'Withdrawn Guidance'). It has been agreed with Transport Scotland and SEPA that the DMRB Stage 2 environmental assessment should be completed following the structure of the Withdrawn Guidance, as there is no material difference between it and a report produced following the New Guidance in terms of the detail incorporated or the conclusions drawn.
- 20.2.33 This section outlines the key differences between the Withdrawn Guidance and New Guidance and describes how this chapter meets the objectives of the New Guidance.
- 20.2.34 There is no change in the focus of the main Road Drainage and the Water Environment assessment for the DMRB Stage 2 environmental assessment.
- 20.2.35 The relevant parts of the New Guidance are within LA 104 Environmental assessment and monitoring and LA 113 Road drainage and the water environment. LA 104 demonstrates how the significance of effects is determined and LA 113 outlines the assessment process from baseline through to determining the magnitude of effect for relevant receptors.

Effects of the New Guidance

- 20.2.36 The assessment conducted to the Withdrawn Guidance uses a similar approach to that outlined in the New Guidance. There are minor changes to importance categorisation of receptors, and the change in magnitude for some receptors.
- 20.2.37 The magnitude scale in LA 113 uses a slightly different nomenclature for the degrees of magnitude, with the introduction of 'no change'. This is also reflected in the changes to the significance matrix in LA 104.
- 20.2.38 A review of the DMRB Stage 2 assessment was conducted to compare the outcomes from using the Withdrawn Guidance against those that would be obtained using the New Guidance. In some cases, the significance of individual impact ratings would have changed, however, the overall outcome of the DMRB

²⁶⁷DMRB Volume 11 Section 3 Part 10 (HD 45/09) Road Drainage and the Water Environment

Stage 2 assessment of Road Drainage and the Water Environment would not have changed.

- 20.2.39 At DMRB Stage 3 the Preferred Option will be assessed using the New Guidance.
- 20.2.40 As outlined in the New Guidance, more detailed assessments are required at DMRB Stage 3, such as a groundwater level and flow assessment and a Groundwater Dependant Terrestrial Ecosystem (GWDTE) Assessment, which were not specifically identified within the Withdrawn Guidance. Additionally, a hydromorphological impact assessment is now required under the New Guidance, which was not previously specified.
- 20.2.41 During the DMRB Stage 3 assessment, a more detailed assessment will be undertaken to inform the ongoing design development of the Preferred Option.

Other Assumptions and Limitations

- 20.2.42 The assessments are primarily reliant on desk-based data sources provided by third parties. Field surveys at DMRB Stage 2 to validate the desk-based data have been undertaken at targeted locations, focussing on the higher sensitivity watercourses.
- 20.2.43 The hydraulic models provided by AC for use in the DMRB Stage 2 assessment are an interim version. The models have been reviewed by AmeyArup and a number of changes have been made to the Inverurie FPS model, as described in Paragraph 20.2.19. The primary aim of the modelling at this stage is to compare the baseline flood risk with that associated with the proposed structures at key crossings points to inform the impact assessment and ensure that any potential increase in flood risk can be mitigated. It is anticipated that further changes to the hydraulic models may be made by AC's consultants prior to completion of the feasibility studies, and by AmeyArup at DMRB Stage 3 when more detailed information becomes available (for example, topographic survey data).
- 20.2.44 The PWS data set provided by AC does not contain a complete record of the source of the supply, and the records generally show the location of the user rather than the abstraction point. Experience from other projects has also shown that these PWS records may not be complete. Those PWS recorded as being supplied by groundwater have been assessed in Chapter 19, Geology, Soils, Contaminated Land and Groundwater. The dataset records the remaining PWS as having an 'unknown' source (i.e. none recorded as being sourced from surface water). For the purposes of this assessment, these PWS have been considered as being potentially sourced from surface water and have been considered in the baseline assessment where they are located downstream of a route option. Detailed investigation into PWS sources and assessment of potential impacts on these supplies will be carried out at DMRB Stage 3.
- 20.2.45 An assessment for each route option of the indirect effect of changes in groundwater flows or levels on nearby watercourses or GWDTEs has been scoped out of the DMRB Stage 2 RDWE assessment. The information required to undertake a meaningful assessment is not available at this stage, including NVC habitat data, localised information on hydrological and hydrogeological regimes, and relevant design details. The habitat data collected at DMRB Stage 2 suggests that potential effects on GWDTEs would not be a key factor in determining the Preferred Option. Chapter 19, Geology, Soils, Contaminated Land and Groundwater assesses potential impacts of each route option on groundwater and the indirect impacts on surface watercourses and GWDTEs will be assessed at DMRB Stage 3.

- 20.2.46 The methodology used is considered to be appropriate for a DMRB Stage 2 assessment to inform the selection of a Preferred Option. More detailed surveys and assessments will underpin the DMRB Stage 3 assessment of the potential construction and operational impacts of the Preferred Option, as described in Section 20.9.

20.3 Baseline

- 20.3.1 Summaries of the baseline sensitivity of the watercourses within the study area are provided in Table 20.4 to Table 20.6. Further details regarding the character of each watercourse are presented in Volume 4b, Appendix A20.2: Baseline Conditions. There are a large number of unnamed tributaries within the study area; these have been assigned a tributary number in the tables below. The watercourse locations and fluvial flood extents are shown in Figures 20.1 to 20.13 (Volume 5).
- 20.3.2 The north-western extent of the study area, from east of Huntly to Hillhead, is located within the headwaters of the Forgue Burn which drains northwards towards the River Deveron. The remainder of the study area falls within the River Don catchment. The whole study area falls within the Aberdeenshire, Banff, Buchan and Moray Nitrate Vulnerable Zone (NVZ). The NVZs are areas designated by SEPA as being impacted, or at risk of impacts, by agricultural nitrates applied as fertilisers.
- 20.3.3 SEPA's fluvial flood risk map and historic flood records provide evidence of localised flood risk to agricultural land, rural roads and properties from the watercourses within the study area. Inverurie, Port Elphinstone and Kintore are situated within Potentially Vulnerable Area (PVA) No. 06/13²⁶⁸ and have experienced localised and extensive flooding on multiple occasions over the past few centuries. Inverurie and Port Elphinstone are most susceptible to fluvial flooding in the area surrounding the confluence of the River Urie and River Don. Recent flooding in 2016 resulted in widespread flood inundation and damage to properties in Port Elphinstone, Inverurie, Kintore and smaller settlements across the area.

East of Huntly to Colpy

- 20.3.4 Between Hillhead and Colpy, the existing A96 follows the topography of the River Urie, which flows within a low relief local floodplain through the Glens of Foudland (Photograph 20.1) before becoming more confined within the steep-sided valley between the Hill of Skares and the Hill of Tillymorgan. Multiple small tributaries in the catchment headwaters drain the adjacent hillslopes, many of which have been historically modified. Jordan Burn flows south-eastwards to the confluence with the River Urie at Colpy (Photograph 20.2). Moorland and coniferous plantation occupy the highest elevations in the catchment, with mixed agriculture on the lower slopes.

²⁶⁸ Inverurie and Kintore (Potentially Vulnerable Area 06/13) available at: https://www2.sepa.org.uk/frmstrategies/pdf/pva/PVA_06_13_Full.pdf



Photograph 20.1 River Urie through the Glens of Foudland (Looking Downstream from NGR 360581, 834860)



Photograph 20.2 Jordan Burn (Looking Upstream from NGR 363980, 832423)

Table 20.4 Summary of Receptor Sensitivity – East of Huntly to Colpy

Watercourse ²⁶⁹	Receptor Sensitivity		
	Hydrology/ Flood Risk	Fluvial Geomorphology	Water Quality
Tributary of Burn of Slioch	Low	Low	Low
Burn of Bogside	Low	Low	Medium
Keithny Burn/ Forgue Burn (WFD)	Low	Low	High
River Urie – source to Old Rayne (WFD)	Medium	High	High
Glen Water	Low	Low	Medium
Tributary of River Urie 2	Low	Medium	Medium
Burn of Stodfold	Low	Medium	Medium
Burn of Lipsden	Low	Low	Medium
Tributary of River Urie 3	Low	Low	Medium
Tributary of River Urie 4	Low	Low	Medium
Tributary of River Urie 5	Low	Low	Medium
Tributary of River Urie 6	High	Low	Medium
Tributary of River Urie 7	Low	Low	Medium
Tributary of River Urie 8	Medium	Low	Medium
Tributary of River Urie 9	Low	Low	Medium
Tributary of River Urie 10	Low	Low	Medium
Tributary of River Urie 11	Low	Low	Low
Tributary of River Urie 12	Low	Low	Medium
Drain 1	Medium	Low	Low
Tributary of River Urie 13	Low	Low	Low

²⁶⁹ WFD is used to identify watercourses which are classified and monitored by SEPA for WFD reporting.

Watercourse ²⁶⁹	Receptor Sensitivity		
	Hydrology/ Flood Risk	Fluvial Geomorphology	Water Quality
Tributary of River Urie 14	Low	Low	Medium
Jordan Burn	Medium	Medium	Medium

Colpy to Pitcaple

20.3.5 Between Colpy and Pitcaple, the topography becomes more undulating and land use is dominated by agriculture (pastoral and arable). For much of this part of the study area the floodplain of the River Urie widens, although there are locations where the floodplain is constrained naturally by the adjacent hillslopes or due to historic deepening and channel incision (Photograph 20.3). A number of larger tributaries join the River Urie through this reach, including The Kellock (Photograph 20.4), Shevock Burn, Bonnyton Burn (Photograph 20.5) and Burn of Durno (Photograph 20.6). These tributaries include reaches which have been historically straightened and deepened.



Photograph 20.3 River Urie North of Kellockbank (Looking Upstream from NGR 365124, 830244)



Photograph 20.4 The Kellock (Looking Downstream from NGR 364882, 829847)



Photograph 20.5 Bonnyton Burn (Looking Upstream from NGR 368306, 829076)



Photograph 20.6 Burn of Durno (Looking Upstream from NGR 372041, 827377)

Table 20.5 Summary of Receptor Sensitivity – Colpy to Pitcapple

Watercourse	Receptor Sensitivity		
	Hydrology/ Flood Risk	Fluvial Geomorphology	Water Quality
River Urie – source to Old Rayne (WFD)	High	High	High
Loch Inch Fishery	Medium	N/A	High
The Kellock (WFD)	Medium	Medium	High
Tributary of The Kellock 1	High	Low	Medium
Tributary of River Urie 15	Low	Low	Medium
Shevock Burn (WFD)	High	High	High
Bonnyton Burn (WFD)	High	Medium	Very High
Tributary of Bonnyton Burn 1	Low	Low	Medium
River Urie – Old Rayne to Pitcapple (WFD)	Medium	High	High
Tributary of River Urie 16	Medium	Low	Medium
Tributary of River Urie 17	Medium	Low	Medium
Tributary of River Urie 18	Low	Low	Medium
Tributary of River Urie 19	Medium	Low	Medium
Tributary of River Urie 20	High	Low	Medium
Burn of Durno (WFD)	Medium	Medium	High

Pitcaple to Kintore

- 20.3.6 The River Urie flows southwards within a broad floodplain to the confluence with the River Don at Inverurie (Photograph 20.7). The most notable tributary of the River Urie within this part of the study area is the Lochter Burn (Photograph 20.8). The River Don flows eastwards through a relatively confined, steep-sided valley towards Inverurie (Photograph 20.9), where it turns south-east into an extensive floodplain (Photograph 20.10). Land use within this part of the study area is predominantly agricultural (pastoral and arable) with pockets of woodland and the urban centres of Inverurie, Port Elphinstone and Kintore.



Photograph 20.7 River Urie South of Pitcaple (Looking Upstream from NGR 373841, 825330)



Photograph 20.8 Lochter Burn (Looking Downstream from NGR 376912, 824332)



Photograph 20.9 River Don Upstream of Inverurie (Looking Downstream from NGR 375140, 820205)



Photograph 20.10 River Don Downstream of Inverurie (Looking Upstream from NGR 379220, 817430)

Table 20.6 Summary of Receptor Sensitivity – Pitcaple to Kintore

Watercourse	Receptor Sensitivity		
	Hydrology/ Flood Risk	Fluvial Geomorphology	Water Quality
River Urie – Pitcaple to Lochter Burn (WFD)	High	High	High
Tributary of Burn of Durno 1	Low	Low	High (in proximity to Pitscurry Moss LNCS only)/Medium
Tributary of River Urie 21	Medium	Low	High (in proximity to Pitscurry Moss LNCS only)/Medium
Strathnaterick Burn	Medium	Low	Medium
Tributary of the River Urie 22	Low	Low	Medium
Ides Burn	High (Violet route option) Low (Orange route option)	Low	Medium
Lochter Burn/Kings Burn (WFD)	High	Medium	High

Watercourse	Receptor Sensitivity		
	Hydrology/ Flood Risk	Fluvial Geomorphology	Water Quality
Tributary of Lochter Burn 1	Medium	Low	Medium
Tributary of River Urie 23	Medium	Low	Medium
Tributary of River Urie 24	Low	Low	Medium
River Don – Alford to Inverurie (WFD)	High	High	Very High
Tributary of River Don 1	Medium	Low	Medium
Woodend Burn	Medium	Medium	Medium
River Don – Inverurie to Dyce (WFD)	Very High	High	Very High
Tributary of River Don 2	Low	Low	Medium
Tributary of River Don 3	High	Low	Medium
Densy Burn	Low	Low	Medium
Bridgealehouse Burn	Medium	Low	Medium
Tributary of Tuach Burn 1	High	Low	Medium
Rollomire Burn	High	Low	Medium
Tributary of Newmill Burn	Low	Low	Medium

20.4 Potential Impacts

- 20.4.1 This section presents a summary of the proposed infrastructure affecting watercourses for each of the route options (Table 20.7), followed by a description of the potential operational impacts of the route options on the water environment (Table 20.8) and measures to avoid, reduce or mitigate these potential impacts. The significance of predicted effects for each of the route options are summarised in Table 20.9 to Table 20.14, with further details provided in Volume 4b, Appendix A20.3: Predicted Environmental Effects.
- 20.4.2 Table 20.7 presents a summary of the number of proposed watercourse crossings and channel realignments for each of the route options. Where the same structure crosses more than one watercourse, it is included more than once in Table 20.7 as the focus of this assessment is on watercourse impacts rather than the number of structures. There are also several locations where proposed earthworks not associated with watercourse crossings encroach into areas of functional floodplain, which have been included in the impact assessment and are also listed within Table 20.7.
- 20.4.3 Road drainage outfalls, flood relief structures and minor localised realignments at culverts have not been included within either Table 20.7 or the impact assessment. The potential impacts associated with this infrastructure are expected to be localised in extent and the design detail required for an assessment is not available at DMRB Stage 2.
- 20.4.4 Table 20.7 demonstrates that all route options will require multiple new watercourse crossings due to the linear nature of the development and characteristics of the study area. There are considerably more new watercourse

crossings required for the Red route option compared to the Cyan route option. However, the majority of these are for minor watercourses. The number and type of new watercourse crossings are similar for the Pink and Brown route options. For the Violet and the Orange route options, the number and type are also comparable.

- 20.4.5 Cyan is the only route option which will require a realignment of a WFD-monitored watercourse (River Urie – source to Old Rayne). However, this realignment is expected to be less than 200m in length. The Red route option includes a more extensive realignment of the Jordan Burn (greater than 1km in length). The other realignments required for the Cyan and Red route options are short in length and affect minor watercourses.
- 20.4.6 The Pink route option includes one short realignment of a minor watercourse and a longer realignment of a tributary of the Bonnyton Burn which appears to be culverted under existing conditions, whilst the Brown route option does not require any channel realignments. The Violet and Orange route options both require realignments of several small watercourses which are currently in a modified condition.

Table 20.7 Summary of Infrastructure by Route Option

Type	Watercourse Type	Route Option					
		Cyan	Red	Pink	Brown	Violet	Orange
Culverts (new and replace/ extend existing culvert)	WFD	0	1	0	0	0	0
	Non-WFD	14	19	5	6	15	15
New bridge	WFD	1	1	4	4	2	2
	Non-WFD	1	0	1	0	2	0
Watercourse realignment	WFD	1	0	0	0	0	0
	Non-WFD	2	2	2	0	5	4
Earthworks encroachment into functional floodplain ²⁷⁰	WFD	2	0	0	0	0	0
	Non-WFD	0	0	0	0	2	0

- 20.4.7 Potential impacts arising during the operational phase of the road scheme and included in the assessment are summarised in Table 20.8. The potential impact magnitude in the absence of mitigation has been assigned according to Volume 4b, Appendix A20.1: Table 1.2 and the methodology outlined in Section 20.2 for each location where an impact is predicted. The predicted significance of effects has been assigned according to Table 20.3.
- 20.4.8 All impacts within Table 20.8 are predicted to have potentially significant effects for one or more of the watercourses within the study area in the absence of mitigation, except for Impact D which is not subsequently reported further within this chapter or the predicted effects tables in Volume 4b, Appendix A20.3: Predicted Environmental Effects because it is considered an indirect impact.
- 20.4.9 For the purposes of the DMRB Stage 2 assessment, all potential impacts have been assessed as being adverse. There are opportunities at some locations for beneficial impacts. For example, channel realignments could be designed in a way

²⁷⁰ These are locations not associated with either a watercourse crossing or realignment.

that improves the morphological functioning of the river compared to existing conditions, or there may be locations where water quality improves due to SuDS treatment of road runoff compared to untreated runoff from the existing A96. A conservative approach has been taken to the assessment and no beneficial impacts have been assigned due to the early stage of the design and uncertainty in the extent to which these benefits could be realised at this stage. A negligible impact magnitude has also been recorded where an impact is absent, for example, where a watercourse will not receive road drainage.

Table 20.8 Potential Impacts across all Route Options

Sub-topic	Potential Impact	Potential Impact Magnitude
Hydrology and flood risk	A. Increase in impermeable area within the catchment arising from the introduction of the road surface, reducing infiltration capacity and increasing surface water runoff rates and volumes.	Minor to Moderate
	B. Alteration of surface water flow pathways, reduction in floodplain storage or change in flood conveyance due to the introduction of new watercourse crossing structures and/or road embankments, causing increased water levels and/or flood extents.	Negligible to Major
Fluvial geomorphology	C. Alteration of morphological forms and processes arising from the introduction of new watercourse crossing structures (bridge piers and abutments, culverts), road embankments, bank alterations (bank reinforcement, outfalls) or channel realignments. This could lead to a reduction in morphological diversity, change in channel stability due to altered patterns of erosion and deposition or alteration of the natural functioning of the channel.	Minor to Major
	D. Indirect impact on morphological processes and functioning of the channel arising from changes in river flow regimes (from impact A or B).	Negligible to Major
Water quality	E. Increase in contaminants entering surface watercourses via the road drainage system from routine road runoff and accidental vehicular spillages.	Moderate to Major

20.5 Mitigation

20.5.1 The development of the route options aimed to avoid potential environmental effects in the first instance and reducing these effects where avoidance is not possible. For example, the linear nature of the scheme means that watercourse crossings cannot be avoided. However, it was preferential to locate crossings where there is a narrower floodplain.

20.5.2 The mitigation measures listed in Paragraph 20.5.4 have been used to assess the residual significance of the predicted effects on the water environment. The measures include those which avoid or reduce an impact, for example, through appropriate design, in addition to those that mitigate effects. These measures will be employed throughout the study area, not just at locations where significant effects are predicted.

20.5.3 The design of SuDS measures, channel engineering structures or modifications (including watercourse crossings and channel realignments) and flood mitigation measures (for example, compensatory floodplain storage) will be undertaken in accordance with the relevant SEPA and CIRIA guidance.

20.5.4 The following mitigation measures (W1 to W9) are relevant to the operational phase and will be developed further for the Preferred Option during DMRB Stage 3:

- W1: The road drainage scheme will use a minimum of two levels of SuDS to provide appropriate treatment and flow attenuation prior to discharge to the water environment. Discharges from the SuDS to watercourses will be restricted to the 1 in 10-year return period greenfield (pre-development) runoff rate, for all events up to the 30-year return period, as agreed with AC. SuDS will be maintained in accordance with CIRIA guidance.
- W2: The drainage scheme (road drainage, management of runoff from the wider catchment and drainage at road cuttings) will consider the natural drainage catchments and existing flow pathways, replicating the existing drainage patterns and preventing the build-up of surface water runoff wherever possible.
- W3: Bridges, culverts and channel realignments will be designed to avoid increasing flood risk to upstream and downstream receptors, as far as possible. Bridges and culverts will be sized to convey the 1 in 200-year return period flood event, including allowances for both climate change and freeboard.
- W4: Encroachment into the functional floodplain will be avoided wherever practical, for example, through the use of structures to span floodplains rather than embankments. SuDS attenuation measures will avoid the functional floodplain wherever possible.
- W5: Where encroachment into the functional floodplain cannot be avoided, appropriate mitigation measures will be used to maintain floodplain conveyance and storage, for example, provision of flood relief culverts and/or like-for-like compensatory flood storage as close to the area lost as possible.
- W6: Modifications to the channel bed and banks will be avoided as far as is practicable, for example, through using bridges or bottomless structures, burying culvert inverts, setting back abutments and avoiding the use of in-channel piers.
- W7: Channel engineering works will be designed to avoid changes in erosion and deposition patterns as far as possible through consideration of local hydraulic and geomorphological conditions. Bridges and culverts will be designed to maintain fish and mammal passage.
- W8: Channel realignment design will replicate the form and processes of the original watercourse as far as is reasonably practicable. Opportunities to improve the morphological functioning and ecological value of historically modified channels will be identified and incorporated into the design of channel realignments where possible.
- W9: Water quality monitoring will be undertaken where required (before, during and post-construction) to identify and mitigate any pollution issues

arising from the scheme. The type, frequency and locations of monitoring, as well as any emergency measures in the event of a pollution incident will be agreed with SEPA.

- 20.5.5 Mitigation relevant to potential impacts on the water environment during the construction phase will be included at DMRB Stage 3.

20.6 Predicted Environmental Effects

- 20.6.1 This section presents a summary of the key predicted effects of the route options on the water environment. The significance of predicted effects has been assessed in the absence of mitigation and the residual effects have been evaluated following the assumed mitigation outlined in Paragraph 20.5.4. Significant residual effects are those which are moderate or major are highlighted in bold. The reporting in Table 20.9 to Table 20.14 includes only those watercourses for which significant effects are predicted for one or more of the sub-topics (i.e. hydrology and flood risk, fluvial geomorphology and water quality). Further details are provided in Volume 4b, Appendix A20.3: Predicted Environmental Effects.

East of Huntly to Colpy

- 20.6.2 The predicted environmental effects of the Cyan and Red route options are summarised in Table 20.9 and Table 20.10 respectively. The following watercourses have been screened out of the reporting of predicted environmental effects:
- Cyan route option: Tributary of Burn of Slioch, Keithny Burn/Forge Burn, Drain 1 and Tributaries of River Urie 6, 8, 11, 12, 13 and 14 have no significant effects predicted for any of the sub-topics; and
 - Red route option: Tributary of Burn of Slioch and Tributaries of River Urie 3, 4, 5, 8 and 9 have no significant effects predicted for any of the sub-topics.
- 20.6.3 The predicted effects are the same for the Burn of Bogside as the scheme is the same for both the Cyan and Red route options at this location.
- 20.6.4 The residual effects on watercourses associated with the Cyan and Red route options are predicted to be mitigated to Slight adverse or Neutral significance (not significant).

Table 20.9 Predicted Environmental Effects: Cyan Route Option

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Burn of Bogside			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 2			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Water Quality	Moderate	W1, W9	Slight adverse
Burn of Lipsden			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
River Urie - source to Old Rayne			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Large	W6 - W8	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of River Urie 7			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 9			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 10			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Jordan Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Large	W6, W7	Slight adverse
Water Quality	Moderate	W1, W9	Slight adverse

Table 20.10 Predicted Environmental Effects: Red Route Option

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Burn of Bogside			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Glen Water			
Hydrology and Flood Risk	No significant effects predicted		

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Fluvial Geomorphology	Moderate	W6 - W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
River Urie - source to Old Rayne			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Burn of Stodfold			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	No significant effects predicted		
Tributary of River Urie 6			
Hydrology and Flood Risk	Moderate	W1 - W5	Neutral
Fluvial Geomorphology	No significant effects predicted		
Water Quality	No significant effects predicted		
Jordan Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Large	W6 - W8	Slight adverse
Water Quality	Moderate	W1, W9	Slight adverse

Colpy to Pitcapple

- 20.6.5 The predicted environmental effects of the Pink and Brown route options are summarised in Table 20.11 and Table 20.12 respectively. The following watercourses have been screened out of the reporting of predicted environmental effects:
- Pink route option: Tributary of Bonnyton Burn 1 and Loch Inch Fishery have no significant effects predicted for any of the sub-topics; and
 - Brown route option: Tributaries of River Urie 16, 17 and 18, and Loch Inch Fishery have no significant effects predicted for any of the sub-topics.
- 20.6.6 Both route options cross the Burn of Durno at a similar location, resulting in the same predicted effects for this watercourse for both the Pink and Brown route options.
- 20.6.7 The residual effects on watercourses associated with the Pink and Brown route options are predicted to be mitigated to Slight adverse or Neutral significance (not significant). Potential effects on water quality from the scheme will be mitigatable through careful design of the SuDS. Consultation with SEPA will be undertaken at DMRB Stage 3 to gain a more detailed understanding of the sensitivity of the watercourse and the type of SuDS treatment required to result in no significant effects.

Table 20.11 Predicted Environmental Effects: Pink Route Option

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
River Urie - source to Old Rayne			
Hydrology and Flood Risk	Moderate	W1 - W5	Neutral
Fluvial Geomorphology	Large	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of River Urie 15			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Bonnyton Burn			
Hydrology and Flood Risk	Large	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of River Urie 19			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 20			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Burn of Durno			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse

Table 20.12 Predicted Environmental Effects: Brown Route Option

Sub-topic	Significance of Predicted effects	Assumed Mitigation	Significance of Residual Effects
The Kellock			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of The Kellock 1			
Hydrology and Flood Risk	Moderate	W1 - W5	Neutral

Sub-topic	Significance of Predicted effects	Assumed Mitigation	Significance of Residual Effects
Fluvial Geomorphology	No significant effects predicted		
Water Quality	No significant effects predicted		
Shevock Burn			
Hydrology and Flood Risk	Large	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
River Urie - Old Rayne to Pitcaple			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of River Urie 20			
Hydrology and Flood Risk	Moderate	W1 - W5	Slight adverse
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Burn of Durno			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse

Pitcaple to Kintore

20.6.8 The predicted environmental effects of the Violet and Orange route options are summarised in Table 20.13 and Table 20.14 respectively. The following watercourses have been screened out of the reporting of predicted environmental effects:

- Violet route option: Tributary of River Don 3, Tributary of Tuach Burn 1 and Rollomire Burn have no significant effects predicted for any of the sub-topics.

20.6.9 The residual effects on watercourses associated with the Violet and Orange route options are predicted to be mitigated to slight adverse or neutral significance (not significant). Potential effects on water quality from the scheme will be mitigatable through careful design of the SuDS. Consultation with SEPA will be undertaken at DMRB Stage 3 to gain a more detailed understanding of the sensitivity of the watercourse and the type of SuDS treatment required to result in no significant effects.

Table 20.13 Predicted Environmental Effects: Violet Route Option

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Tributary of River Urie 21			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Ides Burn			
Hydrology and Flood Risk	Moderate	W1 - W5	Slight adverse
Fluvial Geomorphology	Moderate	W6 - W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
Lochter Burn/Kings Burn			
Hydrology and Flood Risk	Large	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Tributary of Lochter Burn 1			
Hydrology and Flood Risk	Moderate	W1 - W5	Slight adverse
Fluvial Geomorphology	Moderate	W6 - W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 23			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 24			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of Newmill Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Densy Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6 – W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
River Don - Inverurie to Dyce			
Hydrology and Flood Risk	Very Large	W1 - W5	Neutral

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	No significant effects predicted		
Bridgealehouse Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse

Table 20.14 Predicted Environmental Effects: Orange Route Option

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Tributary of Burn of Durno 1			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 21			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6 – W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
Ides Burn			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
River Urie - Pitcaple to Lochter Burn			
Hydrology and Flood Risk	Large	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	Large	W1, W9	Slight adverse
Strathnaterick Burn			
Hydrology and Flood Risk	Moderate	W1 - W5	Slight adverse
Fluvial Geomorphology	Moderate	W6 - W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Urie 22			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse

Sub-topic	Significance of Predicted Effects	Assumed Mitigation	Significance of Residual Effects
Tributary of River Don 1			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	Moderate	W6 - W8	Neutral
Water Quality	Moderate	W1, W9	Slight adverse
River Don - Alford to Inverurie			
Hydrology and Flood Risk	Moderate	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Neutral
Water Quality	Large	W1, W9	Slight adverse
Woodend Burn			
Hydrology and Flood Risk	Moderate	W1 - W5	Neutral
Fluvial Geomorphology	Moderate	W6, W7	Slight adverse
Water Quality	No significant effects predicted		
Tributary of River Don 2			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse
Tributary of River Don 3			
Hydrology and Flood Risk	No significant effects predicted		
Fluvial Geomorphology	No significant effects predicted		
Water Quality	Moderate	W1, W9	Slight adverse

20.7 Cumulative Effects

- 20.7.1 The predicted effects have been reported on a watercourse scale for tributaries and water body scale for WFD-monitored watercourses for each individual route option. The River Urie (source to Old Rayne) water body will be affected by infrastructure associated with both the Cyan or Red route options and the Pink route option. The residual effects of the scheme on this water body are not predicted to be significant for any of the route options. This conclusion does not change when considering the cumulative effects across Cyan/Pink or Red/Pink combinations assuming that the mitigation in Section 20.5 is implemented.
- 20.7.2 The majority of the watercourses within the study area are tributaries of the River Urie or River Don and ultimately drain to the River Don. The majority of the existing A96 within the study area similarly falls within these catchments. Cumulative residual effects on the River Urie and River Don catchments, for example in terms of cumulative loss of floodplain storage or effects on water quality during the operational phase, are not predicted to be significant assuming that the mitigation in Section 20.5 is implemented.
- 20.7.3 Proposed future development within the sites allocated in the Aberdeenshire LDP has the potential to impact upon the water environment. Assuming that these sites are developed in accordance with SPP and other relevant statutory and best

practice guidance, cumulative effects on the water environment are not predicted to be significant.

20.8 Summary of Effects

20.8.1 The key findings of the route options assessment are summarised in Table 20.15 to Table 20.17.

Table 20.15 Summary of Predicted Effects for RDWE – East of Huntly to Colpy

Sub-topic	Predicted Residual Effects – Cyan Route Option	Predicted Residual Effects – Red Route Option
Hydrology and flood risk	<ul style="list-style-type: none"> Earthworks are sited within the functional floodplain of the River Urie (source to Old Rayne) at several locations. This encroachment will be avoided through design refinement during DMRB Stage 3, or compensatory storage will be provided if encroachment is unavoidable. 	<ul style="list-style-type: none"> Neutral residual effects on flood risk are predicted for Tributary of River Urie 6 assuming the new crossing is sized to convey the design flood flows.
Fluvial geomorphology	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for the River Urie (source to Old Rayne) assuming the short realignment (<200m in length) is designed to replicate existing morphological forms and processes and a clear span structure is used for the new crossing. New crossings of Jordan Burn and its tributaries are predicted to result in effects with Slight adverse residual significance. 	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for the River Urie (source to Old Rayne) assuming a clear span structure is used for the new crossing. New crossings of Glen Water and Burn of Stodfold are predicted to result in effects with Neutral and Slight adverse residual significance respectively. Slight adverse residual effects are predicted for Jordan Burn assuming the proposed channel realignment (>1km in length) is designed to replicate existing morphological forms and processes.
Water quality	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for one high sensitivity watercourse (River Urie – source to Old Rayne) and seven medium sensitivity watercourses. 	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for one high sensitivity watercourse (River Urie – source to Old Rayne) and three medium sensitivity watercourses.

Table 20.16 Summary of Predicted Effects on RDWE – Colpy to Pitcaple

Sub-topic	Predicted Residual Effects – Pink Route Option	Predicted Residual Effects – Brown Route Option
Hydrology and flood risk	<ul style="list-style-type: none"> Clear span structures are proposed for the new crossings of the River Urie (source to Old Rayne) and Bonnyton Burn, with no embankments proposed within the functional floodplain, leading to a Neutral residual effect on flood risk. 	<ul style="list-style-type: none"> A clear span structure is proposed for the new crossing of Shevock Burn, with no embankments proposed within the functional floodplain, leading to a Neutral residual effect on flood risk. Neutral residual effects on flood risk are predicted for Tributary of The Kellock 1 assuming the new crossings are sized to convey the design flood flows and compensatory storage is provided if required. Slight adverse residual effects are predicted for Tributary of River Urie 20 (potential residual effects on high grade agricultural land).
Fluvial geomorphology	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for the River Urie (source to Old Rayne), Bonnyton Burn and Burn of Durno assuming a clear span structure is used for the new crossings. The Pink route option crosses these watercourses in locations with limited signs of active channel migration. Neutral residual effects are predicted for the new crossings of Tributary of River Urie 19. 	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for The Kellock, Shevock Burn, River Urie (Old Rayne to Pitcaple) and Burn of Durno assuming a clear span structure is used for the new crossings. The Brown route option crosses these watercourses in locations with limited signs of active channel migration.
Water quality	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for two high sensitivity watercourses (River Urie – source to Old Rayne and Burn of Durno) and three medium sensitivity watercourses. Slight adverse residual effects are predicted for Bonnyton Burn as a conservative approach, due to the ‘High’ WFD status recorded for biological attributes. 	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for four high sensitivity watercourses (The Kellock, Shevock Burn, River Urie – Old Rayne to Pitcaple and Burn of Durno) and one medium sensitivity watercourses.

Table 20.17 Summary of Predicted Effects on RDWE – Pitcaple to Kintore

Sub-topic	Predicted Residual Effects – Violet Route Option	Predicted Residual Effects – Orange Route Option
Hydrology and flood risk	<ul style="list-style-type: none"> • A viaduct structure is proposed for the new crossing of the River Don at Kintore. Hydraulic modelling predicts negligible change in flood risk to upstream or downstream receptors based on the DMRB Stage 2 outline design. • A clear span structure is proposed for the new crossing of Lochter Burn, with no embankments proposed within the functional floodplain, leading to a Neutral residual effect on flood risk. • Slight adverse residual effects on flood risk are predicted for Ides Burn and Tributary of Lochter Burn 1 assuming appropriate design of the new crossings and channel realignment. Compensatory storage will be required to offset loss of floodplain on Ides Burn. • Compensatory storage is likely to be required to offset loss of floodplain on Bridgealehouse Burn. 	<ul style="list-style-type: none"> • A viaduct structure is proposed for the new crossing of the River Urie at Pitcaple. Hydraulic modelling predicts negligible change in flood risk to upstream or downstream receptors based on the DMRB Stage 2 outline design. • A viaduct structure is proposed for the new crossing of the River Don (Alford to Inverurie). Based on the DMRB Stage 2 outline design, the residual significance of effects on flood risk are predicted to be Neutral. • Slight adverse residual effects are predicted for Strathnaterick Burn assuming provision of compensatory storage and appropriate design of the new crossings and channel realignment. • Neutral residual effects on flood risk are predicted for Woodend Burn assuming the new crossing is sized to convey the design flood flows.

Sub-topic	Predicted Residual Effects – Violet Route Option	Predicted Residual Effects – Orange Route Option
Fluvial geomorphology	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for Lochter Burn and the River Don (Inverurie to Dyce) assuming a clear span structure is used for the new crossings. The Violet route option crosses these watercourses in locations with limited signs of active channel migration. Neutral residual effects are predicted for Ides Burn, Tributary of Lochter Burn 1 and Densy Burn assuming the proposed channel realignments (>200m in length) are designed to replicate existing morphological forms and processes. 	<ul style="list-style-type: none"> Slight adverse residual effects are predicted for the River Urie (Pitcaple to Lochter Burn). There is some evidence of localised active geomorphological processes, including minor channel migration, and bank erosion at the crossing location which will need to be considered when designing the piers for the viaduct. Neutral residual effects are predicted for the River Don (Alford to Inverurie). The viaduct is located at a confined reach. Piers in the floodplain will be avoided where possible. Neutral residual effects are predicted for Tributary of River Urie 21, Tributary of River Don 1 and Strathnaterick Burn assuming the proposed channel realignments (>200m in length) are designed to replicate existing morphological forms and processes. Slight adverse residual effects are predicted for the new crossing of Woodend Burn.
Water quality	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for two high sensitivity watercourses (Lochter Burn, River Don – Inverurie to Dyce) and seven medium sensitivity watercourses. 	<ul style="list-style-type: none"> Treatment of road runoff using SuDS is predicted to result in Slight adverse residual significance of effects for one high sensitivity watercourse (River Urie – Pitcaple to Lochter Burn) and eight medium sensitivity watercourses. Slight adverse residual effects are predicted for River Don (Alford to Inverurie) as a conservative approach, due to the ‘High’ WFD status recorded for physico-chemical attributes.

Summary: East of Huntly to Colpy

- 20.8.2 Both route options include clear span structures across the River Urie (source to Old Rayne). The Red route option requires more watercourse crossings in total than the Cyan route option. However, most of these crossings are of minor tributaries with no significant effects predicted.
- 20.8.3 There are no significant residual effects on hydrology and flood risk for either route option. However, design refinement or provision of compensatory storage will be required for the Cyan route option to avoid piecemeal reduction of the functional floodplain of the River Urie.
- 20.8.4 Slight adverse residual effects on geomorphology are predicted for the River Urie (source to Old Rayne) and Jordan Burn for both route options. The Cyan route option requires a short realignment of the River Urie (less than 200m in length) and the Red route option requires a longer realignment of Jordan Burn (greater than 1km in length). The channel realignment of Jordan Burn may be more challenging to mitigate due to topographic and infrastructure constraints. However, this watercourse is already in a modified state and it is likely that an acceptable realignment could be achieved at this location. The River Urie is a higher sensitivity watercourse and is currently at 'Good' WFD status for morphology.
- 20.8.5 Overall, the Red route option is predicted to have slightly less effect on the road drainage and water environment due to a lesser impact on the River Urie.

Summary: Colpy to Pitcaple

- 20.8.6 Both route options include clear span structures across several WFD-monitored watercourses. No significant effects are predicted for these watercourses for flood risk or fluvial geomorphology assuming that the proposed crossings do not encroach into the functional floodplain.
- 20.8.7 Compensatory storage may need to be provided to offset loss of floodplain for Tributary of The Kellock 1, and there may be slight adverse residual effects on flood risk for high grade agricultural land for Tributary of River Urie 20 (Brown route option). Slight adverse residual effects are predicted for Bonnyton Burn for the Pink route option.
- 20.8.8 Overall, effects on the road drainage and water environment are similar for both route options.

Summary: Pitcaple to Kintore

- 20.8.9 Both route options require new crossings of extensive floodplain of either the River Don (Violet route option at Kintore) or the River Urie (Orange route option at Pitcaple). Viaducts are proposed to minimise flood risk and geomorphology impacts. Hydraulic modelling predicts negligible change in flood risk to sensitive receptors for both route options based on the DMRB Stage 2 outline design.
- 20.8.10 A viaduct across the River Don upstream of Inverurie (Orange route option) and a clear span structure across Lochter Burn (Violet route option) are also predicted to result in no significant residual effects on flood risk or geomorphology.
- 20.8.11 Both route options are predicted to have slight adverse residual significance of effects on flood risk for high grade agricultural land. Compensatory storage will be required to offset any loss of floodplain storage of the Ides Burn and Bridgealehouse Burn for the Violet route option and Strathnaterick Burn for the Orange route option.

- 20.8.12 Both route options require realignments greater than 200m of three low sensitivity, modified watercourses, with neutral residual significance of effects on fluvial geomorphology predicted. The realignment of Tributary of River Urie 21 on the Orange route option may be more challenging to mitigate than realignments on the Violet route option, due to topographic and infrastructure constraints. However, this watercourse is already in a modified state and it is likely that a functional realignment could be achieved at this location. Slight adverse effects are predicted for River Don (Alford to Inverurie) for the Orange route option due to the 'High' WFD status recorded for physico-chemical attributes.
- 20.8.13 Overall, effects on the road drainage and water environment are similar for both route options.

20.9 Scope of DMRB Stage 3 Assessment

- 20.9.1 The DMRB Stage 3 assessment will follow the methods described in DMRB LA 113 Road drainage and the water environment and industry accepted practice for assessing potential impacts for RDWE. Potential impacts during both the construction and operational phases will be assessed for the DMRB Stage 3 assessment.
- 20.9.2 The following section summarises the proposed scope of the DMRB Stage 3 assessment, which will be discussed and agreed with SEPA and AC where appropriate. Reconnaissance level site visits will be undertaken to all watercourses that could be impacted by the Preferred Option, to record field indicators of baseline conditions for all three sub-topics. The potential requirement for more detailed field surveys is described under each of the subheadings below.
- 20.9.3 The DMRB Stage 3 assessment will encompass the inter-linked impacts across various environmental topics, for example using advice from groundwater and ecological specialists in relation to abstractions, water-dependent habitats or aquatic ecology. A WFD assessment will be undertaken in accordance with DMRB LA 113 to identify whether the Preferred Option could lead to non-compliance with the WFD.

Hydrology and Flood Risk

- 20.9.4 A quantitative assessment of hydrology and flood risk will be undertaken for sensitive watercourses in accordance with DMRB LA 113 and the relevant SEPA guidance. The hydrological assessment will include:
- Estimation of peak design flows (flood flows) for a range of return periods using standard FEH²⁵⁵ methodologies. Local gauged data will be used where applicable. An analysis will be undertaken to determine whether ReFH2²⁶⁴ is suitable for use within the study area and consultation carried out with SEPA to agree on the proposed approach to high flows estimation;
 - Estimation of low and average flows using LowFlows2²⁷¹ software;
 - Consultation with SEPA and AC to agree an appropriate climate change allowance to be used at DMRB Stage 3;

²⁷¹ LowFlows2 software, available at: <https://www.hydrosolutions.co.uk/software/lowflows2/>

- The design flow estimates will be used to inform the design of bridges, culverts and channel realignments and to aid the assessment of impacts on hydrology and flood risk, geomorphology and water quality; and
- A qualitative assessment will also be made of potential impacts on catchment hydrology which could lead to effects on flood risk, water-dependent habitats or abstractions, for example changes to impermeable areas and surface water flow pathways and the indirect effects of changes in groundwater flows or levels on surface watercourses (for example, from dewatering activities). Effects on GWDTes will be assessed following SEPA's guidance²⁷².

20.9.5 The flood risk assessment will include the following:

- Consultation with AC regarding any changes made to the two FPS hydraulic models since they were issued to AmeyArup for use in the DMRB Stage 2 assessment, and to obtain information regarding any proposed flood alleviation works that could affect existing flood extents and levels within the study area;
- Hydraulic modelling of sensitive watercourses to provide a quantitative assessment of existing flood extents and levels, and the predicted change in flood risk to sensitive receptors for the Preferred Option. The scope and method of the hydraulic modelling will be agreed with SEPA and AC and is likely to incorporate:
 - Update, extend or adapt the existing hydraulic models of the River Urie, River Don and Shevock Burn as necessary to ensure that they are appropriate for use in the DMRB Stage 3 assessment;
 - Develop hydraulic models of other sensitive watercourses within the study area for which a quantitative assessment is required; and
 - Calibration and sensitivity testing of models where appropriate.
- Mitigation design to achieve no increase in flood risk at sensitive receptors where possible, including the use of flood relief culverts and compensatory storage; and
- Assessment of flood risk from all sources including fluvial, surface water, groundwater and infrastructure failure.

Fluvial Geomorphology

20.9.6 The scope of the assessment of impacts on fluvial geomorphology is likely to incorporate the following:

- Reconnaissance level site visits for all watercourses that could be impacted by the Preferred Option and detailed geomorphological surveys using reach-scale fluvial audits or a similar method for sensitive watercourses and those for which a channel realignment is proposed. These surveys will collect data on current river forms, evidence of existing processes and modifications and sensitivity to change;

²⁷² SEPA, *Land Use Planning System SEPA Guidance Note 31 – Guidance on Assessing the Impact of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems*, 2017

- Use of hydrological and hydraulic assessment outputs for the calculation of stream power or sediment transport metrics for sensitive locations;
- Geomorphological input to the design of bridges, culverts, channel realignments and other in-channel engineering (for example, scour protection and drainage outfalls) to minimise the impact on existing river processes where possible, for example by reducing the length of culverts, and provide improvements to already modified reaches where there is an opportunity to do so; and
- Identification of appropriate measures to off-set any significant residual effects on geomorphology in consultation with SEPA, for example through morphological improvements to other reaches of the affected watercourse or other watercourses within an affected catchment.

Water Quality

20.9.7 The scope of the assessment of impacts on water quality is likely to incorporate the following:

- Consultation with SEPA regarding the sensitivity and pressures of Bonnyton Burn and River Don (Alford to Inverurie) to gain a better understanding of ecological, chemical and morphological baseline conditions within these watercourses and to inform appropriate mitigation;
- Consultation with relevant stakeholders to ensure that lessons learned from previous similar schemes are applied when determining appropriate mitigation for potential impacts on water quality during the construction phase;
- Assessment of the potential impacts from routine road runoff and accidental spillages using the Highways England Water Risk Assessment Tool (HEWRAT) tool (formerly HAWRAT). The results from the HEWRAT tool will be used to inform the SuDS design;
- More detailed information will be sought on PWS and CAR licenced abstractions within the study area, including the source type and location of the point of abstraction; and
- Assessment of impacts on surface water abstractions for the Preferred Option and outline of design and mitigation requirements.

21 Climate

21.1 Introduction

- 21.1.1 This chapter assesses the potential climate impacts and effects from construction and operation of the scheme, following the methodology set out in Design Manual for Roads and Bridges (DMRB) LA 114 Climate.²⁷³
- 21.1.2 In accordance with the Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017 and to align with the requirements of DMRB LA 114 Climate, this DMRB Stage 2 Scheme Assessment Report considers the potential impacts of the route options on climate, regarding their:
- Impacts on climate (Greenhouse Gas (GHG) emissions);
 - In-combination Climate Change Impact Assessment (ICCI); and
 - Vulnerability to climate change (Climate Change Resilience and Adaptation).
- 21.1.3 Supporting information for this chapter can be found in Volume 4b, Appendix A21.1 to A21.6.
- 21.1.4 The chapter provides a summary of the policy and legislative frameworks associated with climate change, the approach to the assessment taken, any limitations of the assessment at this stage, and an outline of the current and projected future local and regional climate and GHG baseline environment for the area relevant to the assessment. Following this summary, the baseline, impacts, mitigation, and predicted effects of the scheme are discussed.
- 21.1.5 DMRB LA 114 Climate, sets out criteria to determine the requirements for a full GHG assessment by asking a series of questions as outlined below:
- Are construction GHG emissions (or GHG-emitting activity) increasing by >1%, compared to the baseline scenario (i.e. when compared to GHG emissions and energy use associated with existing maintenance activities); and
 - During operation, will roads meet or exceed any of the following criteria:
 - a change of more than 10% Annual Average Daily Traffic (AADT);
 - a change of more than 10% to the number of heavy-duty vehicles; and
 - a change in daily average speed of more than 20 km/hr.
- 21.1.6 Due to the scheme involving the construction of a new road, the first criterion (based on construction GHG emissions) is considered to have been met as construction emissions will be significantly larger than those attributable to operational and maintenance of the existing A96.
- 21.1.7 DMRB LA 114 Climate states that should the anticipated climate changes have the potential to result in significant environmental effects to project receptors, then a

²⁷³ Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, *Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 114 Climate Revision 0*, 2019, available at www.standardsforhighways.co.uk/dmrbs.

Climate Change Resilience & Adaptation Assessment (CCRA) should be scoped in.

- 21.1.8 Projected changes to average climate conditions, in addition to an increased frequency and severity of extreme weather events, have the potential to increase the risk of environmental impacts upon the scheme. Due to the size and nature of the scheme and the predicted changes in climate, a CCRA is considered necessary.
- 21.1.9 An ICCI considers the way changes to climate will affect the future baseline and impacts of the proposed scheme for all assessment topics. A standalone ICCI has not been included in this DMRB Stage 2 Scheme Assessment Report, as it was determined that it was not appropriate to this assessment stage as it is not a specific requirement of DMRB LA 114.
- 21.1.10 Table 21.1 details where in-combination climate change impacts have been included within the DMRB Stage 2 Scheme Assessment Report within technical topics, and whether or not consideration of in-combination climate change impacts has been deferred to the next stage or if it is not considered relevant.

Table 21.1 In-Combination Climate Impact (ICCI) Assessment Review

Topic	DMRB Stage 2 Assessment considered ICCI	DMRB Stage 3 Assessment will consider ICCI	Detail
Air Quality	No	No	N/A
Noise	No	No	N/A
People and Communities	No	No	N/A
Agriculture, Forestry and Sporting Interests	No	Yes	Consideration of extreme weather events, precipitation and temperature change will be included at DMRB Stage 3.
Materials	No	No	Details of GHG emissions related to material use is included within this Climate Assessment.
Landscape and Visual Impacts	No	No	N/A

Topic	DMRB Stage 2 Assessment considered ICCI	DMRB Stage 3 Assessment will consider ICCI	Detail
Cultural Heritage	No	Yes	The Cultural Heritage chapter will consider in DMRB Stage 3 the impacts of future climatic change on the cultural heritage (archaeology, built heritage and historic landscapes) baseline of the Preferred Option. The assessment will be based upon climate predictions detailed in the UK Climate Projections 2018 (UKCP18) for North East Scotland (or such as is current at the time of submission) and will include consideration of the principal climate change factors (i.e. increased temperature, increased rainfall and increased flooding) outlined in 'Our Place and Time: A Guide to Climate Change Impacts on Scotland's Historic Environment' (HES, 2019). The assessment will identify key climate hazards and the potential impacts that these could have on the cultural heritage baseline of the Preferred Option.
Landscape	No	No	N/A
Nature Conservation	No	Yes	Consideration of extreme weather events, precipitation and temperature change will be included at DMRB Stage 3.
Geology and Soils	No	No	Details of GHG emissions related to geology and soils use is included within this Climate Assessment.

Topic	DMRB Stage 2 Assessment considered ICCI	DMRB Stage 3 Assessment will consider ICCI	Detail
Road Drainage and the Water Environment.	Yes	Yes	The impacts of extreme weather events on the water environment discipline are considered as part of the climate change allowances within Chapter 20 - Road Drainage and the Water Environment and within the Flood Risk Simple Assessment (FRSA). The climate change allowance will be revisited at DMRB Stage 3 and a climate change uplift will be agreed following consultation with Scottish Environment Protection Agency (SEPA) and Aberdeenshire Council. Therefore, it would not be proportionate or appropriate to assess such effects within the climate assessment solely for the purpose of the ICCI assessment. These impacts are, therefore, not included in this chapter.
Human Health	No	No	N/A

21.1.11 Screening for the ICCI assessment will be reviewed at the commencement of DMRB Stage 3.

21.2 Approach to the Assessment

Relevant Legislation, Policy and Guidance

21.2.1 The climate change assessment has been undertaken in line with relevant policy, legislation and guidance. Summaries of these are outlined in the following section.

Legislation

21.2.2 The Paris Agreement²⁷⁴ is a 2015 global climate agreement adopted at the 21st Conference of all Parties (COP 21). The agreement is international in scope and intended to limit global temperature increase this century to less than 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit this to 1.5 degrees Celsius. It additionally includes goals on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.

²⁷⁴ United Nations, *Paris Agreement*, 2015, available at www.unfccc.int.

The Paris Agreement was ratified and entered into force in the United Kingdom (UK) in November 2016.

- 21.2.3 At the European level, the EIA Directive 2011/92/EU²⁷⁵ places a requirement upon projects which have the potential for significant effects on the surrounding environment and communities to make a formal assessment of these effects. The amended 2014 EIA directive, 2014/52/EU²⁷⁶, states that EIAs shall identify, describe and assess the direct and indirect significant effects of climate change relevant to the scheme. The regulations implementing this directive were transposed into UK legislation in May 2017²⁷⁷.
- 21.2.4 The Climate Change Act 2008²⁷⁸ provides the statutory framework for the greenhouse gas emissions reductions in the UK. The Act requires the UK Government to set five-yearly carbon budgets, twelve years in advance, from 2008 to 2050 and to publish a national Climate Change Risk Assessment (CCRkA) on a five-yearly basis to provide assessments of climate change risks for different sectors of society.
- 21.2.5 The Climate Change Act 2008 (2050 Target Amendment) Order 2019²⁷⁹ amended the previous legally binding target within the Climate Change Act 2008 from an 80% reduction (compared to 1990 levels) in UK Greenhouse Gas emissions to 100%, or net zero, by 2050.
- 21.2.6 The Climate Change (Scotland) Act 2009²⁸⁰ provides the statutory framework for greenhouse gas emissions reductions in Scotland. The Act commits Scotland to an emissions target, set for the year 2050, of a reduction of at least 80% from the baseline of 1990/1995 baseline period²⁸¹. To facilitate the delivery of these targets, the Act mandates ministers to set annual targets, in secondary legislation, from 2010 to 2050.
- 21.2.7 The Climate Change (Emissions Reductions Targets) (Scotland) Act 2019²⁸² amends the Climate Change (Scotland) Act 2009 and sets targets to reduce emissions of all greenhouse gases in Scotland to net-zero by 2045, these include interim targets designed to facilitate the transition to the 2045 targets and which are outlined in Table 21.2.

Table 21.2 Climate Change Emission Reduction Targets

Date	Emission reduction target against 1990/1995 baseline period
2020	56%

²⁷⁵ Council of The European Union and European Parliament, *Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment*, 2011.

²⁷⁶ Council of The European Union and European Parliament, *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment Text with EEA relevance*, 2014

²⁷⁷ The Scottish Parliament, *The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017*.

²⁷⁸ UK Government, *The Climate Change Act 2009*, 2009.

²⁷⁹ UK Government, *The Climate Change Act 2009 (2050 Target Amendment) Order*, 2019.

²⁸⁰ The Scottish Parliament, *The Climate Change (Scotland) Act*, 2009.

²⁸¹ The baseline for emissions in Scotland is derived from 1990 emissions of carbon dioxide, methane and nitrous oxide and 1995 emissions for hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. The Scottish Greenhouse Gas Inventory has undergone data revisions in successive years between the publication of the 1990-2008 inventory and the more recent 1990-2013 inventory. For brevity the baseline is referred to throughout this document as the '1990/1995 baseline period'.

²⁸² The Scottish Parliament, *The Climate Change (Emissions Reductions) (Scotland) Act*, 2019

Date	Emission reduction target against 1990/1995 baseline period
2030	75%
2040	90%
2045	100%

21.2.8 The Climate Change (Emissions Reductions Targets) (Scotland) Act 2019 mandates the publication of a strategic delivery plan for meeting the targets outlined in the Act, to be published at 5 yearly intervals. This is actioned by the publication of Scotland's Climate Change Plan, the latest of which was published in 2018²⁸³. The Scottish Government is currently updating this Climate Change Plan to reflect the amendment to the long-term carbon²⁸⁴ targets, and the adoption of the net-zero target for 2045. The Climate Change Plan sets out how carbon reductions will be achieved, and also provides annual carbon budgets for the period up to 2032.

Policy

21.2.9 Scottish Planning Policy (SPP) (2014)²⁸⁵ sets out the national planning policies which reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land, and works in conjunction with the Scottish Government, National Planning Framework 3, 2014 (NPF3)²⁸⁶. The SPP supports National Outcome 2 - reducing our emissions and adapting to climate change. It sets out how this should be delivered on the ground, by seizing opportunities to encourage mitigation and adaptation measures, planning can support the transformational change required to meet emission reduction targets and influence climate change.

21.2.10 NPF3 sets out the long-term vision for development and investment across Scotland, providing a framework for decision makers to inform their decisions on large strategic developments. This document sets out the requirement for nationally significant road infrastructure to ensure connectivity between Scotland's cities and regions. Section 3 'A low carbon place' details the role that planning will play in Scotland's carbon reduction targets, and the future vision for Scotland. Section 5 'A Connected Place' details how investment in infrastructure will be required to facilitate a transition to low carbon vehicles and to decarbonise the transport sector by 2050. This document is currently being revised to consider, amongst other elements, the revised carbon reduction targets adopted in the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019.

21.2.11 Low Carbon Scotland: Meeting the Emissions Reduction Targets 2013 to 2027²⁸⁷, sets out the specific plans and policies required for Scotland to deliver its statutory annual targets for reductions in greenhouse gas emissions for the period 2013 to 2027, as outlined in the Climate Change (Scotland) Act 2009. These are outlined

²⁸³ The Scottish Government, *Scotland Climate Change Plan*, 2018

²⁸⁴ "Carbon" is typically used as shorthand to refer to greenhouse gases (GHG). This term is defined as those gases within the 'Kyoto basket' i.e. carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (SF₆).

²⁸⁵ The Scottish Government, *Scottish Planning Policy*, 2014

²⁸⁶ The Scottish Government, *Scottish Planning Framework*, 2014

²⁸⁷ The Scottish Government, *Low Carbon Scotland: Meeting the Emissions Reductions Targets 2013-2027*, 2013.

on a per-sector basis, with the specific ambitions for the transport sector in relation to climate with reference to transition to electric vehicles and to increase road network efficiencies.

- 21.2.12 At a national level, the Climate Change Act (2008)²⁸⁸ requires the UK Government to undertake a national CCRkA on a five-yearly basis. The second CCRkA was published in 2017 and provides assessments of climate change risks for different sectors of society, including infrastructure, people and the built environment, natural environment and natural assets, business and industry as well as international dimensions and cross-cutting issues. The Scottish Climate Change Adaptation Programme (SCCAP)²⁸⁹, the second of which was published in 2019, is a requirement of the Climate Change (Scotland) Act 2009 and addresses the impacts identified for Scotland in the UK CCRkA.
- 21.2.13 In February 2020, Transport Scotland published a National Transport Strategy (NTS2) for 2020 to 2040²⁹⁰. NTS2 sets out Scottish Government's vision for transport for the next 20 years. It is supported by four interconnected priorities that will help to deliver the vision of a sustainable, inclusive, safe and accessible transport system that:
- reduces inequalities;
 - takes climate action;
 - helps deliver inclusive economic growth; and
 - improves health and wellbeing.
- 21.2.14 The strategy sets out a Sustainable Travel Hierarchy which is relevant to the assessment of climate as it prioritises reductions in travel through digital technology, and lower carbon transport options (walking, cycling and public transport) over the use of private cars. It also promotes the move to ultra-low emissions vehicles. However, with regard to GHG emissions, the NTS2 gives no consideration to reducing emissions embodied in the physical construction of infrastructure.
- 21.2.15 The Scottish Government's Strategic Transport Projects Review (STPR), published in 2008, set out a number of transport priorities for the Aberdeen to Inverness corridor. Refer to Chapter 9, Policies and Plans, for further information on this review.

Regional and Local

- 21.2.16 The Aberdeen City and Shire Strategic Development Plan²⁹¹ outlines the strategy for growth in the North East region. This document states that the Aberdeen City and Shire Strategic Planning Authority Area will be a city region which takes the lead in reducing the amount of carbon dioxide released into the air, and which adapts to the effects of climate change.
- 21.2.17 Aberdeenshire Council, Climate Change Action Plan 2011-2015²⁹² sets out the goal of working towards carbon neutrality. The Plan has four themes within which

²⁸⁸ UK Government, *Climate Change Act 2008*, 2008.

²⁸⁹ The Scottish Government, *The Scottish Climate Change Adaption Programme*, 2019.

²⁹⁰ Transport Scotland, *National Transport Strategy for 2020 to 2040, 2020*, available at <https://www.transport.gov.scot/media/47052/national-transport-strategy.pdf>

²⁹¹ Aberdeen City and Shire Strategic Development Planning Authority, *Aberdeen City and Shire Strategic Development Plan*, 2014.

²⁹² Aberdeenshire Council, *Climate Change Action Plan 2011-2015*, 2011

emission reduction projects and targets are grouped. The themes are: Energy, Travel, Waste and Behavioural Change, with the plan outlining a need to develop an integrated transportation system which contributes to the development of an inclusive and safe society, a sustainable economy and which reduces environmental damage caused by transport.

Guidance

- 21.2.18 The DMRB LA 114 guidance on assessing impacts of and on climate was published in October 2019 and provides information on the methodologies required to undertake both the assessment of the effects of climate change on highways (climate change resilience and adaptation) and the effect on the climate of greenhouse gas emissions from construction, operation and maintenance.
- 21.2.19 Publicly Available Specification (PAS) 2080: Carbon Management in Infrastructure²⁹³ is a standard which provides guidance on how infrastructure projects should quantify, manage, and reduce carbon emissions through the lifecycle of infrastructure delivery. It provides methodological advice on how to address lack of data and the analytical scoping and sensitivities of the carbon assessment and management process.
- 21.2.20 Transport Scotland's Projects Carbon Tool forms part of Transport Scotland's Carbon Management System (CMS)²⁹⁴ and provides a set of calculation spreadsheets for capturing design and construction information throughout the project lifetime. It includes information and carbon emissions factors to help calculate the embodied carbon of materials, their transportation, replacement emissions, and waste management.
- 21.2.21 The Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance²⁹⁵ provides guidance on areas of consideration for the quantification and assessment of GHG emissions, and an approach to considering the significance of impacts.
- 21.2.22 IEMA's guidance on climate change resilience and adaptation²⁹⁶ was drafted in response to the requirements specified in the amended EIA Directive 2014. This guidance provides an approach to undertaking assessments of climate change resilience within the EIA process in the UK.

Sources of Information

- 21.2.23 The GHG assessment draws on various information sources to inform the assessment of impacts during the construction stage and operational stage as shown in Table 21.3.

²⁹³ BSI PAS 2080 Carbon Management in Infrastructure, 2016, available at <https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/>

²⁹⁴ Transport Scotland, *Carbon Management System (CMS) Projects Carbon Tool*, Last update: 2016.

²⁹⁵ Institute of Environmental Management and Assessment (IEMA), *IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance*, 2017.

²⁹⁶ The Institute of Environmental Management and Assessment (IEMA), *IEMA Environmental Impact Assessment Guide To Climate Change Resilience And Adaptation*, 2020.

Table 21.3 GHG Data Sources

Main Stage of Project Life Cycle	Emissions Category / Source	Data Used to Inform the Assessment
Construction stage	Material product stage; including raw material supply, transport and manufacture	Overarching parameters for each route option, including length, pavement area, central reservation area etc as summarised in Volume 4b, Appendix A21.1 Route Option Design Parameters Informing the Climate Construction Assessment.
	Construction process stage; including transport to/from works site and construction/installation processes.	Assumptions have been used for transport distances for key materials in the absence of known procurement routes/sources. These are presented in Volume 4b, Appendix A21.2 Material Replacement Assumptions Informing the Climate Assessment. No data is currently available on construction energy, and this section has not been quantified from design data.
	Land use change	Design information on the footprint of each route option plus an allowance for a maintenance strip These are presented in Volume 4b, Appendix A21.3 Land Use Data for Each Route Option to Inform the Construction and Operational Climate Assessments.
Operation ('use stage')	Use of the infrastructure by the end-user (road use)	Information on CO ₂ emissions for each affected road network (ARN) have been produced from traffic modelling for the 2030 year of opening, and for the 2045 design year, for each end-to-end option. Emissions for each ARN for the Dominium scenario have also been calculated for each end-to-end option.
	Operation and maintenance (including repair, replacement and refurbishment)	Maintenance emissions have not been estimated at this stage due to lack of available data. Replacement emissions have been estimated for each route option based on typical replacement schedules.

Main Stage of Project Life Cycle	Emissions Category / Source	Data Used to Inform the Assessment
	Land use and forestry	Design information on the area taken up by the footprint of the new road plus an adjacent maintenance strip. These are presented in Volume 4b, Appendix A21.3 Land Use Data for Each Route Option to Inform the Construction and Operational Climate Assessments.

21.2.24 The CCRA assessment draws on the following information sources:

- The data used for the baseline has been taken from the historical meteorological variables recorded by the Met Office²⁹⁷;
- The future projections have been taken from the UK Climate Projections (UKCP18), developed by the Met Office²⁹⁸;
- Information related to scheme wide mitigation has been taken from the A96 Scheme Resilience Strategy²⁹⁹; and
- Information related to flood risk has been obtained from the A96 Flood Risk Simple Assessment (FRSA) contained in Volume 4b, Appendix A20.4.

Consultation

21.2.25 Formal consultation has been undertaken between Aberdeen City Council, Aberdeenshire Council and AmeyArup in May 2019. This consultation, particularly around air quality and flood risk, has informed this assessment. Details of the consultation as it relates to flood risk can be found in the consultation section of Chapter 20, Road Drainage and the Water Environment. Consultation will be undertaken as required at commencement of the DMRB Stage 3 process.

Study Area

21.2.26 The study area for the GHG assessment aligns with that specified in DMRB LA 114:

- For construction emissions, the study area comprises the footprint of the road including earthworks and maintenance strip. It also extends to cover the area over which materials are transported from source/manufacturer to construction site. It also extends to cover the area over which waste is transported for reuse, recycling or landfill.
- For operational maintenance, the study area comprises the footprint of the road and maintenance strip, and the area over which maintenance materials are transported from supplier to site.

²⁹⁷ Met Office; (2018): *HadUK-Grid gridded and regional average climate observations for the UK. Centre for Environmental Data Analysis*. Available at: <http://catalogue.ceda.ac.uk/uuid/4dc8450d889a491ebb20e724debe2dfb>

²⁹⁸ Met Office Hadley Centre (2018): *UKCP18 Probabilistic Projections on a 25km grid over the UK for 1961-2100. Centre for Environmental Data Analysis*. Available at: <https://catalogue.ceda.ac.uk/uuid/9f8dfaf790644dbcb2c3f69f409a70d6>

²⁹⁹ Jacobs, *A96 Dualling Preliminary Engineering Services Scheme Resilience Strategy*, 2015.

- For operational road use GHG emissions, the study area is the ARN defined by applying the relevant Air Quality network criteria within in the scheme's traffic model. The ARN for each route option is provided in Volume 5, Figures 10.1 to 10.24.

21.2.27 The study area for the CCRA assessment of vulnerability to climate change is based on the construction footprint/scheme boundary of the six route options.

Methodology

GHG Emissions Assessment

21.2.28 The assessment of the magnitude of GHG emissions has been undertaken in accordance with DMRB LA 114 and the principal steps identified in PAS 2080 (with the exception of setting project level carbon reduction targets).

21.2.29 GHG emissions are quantified to calculate the emissions anticipated to be generated or avoided by the scheme (according to the scheme boundary and emissions scope set out in Paragraph 21.2.26). The purpose of this is to:

- Determine the magnitude of the scheme's emissions for the relevant route options;
- Enable comparison of the 'Do-Something' scenario against the 'Do-Minimum' scenario;
- Enable a comparative assessment of route options based on a life-cycle GHG assessment; and
- Enable comparison of the 'Do-Something' scenario against Scotland's carbon reduction targets;
- In accordance with DMRB LA 114, end of life impacts have not been considered due to the long design life of the asset.
- The assessment estimates four main categories of GHG emissions across the scheme lifecycle as discussed in the following sections.

Construction Works and Supply Chain Emissions

21.2.30 Construction emissions are assessed based on the route option designs and cost estimates. Paragraph 21.2.67 onwards summarises the limitations of this data, and the assumptions made in the estimation of emissions. The calculation of emissions from construction and the supply chain was calculated using Transport Scotland's Projects Carbon Tool, which forms part of Transport Scotland's CMS suite of tools. For some physical elements, i.e. bridges, there was insufficient materials data available to complete the Transport Scotland Project Carbon Tool. However, a

simple scaling exercise based on bridge deck-area has been used to estimate embodied carbon from these elements of the route options.

Operational Maintenance and Replacement Emissions

- 21.2.31 An estimate of GHG emissions associated with replacement of key materials within the scheme has been carried out using the Transport Scotland Projects Carbon Tool.
- 21.2.32 Due to lack of data at this stage a quantification of maintenance emissions has not been carried out.

Traffic Carbon Emissions (user carbon) from Vehicle Exhausts

- 21.2.33 Vehicle emissions are calculated from the traffic model using standard air quality emissions modelling tools. User emissions are calculated for end-to-end options, rather than for individual route options, due to the way in which the underlying traffic modelling has been carried out. The three pairs of route options allow for eight possible end-to-end options.
- 21.2.34 The study area for the GHG assessment is the same as the ARN for the air quality impact assessment. GHG emissions have been estimated for the ARN for each end-to-end option for 2030 as required by DMRB LA 114 and are presented in Chapter 10, Air Quality. A single value of CO₂ emissions has been calculated for each end-to-end option for 2030 and for 2045.
- 21.2.35 To estimate the net change in emissions for 2030, a comparison has been made between the vehicle kilometres for each road in the ARN (for each end-to-end option) and the same road in the Do-Minimum model. Aggregating these values provides a scaling metric which has been used to estimate Do-Minimum emissions for each end-to-end option.
- 21.2.36 2045 Do-minimum emissions have also been calculated by scaling the 2045 Do-something emissions down using the same vehicle-km ratio used for the 2030 calculation.
- 21.2.37 To estimate emissions beyond 2030, and aggregate user emissions over a 60-year period, the projected emissions include two external trend assumptions:
- Engine efficiency improvements between 2030 and 2045 totalling a 15% reduction in CO₂ emissions, based on future efficiency expectations in the TAG data book³⁰⁰; and
 - A tapering of overall emissions between 2030 and 2070 to reflect the wider transition to alternative fuel vehicles. This has been assumed to result in an 80% reduction in emissions between 2030 and 2070, driven by increased uptake of electric vehicles, and use of electric and other power sources for HGVs.
- 21.2.38 Air quality modelling provides quantification of vehicle emissions, reported as CO₂ emissions. DMRB LA 114 requires the assessment to report emissions in units of CO₂e (which incorporates a measure of other GHGs in addition to CO₂). For combustion of fuels in vehicles, the CO₂e emissions are approximately 1% greater than the CO₂ element (depending on which fuel is being used). Given the current uncertainty around the mix of vehicles and engine types within the assessment,

³⁰⁰ Department for Transport, *TAG Data Book*, 2019, Available: <https://www.gov.uk/government/publications/tag-data-book>.

and to support consistency in reporting with other chapters, the vehicle emissions have been kept as their CO₂ values for the subsequent assessment and reporting.

Emissions Associated with Land-use Change

21.2.39 DMRB LA 114 states that a proportionate approach shall be applied to calculating and reporting GHG emissions from changes in land use and forestry, reporting only where there is likely to be a substantial change. The land take for the six route options ranges from 87ha to 176ha and it is considered that this could result in a substantial change and, as such, has been considered in more detail within the assessment.

- The impact of land use change during construction has been calculated based on the land take for each route option, and assuming all carbon is released from this area during construction; and
- An assessment has also been made of future sequestration opportunity loss during operation of the scheme due to loss of land for each route option.

21.2.40 The assessment of emissions associated with land-use change was carried out as follows:

- The area of impacted land for each route option was assessed based on taking the earthworks boundary for the existing design and including the maintenance strip. The land type was determined using MasterMap Topographic dataset, providing hectarage for a range of land use types. Each land type from the MasterMap data was classified into a short list of main land use categories for analysis purposes.
- For **Construction**, the overlay analysis outputs for the construction phase were assigned a construction GHG factor. The GHG factors and the corresponding land areas were used to determine the carbon stock within the soil/land currently present within the study area and, therefore, the GHG emissions that would occur if this stock was to be released; and
- For **Operation** the overlay analysis outputs for the operational phase were assigned an operational GHG factor. The GHG factors and the corresponding land areas have been used to determine the annual GHG sequestration potential of the land uses currently present within the study area. This was multiplied to find total 'opportunity lost' for GHG sequestration over the 60-year appraisal period.

21.2.41 GHG factors for land use assessment during Construction and Operation are set out in Volume 4b, Appendix A21.4 GHG Factors for Land Use Types.

Assessment of Significance – GHG Assessment

21.2.42 DMRB LA 114 provides some guidance on how significance should be assessed by comparison with the carbon budgets used by the Overseeing Organisation (Transport Scotland). It notes that an assessment of the project GHG emissions shall be undertaken against UK government or Overseeing Organisation carbon

budgets. For this project the most relevant carbon budgets are taken to be those set for Scotland by the Scottish Government.

21.2.43 Carbon budgets for Scotland are set out in the Scottish Government Climate Change Plan, most recently updated in February 2018³⁰¹. This document sets out annual carbon budgets for Scotland for the period 2018-2032. These budgets have not yet been updated to reflect the new national targets set in the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019 which supports the target of net zero by 2045.

21.2.44 The existing carbon budgets for Scotland are summarised in Table 21.4.

Table 21.4 Annual Emissions Targets for Scotland

Year	Annual Target in tonnes of Carbon Dioxide Equivalent (tCO ₂ e)
2020	40,717,000
2021	39,495,000
2022	38,310,000
2023	37,161,000
2024	35,787,000
2025	34,117,000
2026	32,446,000
2027	30,777,000
2028	29,854,000
2029	28,958,000
2030	28,089,000
2031	27,247,000
2032	26,429,000

³⁰¹ Climate Change Plan. The Third Report on Proposals and Policies 2018-2030 (February 2018).
<https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2018/02/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/documents/00532096-pdf/00532096-pdf/govscot%3Adocument/00532096.pdf>

- 21.2.45 The current 2030 target, within the Climate Change Plan, represents a 64% reduction from the Scottish 1990/1995 baseline period level of 77.1 MtCO₂e³⁰².
- 21.2.46 Under the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019, the national reduction for 2030 is now at least 75% below the 1990/1995 baseline period. Updated annual targets have not yet been produced but will be provided in the forthcoming Climate Change Plan update from the Scottish Government³⁰³.
- 21.2.47 DMRB LA 114 notes that the assessment must report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets.
- 21.2.48 DMRB LA 114 references paragraph 5.17 of the National Networks National Planning Policy Statement (NN NPPS) which states that “It is unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction targets”. Although this document is not a Scottish Government document, it is relevant to this assessment as it is included in the DMRB LA 114 guidance document on which this assessment is based.
- 21.2.49 The construction period for the scheme is expected to be between three and five years, with the expectation that the scheme is operational by 2030. In order to consider a worst case, the assessment will assume a three-year construction period (meaning average annual emissions from construction are at their highest), completing in 2030 when annual carbon targets are at their lowest.
- 21.2.50 The assessment must also present benchmarking of the scheme against other highways schemes, which must be normalised to take account of differences in size and scale.

Scenarios and Comparative Assessment

- 21.2.51 The assessment compares the relative impact of each route option:
- For construction and supply chain, and maintenance-related emissions this is carried out by comparing each pair of route options: East of Huntly to Colpy (Cyan route option vs Red route option); Colpy to Pitcaple (Brown route option vs Pink route option); and Pitcaple to Kintore (Violet route option vs Orange route option);
 - For user emissions, which are based on end-to-end route option traffic modelling, the assessment compares the differences in net increases for end-to-end user GHG emissions (compared to Do-minimum emissions); and
 - Land use change emissions are compared for each route option pair.

Climate Change Resilience and Adaptation

- 21.2.52 The CCRA assessment is a qualitative assessment which assesses the impacts and risks of climate change on the scheme. This assessment is based on professional judgement and experience of similar schemes.

³⁰² Scottish greenhouse gas emissions: 1990-2015. Available: <https://www.gov.scot/publications/scottish-greenhouse-gas-emissions-2015/pages/3/>

³⁰³ Publication of the Climate Change Plan update was scheduled for the end of April 2020 but this has been delayed due to the coronavirus (COVID-19) outbreak.

- 21.2.53 The assessment of climate effects on the scheme are assessed over the construction period and over a 60-year operational life cycle, in line with the methodology described in DMRB LA 114.
- 21.2.54 The potential high-level risks and impacts associated with flood risk have been included in this assessment, however, this is covered in more detail within the FRSA, which can be found in Volume 4b, Appendix A20.4. This assessment considers current SEPA climate change allowances for increases in peak flow and rainfall intensity.
- 21.2.55 The CCRA assessment is comprised of three stages, outlined below:
 - Identification of climate hazards, risks and benefits;
 - Assessment of likelihood and consequences; and
 - Evaluation of significance.
- 21.2.56 The following climate change hazards have been identified and considered in the CCRA assessment: high temperatures, low temperatures, high precipitation and low precipitation.
- 21.2.57 The CCRA assessment considers the likelihood and consequence of climate risk during the construction and operational phases of the scheme. These aspects are scored using a five-point scale which is set out in DMRB LA 114 and are shown in Tables 21.5 and 21.6.

Table 21.5 Climate Risk Likelihood (Reproduced from DMRB LA 114)

Likelihood Category	Description (Probability and Frequency of Occurrence)
Very High	The event occurs multiple times during the lifetime of the scheme (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the scheme (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the scheme (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the scheme (60 years) e.g. once in 60 years.
Very Low	The event can occur once during the lifetime of the scheme (60 years).

Table 21.6 Consequence of Climate Risks (Reproduced from DMRB LA 114)

Consequence of Impact	Description
Very large adverse	Operation - national level (or greater) disruption to strategic route(s) lasting more than one week.
Large adverse	Operation - national level disruption to strategic route(s) lasting more than one day but less than one week or regional level disruption to strategic route(s) lasting more than one week.
Moderate adverse	Operation - regional level disruption to strategic route(s) lasting more than one day but less than one week.

Consequence of Impact	Description
Minor adverse	Operation - regional level disruption to strategic route(s) lasting less than one day.
Negligible	Operation - disruption to an isolated section of a strategic route lasting less than one day.

21.2.58 The route options are the result of preliminary options appraisal and assessment, where options have been deselected based on their engineering, environmental, traffic and economic performance and their performance against the scheme objectives. A summary of this process is available on the Transport Scotland website³⁰⁴. This process has subsequently generated route options which have embedded climate resilience.

21.2.59 Design principles have been established which aim to mitigate against the potential climate hazards faced by the scheme. This embedded mitigation has been considered when assigning the likelihood, consequence and significance ratings of the environmental impacts.

21.2.60 Where hazards are identified as being significant, the need for additional resilience measures to protect against these impacts will be identified and developed in DMRB Stage 3.

Assessment of Significance - CCRA

21.2.61 The evaluation of significance is determined by applying the likelihood and consequence of each impact to a significance matrix, outlined in Table 21.7, taken from DMRB LA 114.

Table 21.7 Significance Matrix (Reproduced from DMRB LA 114)

		Measure of Likelihood				
		Very Low	Low	Medium	High	Very High
Measure of Consequence	Very Large	NS	S	S	S	S
	Large	NS	NS	S	S	S
	Moderate	NS	NS	S	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

(Note: S - Significant; NS – Not Significant, All measures of consequence are adverse)

21.2.62 DMRB LA 114, Section 3.30, requires the H++ climate scenarios to be used to test the sensitivity of vulnerable safety critical features. H++ scenarios are a set of plausible ‘high-end’ climate change scenarios which are typically extreme climate change scenarios. They cover the following climate hazards: heat waves, cold

³⁰⁴ A96 East of Huntly to Aberdeen. Accessed on: www.transport.gov.scot/projects/a96-dualling-inverness-to-aberdeen/a96-east-of-huntly-to-aberdeen/

snaps, low and high rainfall, droughts, floods and windstorms. These requirements are included to ensure that such features will not be affected by more radical changes to the climate beyond that projected in UKCP18. Safety critical features for highway schemes have been identified as:

- Retaining walls;
- Bridges;
- Pavements;
- Road restraint system; and
- Drainage.

21.2.63 An assessment using H++ climate scenarios has not been undertaken at this stage as there is insufficient detail on the locations and type of safety critical features. Assessment of the safety critical features against H++ scenarios will occur at DMRB Stage 3, where specific mitigation will be designed, if necessary.

21.2.64 The resilience of the scheme has been considered against UKCP18 and Representative Concentration Pathways 8.5 (RCP8.5) models³⁰⁵. The RCP 8.5 global warming scenario represents a very high baseline emission scenario, representing the 90th percentile of no-policy baseline scenarios available at the time and is a requirement of DMRB LA 114.

Assumptions and Limitations

GHG Assessment

21.2.65 The main assumptions and limitations in this assessment, and the implications of these for the assessment, are set out below.

Limitations on Existing Design Data for Material Quantities

21.2.66 The main construction material quantity data has been estimated using general design parameters for each route option as set out in Volume 4b, Appendix A21.1 Route Option Design Parameters Informing the Climate Construction Assessment. This assumes typical material quantities per unit area of pavement and central reservation. General assumptions have been made on fencing types / lengths, drainage pipe sizes, and vehicle restraint systems.

21.2.67 Design information at this stage does not include material quantities for structures for each route option. To account for this an estimated embodied emissions factor of 3 tCO₂e/m² of deck area has been assumed³⁰⁶.

21.2.68 No estimate has been made at this stage on construction waste quantities except for management and disposal of excess excavation material, and unsuitable excavated material.

³⁰⁵ Met office, United Kingdom Climate Projections, 2018, Available: <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/download-data>.

³⁰⁶ The value of 3tCO₂/m² of deck area is at the upper end of the range of values for a range of bridges studied in Smith, D et al. Carbon calculator design tool for bridges. *Proceedings of the Institution of Civil Engineers – Bridge Engineering*, Vol 168, Issue 3, September 2015

Limitations on Material Transport Emissions

- 21.2.69 There is little information at this stage on likely sourcing of materials and geographical transportation modes and distances. Assumptions on transport distances and modes have been made as set out in Volume 4b, Appendix 21.2 Material Replacement Assumptions Informing the Climate Assessment.

Limitations on Construction Plant Energy

- 21.2.70 No information is available on plant usage in construction at this stage as construction programmes have not been developed for each route option. Typically, this can account for 10-20% of the overall construction emissions for infrastructure projects. An estimated uplift of 20% has been applied to the embodied material emissions for each route option to represent a conservative estimate of energy use in construction for the purposes of assessing significance.

Potential for Transfer of Excavation Material between Route Options

- 21.2.71 This assessment focuses on a comparative assessment between pairs of route options. A key GHG mitigation opportunity is present where excavated material can be transferred between geographical sections, to minimise the need for the import of virgin materials. This has not been included in the main assessment of construction impacts, although this will be reviewed and integrated in the assessment at DMRB Stage 3.

Limitations on Maintenance Requirements Data

- 21.2.72 The full comparison of Do-Something and Do-Minimum operational GHG emissions should also take account of the maintenance requirements of the existing A96. These maintenance requirements are not known at this stage and have been excluded from the assessment, however, an assessment of these will be made at DMRB Stage 3. While these emissions are relevant to understanding the full GHG impact of the scheme, they will not significantly affect the comparative assessment between route options.

Limitations on Operational Energy Usage

- 21.2.73 Operational energy usage for the scheme has not been estimated at this stage, however, an assessment of this will be made at DMRB Stage 3. Generally, this contributes a small proportion of overall emissions when compared to construction and user emissions and is not expected to significantly affect the assessment.

Limitations on the quantification of the Do-minimum User emissions

- 21.2.74 A single Do-minimum dataset has been used as the basis of calculating net CO₂ user emissions. Due to the criteria used to identify the ARN, each end-to-end option has a different ARN and, hence, different Do-minimum emissions scenario. A single Do-Minimum scenario has instead been used (as set out in section 21.3.5) so as to avoid developing multiple (inconsistent) Do-minimum ARNs. This does introduce a limitation to the assessment by potentially excluding road links which see a drop in AADT (greater than screening thresholds) between Do-minimum and Do-something. However, this is likely to lead to over-estimation of net CO₂ emissions (rather than an underestimate) and is considered unlikely to materially affect the quantification outcomes. The modelling will be revisited at DMRB Stage 3 and will use the single specific ARN for the selected Preferred Option at that stage.

Uncertainties around Future Vehicle Fleet

- 21.2.75 The assessment of user emissions is based on the modelling of the ARN for the opening year 2030, which was then scaled to estimate emissions for a design year of 2045. Between 2030 and 2045, and beyond this period (up to the 60-year study period specified in DMRB LA 114), vehicle emissions have been scaled to account for improvements in engine efficiency, and the long-term shift away from petrol-diesel vehicles to alternative power sources with lower exhaust emissions. The assumptions for these forecasts have been developed based on the following:
- The DfT provide some forecasts (in the WebTAG data book) for future vehicle efficiency improvements, which have been interpreted as a reduction in emissions per km across all fuel types. Between 2020 and 2050 this represents between 11% and 18% reduction in emissions depending on vehicle/fuel type. A reduction of emissions by 15% between 2030 and 2045 has been assumed;
 - Beyond 2045, it is assumed that traffic levels will remain constant; and
 - An assumption has been made that emissions in 2070 have reduced to 20% of those in 2045. In practice, this rate of reduction will depend on external factors including fuel pricing/tax, incentives for low carbon vehicles and other policy/legislation.

Limitations on the Assessment of Land Use Change

- 21.2.76 One of the limitations to the land use assessment is the wide variety of GHG factors for different land uses, soils, agricultural and forestry uses in relevant literature. Land use and land use change GHG factors have been determined for this assessment following a literature review and are presented in Volume 4b, Appendix 21.4 GHG Factors for Land Use Types.
- 21.2.77 No detailed assessment of the likely emissions arising from peat-containing soils during construction and operation has been carried out at this stage. Chapter 19, Geology, Soils, Contaminated Land and Groundwater provides background information on the area of peat within each route option which varies from zero (for the Pink route option) to 15.6 ha (for the Red route option). The presence of peat will be further investigated and assessed as part of the DMRB Stage 3.
- 21.2.78 At this stage, the assessment only considers land within the footprint of the route option including the maintenance strip.

Climate Change Resilience and Adaptation

- 21.2.79 Climate projections are simulations of potential future climate scenarios, under a range of hypothetical emissions scenarios and assumptions, and should not be viewed as predictions or forecasts. Subsequently, the projections used for this assessment should not be viewed as exact or factual, but possible scenarios. They provide a consistent representation of how the climate may change in response to a range of potential scenarios, with the reliability of these scenarios changing according to different variables. In general terms, global projections are more certain than regional projections, with the accuracy diminishing for smaller geographical areas, while temperature projections are more certain than those for precipitation. Climate change projections are less certain the further they project into the future.

21.2.80 The CCRA assessment has been informed by the following assumptions:

- The assessment has assumed that mitigation measures relevant to the different assets would be implemented; and
- The assessment is affected by assumptions associated with climate modelling and climate change projections, incorporated in UKCP18.

21.2.81 The CCRA assessment has the following limitations:

- The assessment is largely qualitative, except for assessments relevant to flood risk, which have been informed by the SEPA climate change allowances for increases in peak river flow and rainfall intensity;
- There is limited guidance related to undertaking climate change resilience assessments in EIA from the Scottish Government or professional institutions, although examples from other large infrastructure assessments are becoming more widely available;
- There is uncertainty about relationships between changes in climate hazards and the infrastructure assets ability to respond. This uncertainty has been assessed qualitatively;
- The impacts of climate change in relation to road infrastructure has been predominantly informed by professional judgement; and
- The UKCP probabilistic projections are provided for 25 km grid squares. Given the similarity in projections across the relevant grid squares covering the study area an aggregated set of the most extreme parameters from relevant grid squares has been developed. This is presented in Section 21.3 as the basis of the assessment.

21.3 Baseline

GHG Assessment

21.3.1 In line with guidance in DMRB LA 114, the GHG assessment should consider baseline emissions in the future Do-Minimum scenario. In the absence of the scheme:

- Construction related emissions are assumed to be zero;
- Emissions arising from land use change in construction are assumed to be zero; and
- Emissions and sequestration from land use and forestry are assumed to remain broadly constant.

21.3.2 In the absence of the scheme, future emissions sources are taken to comprise:

- Operation and maintenance impacts for the existing road network; and
- User emissions from vehicles for the affected road network in the absence of the scheme.

- 21.3.3 The existing road network will be subject to ongoing maintenance during operation. However, the impacts arising from this have not been quantified for this DMRB Stage 2 assessment due to unavailability of data. In the absence of the scheme, the existing A96 would continue to provide the trunk road connection between Inverness and Aberdeen. Maintenance of the road surface, drainage, signage etc. would be carried out in accordance with the status of the road and associated traffic levels. Without the scheme, maintenance and replacement would still be required for the existing A96. However, it is not expected that this will materially affect the assessment of GHG emissions for the scheme, nor is it expected to materially affect the comparative assessment between the route options.
- 21.3.4 The future user emissions have been modelled for the ARN as determined by the traffic model. The definition of what roads are considered 'affected' is determined by the application of criteria within the Air Quality assessment in Chapter 10. At this stage, ARN emissions have not been calculated for a 'base year' as defined in DMRB LA 114. For the purposes of this assessment the 'base year' is assumed to be the opening year.
- 21.3.5 The assessment of emissions for each route option is undertaken by calculating the net change in CO₂ emissions for each end-to-end option. Each end-to-end option has a different ARN and, because of this, there is no single 'Do-Minimum' ARN, or single quantification of user emissions which can be used as a comparator for all potential end-to-end options. The future baseline without the scheme is, therefore, developed individually for each end-to-end option. It is calculated by taking traffic model data for each road link (length and vehicle numbers) to generate aggregated total vehicle-km for each end-to-end option (Do-minimum and Do-something) for the relevant ARN. This then provides a scaling metric used to calculate the Do-minimum emissions, derived from the modelled Do-Something emissions.

Climate Change Resilience and Adaptation

- 21.3.6 As outlined within DMRB LA 114, the Climate Change Resilience and Adaptation assessment shall use published historical regional weather data to determine the current climate impacts upon the study area. This will include information on recent extreme weather events, to provide an indication on current and past vulnerability.

Historic Observed Regional Weather Data

- 21.3.7 Table 21.8 presents historical climate data for the same 25km grid squares which has been used for the future climate projections. The data has been obtained from the Met Office HadUK gridded climate observational dataset, at a spatial resolution of 25km for the period 1981 to 2010³⁰⁷. This data is supplemented by the Met Office regional climate summary publication, which provides an overview for Eastern Scotland³⁰⁸ in the context of the overall UK climate.

³⁰⁷ Met Office; (2018): *HadUK-Grid gridded and regional average climate observations for the UK*. Centre for Environmental Data Analysis. Available at: <http://catalogue.ceda.ac.uk/uuid/4dc8450d889a491ebb20e724debe2dfb>

³⁰⁸ Met office, Eastern Scotland Climate Summary, Available: Met office, United Kingdom Climate Projections, 2018, Available: <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/download-data>.

Table 21.8 Historical Climate Data for the Aberdeenshire Region (1981 to 2010)

Parameter	Climate Observations
Temperature	<p>The mean annual temperature for the study area is 7.7°C, in comparison to the south of England (used for comparative purposes only) which experiences an annual mean temperature of 11°C. Within the study area itself, due to the length of the end-to-end options and as a result of the varying topography, there will likely be variances in the mean temperature experienced.</p> <p>The mean daily winter temperature is 2.3°C, with a minimum average of -0.4°C. Mean daily summer temperature is 12.8°C, with a maximum average of 17.8°C.</p>
Precipitation	<p>The area surrounding the scheme experiences on average 913 mm of rain per/annum. Rainfall is generally well distributed throughout the year, while the frequency of Atlantic depressions is ordinarily greatest during the autumn and winter, with spring and late winter being the driest periods.</p>
Wind	<p>North-East Scotland is one of the windier parts of the UK, with winds primarily associated with the UK's geographical proximity to the Atlantic Ocean and the winds generated by the Atlantic depressions, generating a predominantly south-westerly prevailing wind. The strongest winds are associated with the passage of deep areas of low pressure, with the frequency and strength of these depressions occurring between December and February. Average winter wind speed for the proposed scheme area is 5.1 knots, while comparatively the wind speed during the summer period is 3.8 knots. Figure A1.1 in Appendix A10.1 (Volume 4b) provides a wind rose for the Aberdeen Dyce meteorological station.</p>
Sunshine	<p>Sunshine is a factor of the location's altitude, latitude and distance from the coast, while topography also exerts a strong influence. The annual sunshine experienced in the study area is 1287 hours per annum, with the highest annual sunshine in Scotland experienced on the coast of Fife, with an average of 1500 hours per annum. is 1287 hours per annum, which is higher than average for Scotland (averaging approximately 1190 hours per year for the period since 1929).</p>
Ground Frost	<p>A ground frost occurs when the temperature of the ground falls below 0°C. In Eastern Scotland, the number of annual days with ground frost is 144.3. This data is deemed appropriate for this stage of the assessment. More geographically specific data will be available during DMRB Stage 3.</p>

Recent Weather Patterns and Extreme Weather Events

- 21.3.8 A Local Climate Impact Profile (LCIP) for Aberdeenshire Council was published in 2019³⁰⁹, which follows the framework from the United Kingdom Climate Impacts Programme (UKCIP). This document details the extreme weather events which have occurred in Aberdeenshire between 2011 to 2018. This profile aims to provide

³⁰⁹ Aberdeenshire Council. *Local Climate Impact Profile*. 2019

an understanding of the nature of past extreme weather events and the impacts they have had on the community, environment and economy.

21.3.9 Table 21.9 summarises the primary weather events currently affecting the region and provides a high-level overview of the impacts experienced.

Table 21.9 Local Climate Impacts Profile for Aberdeenshire Council (2011-2018)

Weather Event	Impacts
Heavy Rain/Flash floods	<ul style="list-style-type: none"> • 18 occurrences of incidents related to heavy or prolonged rainfall were identified; • These occurrences resulted in several towns flooding, road and school closures and power failure; and • These incidents resulted in health and safety concerns, and necessitated emergency rescue operations.
Snow/Frost/Ice	<ul style="list-style-type: none"> • 17 occurrences were identified of cold spells which did not overlap with those instances classed as storms; and • Incidents resulted in round-the-clock clearing of roads, travel warnings as a result of dangerous driving conditions and road closures.
Heatwave	<ul style="list-style-type: none"> • 16 dates were identified across a spectrum from where temperatures exceeded at least one record breaking day per month of unusually hot weather; • Impacts from these occurrences included increased air pollution, changes to insect activity, wildfires, health warnings and road damage and water scarcity; and • The most severe of these instances was a prolonged dry spell experienced during the summer of 2018, which resulted in half of Aberdeenshire recording in excess of half of the regions private water supplies experiencing Significant Scarcity, the highest level of reporting.
Wind/Storms	<ul style="list-style-type: none"> • 11 dates were identified, over the study timeframe, where parts of Aberdeenshire experienced strong winds often accompanied by heavy rainfall, snow and high tides; • ‘Storm Frank’, in December 2015, was the most severe storm during this period, which resulted in the declaration of a major incident which required multi-agency response and recovery; and • During this event, multiple roads were closed with widespread bridge closure and surface water flooding.

Climate Change Resilience Future Baseline

Predicted UK Wide Changes

- 21.3.10 All projections (probabilistic, global, regional and local) demonstrate an increased chance of warmer, wetter winters and hotter, drier summers in addition to an increase in the frequency and intensity of the extremes.
- 21.3.11 Under the high emissions scenario, the warming experienced in the UK by 2070 could be as high as 5.4°C warmer on average, with winters experiencing an increase of 4.2°C.
- 21.3.12 Precipitation is likely to become more seasonally polarised, with wetter winters and drier summers. Under the high emissions scenario, the precipitation increase during winter has the potential to be 35% greater than existing levels, while during summer there is a projected 47% decrease in precipitation under the high emission scenario.
- 21.3.13 Despite the expected decrease in overall precipitation volumes, projections indicate an increase in the intensity of heavy summer rainfall events.

Aberdeenshire Climate Projections

- 21.3.14 The following section presents future projected climate conditions for time periods covering construction (2010 to 2039) and operation, assuming a 60-year lifespan of the asset (2070 to 2099). These time periods have been selected, as the projected data is provided in 29-year time periods.
- 21.3.15 The UKCIP data is provided in 25km grid squares, of which the scheme intersects four. A review of all the grid squares has been undertaken, with the worst-case value used for each climate parameter from these four grid data points. Defined as the largest change from the baseline. This is outlined within Table 21.10 and in Volume 5, Figure 21.1.
- 21.3.16 In accordance with DMRB LA 114, the changes in average climate conditions were obtained from the UKCP18 high emissions scenario RCP8.5 (50% probability) 25km probabilistic projection. The baseline data has been taken from the HadUK-Grid regional average climate observations for the UK.
- 21.3.17 Table 21.10 highlights expected changes in climate conditions, such as the mean temperature and precipitation for the 2020s and 2080s. Average temperature during both winter and summer is expected to increase over the course of the scheme's operational lifespan, with the median increase in average daily temperature projected to be 2.8°C and 3.3°C (50th percentile) respectively during the 2080's.
- 21.3.18 Likewise, the maximum and minimum winter and summer temperatures are likely to increase by a broadly similar amount as those described above, with projected mean increases (50th percentile) of 2.8°C and 3.5°C respectively.
- 21.3.19 Mean precipitation in the region is expected to be significantly altered throughout the course of this century with a mean increase of 33.1% during the winter and a mean decrease of 18.8% during the summer by the 2080s. These changes are

likely to result in warmer and wetter winters and warmer and drier summers, in line with the wider trend expected for the United Kingdom as a whole.

Table 21.10 UKCP18 Climate Change Projections for Average Climate Variables for Relevant 25 km Grid Square Study Area

Parameter	Baseline (1981 to 2010)		Anomalies from Baseline for 2020s (2010 to 2039)	Anomalies from Baseline for 2080s (2070 to 2099)	Relevant 25km Grid Square
			50th Percentile	50th Percentile	
Temperature (°C) (change from baseline)	Mean winter daily temperature	2.3	0.7	2.8	362500, 812500
	Mean summer daily temperature	12.8	0.6	3.3	362500, 812500
	Mean daily winter minimum temperature	-0.4	0.6	2.8	362500, 837500
	daily summer maximum temperature	17.2	0.7	3.5	362500, 812500
Precipitation (% change from baseline)	Winter mean daily precipitation rate	2.2mm	12.1%	33.1%	387500, 812500
	Summer mean daily precipitation rate	2.4mm	0.3%	-18.8%	362500, 812500

21.3.20 Consultation with SEPA and Aberdeenshire Council confirmed that a 20% climate change allowance for rainfall should be included within the FRSA. It is acknowledged that the available guidance in DMRB HD45/09 will shortly be amended to take account of the UKCP 2018 projections, which should be used as part of the detailed modelling to be undertaken at DMRB Stage 3.

21.4 Potential Impacts

GHG Impacts

21.4.1 The potential impacts on climate, in the form of GHG emissions, are listed in Table 21.11, reproduced from DMRB LA 114.

Table 21.11 Sources and lifecycle Stages for Project GHG Emissions (Reproduced from DMRB LA 114)

Main Stage of Project Life Cycle	Sub-stage of Life Cycle	Potential Sources of GHG Emissions
Construction stage	Product stage; including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.
	Construction process stage; including transport to/from works site and construction/installation processes.	Activities for organisations conducting construction work.
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.
Operation	Use of the infrastructure by the end-user (road user)	Vehicles using road infrastructure.
	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.
	Land use and forestry.	Ongoing land use GHG emissions/sequestration each year.

Climate Change Resilience and Adaptation Impacts

21.4.2 The potential impacts upon the scheme resulting from a change in climate are similar across all the route options, given their geographical proximity. Subsequently, these are presented together as scheme-wide impacts.

Scheme-wide Impacts

- 21.4.3 Changing climate conditions and associated weather events have the potential to affect the scheme, or elements of the scheme, during construction and operation. These are referred to in this assessment as climate hazards, which are caused as a result of changing climate impacts, such as higher precipitation. Due to the geographical proximity of the six route options, it is expected that each of these route options will experience similar climate impacts and be susceptible to the same climate hazards.
- 21.4.4 During the construction of the scheme, assets may be affected by a range of hazards resulting from short term climate events, such as freezing temperatures or high precipitation. This may result in damage to construction materials, plant and other equipment; unsuitable conditions for construction activities; delay to construction programmes and associated increase in capital costs as well as health and safety impacts to the workforce during extreme weather events.
- 21.4.5 Once operational, the scheme will be impacted upon by the changing climatic conditions, resulting from more frequent severe weather events in the medium to long-term. In the longer term, these impacts will include a trend for warmer, wetter winters and warmer, drier summers, leading to an increased risk of impacts associated with high rainfall events. There is also likely to be an increase in extreme weather events, over the course of the 21st century. It should be noted, however, that the climate projections show a change to climatic parameters which are currently already experienced in parts of the United Kingdom.
- 21.4.6 Potential hazards linked to these impacts include more rapid material and asset deterioration giving rise to associated health and safety risks to users, potential risk in landslides exacerbated by variance between high and low precipitation events and soil moisture levels, and risks of flooding associated with high rainfall events. A summary of all the potential climate related impacts and hazards for all route options considered as part of this assessment are outlined in Volume 4b, Appendix A21.6 CCRA Assessment - Potential Climate Impacts, Hazards and Assessment.

21.5 Mitigation

GHG Impact Mitigation

- 21.5.1 The assessment of GHG emissions takes account of a series of embedded mitigation measures which result in a lower carbon scheme.
- 21.5.2 Strategies to reduce scheme costs (such as consideration of alignment length, and size of structures) will frequently lead to lower overall GHG emissions through both materials savings and through reduced travel distances for users.
- 21.5.3 The assessment has assumed the reuse of excavation material and topsoil within each of the route options, to minimise the need for use of virgin materials. Some route options have an excess of material from excavation, and a potential further mitigation opportunity is to transfer this to other geographical sections of the scheme. This will be evaluated at DMRB Stage 3.
- 21.5.4 A series of mitigation measures (M1 to M7) have been identified to reduce GHG emissions from the scheme. These measures include:
- M1: The sustainable reuse of soil and aggregate materials won from excavation;
 - M2: The reuse, where possible, of materials and waste generated from construction works, including reuse of excess excavation materials;
 - M3: The specification and use of materials with lower embodied carbon, such as those with higher recycled content;
 - M4: Procurement of locally produced materials where practicable, to reduce transportation emissions;
 - M5: Careful construction management to avoid over-ordering of materials, to reduce transportation emissions;
 - M6: Training of construction staff; and
 - M7: Monitoring of site impacts.
- 21.5.5 This assessment has not considered any land use measures to reduce or mitigate GHGs and this will be considered in DMRB Stage 3. In addition, other mitigation measures (such as tree planting or ecological planting) may also provide benefit through carbon sequestration during operation and will be assessed at DMRB Stage 3.
- 21.5.6 The benefits of all these mitigation measures will be evaluated more fully in DMRB Stage 3. In addition, a number of mitigation measures will also fall under the responsibility of the contractor, and these will be identified and implemented through a Construction Environmental Management Plan or equivalent.

Climate Change Resilience and Adaptation Mitigation

- 21.5.7 As part of the preparatory works for the A96 Dualling Programme, a Scheme Resilience Strategy³¹⁰ was produced in 2015 and provides a framework for the design of the A96 schemes to ensure climate resilience is considered. This strategy focuses on the recommendations of the Scottish Road Network Climate Change

³¹⁰ Transport Scotland. *A96 Dualling Preliminary Engineering Services Scheme Resilience Strategy*, 2015.

Study (2005), and the progress report to this document: Scottish Road Network Climate Change Study: UKCOP09 update (2011). These documents pay particular regard to the potential impacts caused as a result of rainfall and flooding.³¹¹

- 21.5.8 A FRSA (see Volume 4b, Appendix A20.4) has been undertaken for the scheme, which has included consideration of climate change and scheme resilience.
- 21.5.9 Several design and operational mitigation principles are detailed within the FRSA which will be developed during DMRB Stage 3:
- Structures will be used where possible to cross floodplains rather than embankments, placing the abutments outside of the functional floodplain;
 - Retaining walls have been incorporated into the outline design in certain locations to avoid encroachment into the functional floodplain. However, opportunities to develop this approach elsewhere along the Preferred Option will be explored in more detail at DMRB Stage 3;
 - SuDS basins will be provided to avoid the functional floodplain;
 - Where encroachment into the functional floodplain cannot be avoided, appropriate mitigation measures will be used to maintain floodplain conveyance and storage, for example, provision of flood relief culverts and/or like-for-like compensatory flood storage will be located as close to the area lost as possible;
 - Bridges, culverts and channel realignments will be designed as far as possible to avoid increasing flood risk to upstream and downstream receptors. Bridges and culverts will be sized to convey the 1 in 200-year return period flood event, including allowances for both climate change and freeboard;
 - Discharges from the SuDS basins to watercourses will be restricted to the equivalent of a 10-year greenfield runoff rate, for all events up to the 30-year rainfall event, as agreed with Aberdeenshire Council. SuDS should be maintained in accordance with CIRIA guidance; and
 - The drainage design (road drainage, management of runoff from the wider catchment and earthworks drainage) will consider the natural drainage catchments and existing flow pathways, replicating the existing drainage patterns and preventing the build-up of surface water runoff wherever possible.
- 21.5.10 Earthworks and land drainage will be designed to mitigate any potential hazard from landslip to the new road and to adjacent properties and land. All structural, road and geotechnical engineering will include conservative design assumptions, which will be required to consider projected climate change.
- 21.5.11 During DMRB Stage 3, if hazards are identified as part of the ongoing assessment, these will be mitigated through standard and scheme specific designs, design

³¹¹ Transport Scotland. *Scottish Road Network Landslides Study: Implementation*. 2019

measures for specific locations, appropriate materials, and maintenance and asset management procedures during the operational life.

21.5.12 The mitigation associated with each climate change hazard is described in Volume 4b, Appendix A21.6 CCRA Assessment - Potential Climate Impacts, Hazards and Assessment. A summary of the main measures is provided below:

- Health and safety procedures will be outlined within the Construction Environmental Management Plan (CEMP) to mitigate against periods of inclement weather during construction;
- On-site drainage will be specified within the CEMP;
- Risk associated with periods of dry weather, such as increased risk of soil shrinkage, will be taken into account by conservative assumptions made during design;
- Risk associated to the scheme by periods of cold weather to be incorporated within proposed maintenance regimes and to be reviewed regularly to ensure health and safety requirements are met;
- Risk associated to the scheme by periods of cold weather to operational infrastructure, will be mitigated through suitable choice of appropriate electrical equipment, with the projected temperature range taken into account within the operating parameters;
- Risk associated with an increase in rainfall and flooding will be mitigated via drainage design. The Flood Risk Assessment (FRA) for the scheme will include an appropriated allowance for climate change, agreed with SEPA and Aberdeenshire Council. An appropriate freeboard will be allowed for, over and above the water level, when setting any road level; and
- The potential impact of increased rainfall on assets, including culverts, will be mitigated via the application of design parameters which account for climate change.

21.6 Predicted Environmental Effects

GHG Assessment

21.6.1 Impacts of the scheme, through emissions of GHGs, are set out by scheme stage and main emissions source category.

21.6.2 The predicted emissions set out in this section represent those which are expected given the embedded mitigation as set out in Section 21.5. The quantifications set out in subsequent sections do not account for any further mitigation that might be introduced during subsequent design stages, and hence do not represent 'residual' emissions at this stage. The residual effects after mitigation will be assessed at DMRB Stage 3.

Construction Stage Emissions

21.6.3 The construction-stage emissions assessment considers two main elements:

- Emissions associated with the manufacture and transportation of materials, and construction of the scheme; and
- Emissions arising from the loss of land due to the construction of the scheme.

- 21.6.4 Emissions for construction of the route options (mainline and junctions excluding structures) have been calculated using Transport Scotland’s ‘Project’s Carbon Tool’ using input data derived from the route option designs.
- 21.6.5 Emissions for construction of structures have been estimated using a benchmark value as set out in Paragraph 21.2.67.
- 21.6.6 Emissions from plant energy and fuel have not been calculated at this stage as there is insufficient information to provide reliable aggregated estimates of plant type and operational profiles for construction.
- 21.6.7 Emissions arising from the loss of land to the new road construction have been estimated by categorising land uses within the study area into a shortlist of main land uses for which GHG emissions factors have been identified. Details on the land use categories are provided in Volume 4b, Appendix A21.3 Land Use Data for Each Route Option to Inform the Construction and Operational Climate Assessments.

East of Huntly to Colpy: Cyan and Red Route Options

- 21.6.8 The aggregated construction emissions for comparison between the Cyan and Red route options are shown in Table 21.12.

Table 21.12 Construction Emissions Comparison – Cyan and Red Route Options

Emissions Source	Cyan (tCO ₂ e)	Red (tCO ₂ e)
Mainline and Junctions (excluding Structures)		
Construction: materials embodied	34,482	29,781
Construction: transport of materials and wastes	13,966	19,958
Construction: waste management	1,375	2,325
Construction: waste treatment	Not assessed	Not assessed
Construction: plant energy and fuel	Not assessed	Not assessed
Structures	52,500	44,700
Land use change	23,773	27,090
Total (tCO₂e)	126,096	123,854

Colpy to Pitcaple: Pink and Brown Route Options

- 21.6.9 The aggregated construction emissions for comparison between the Pink and Brown route options are shown in Table 21.13.

Table 21.13 Construction Emissions Comparison – Pink and Brown Route Options

Emissions Source	Pink (tCO ₂ e)	Brown (tCO ₂ e)
Mainline and Junctions (excluding Structures)		
Construction: materials embodied	21,852	32,428
Construction: transport of materials and wastes	3,475	2,800

Emissions Source	Pink (tCO ₂ e)	Brown (tCO ₂ e)
Construction: waste management	575	625
Construction: waste treatment	Not assessed	Not assessed
Construction: plant energy and fuel	Not assessed	Not assessed
Structures	65,700	78,600
Land use change	15,712	20,265
Total (tCO₂e)	107,314	134,718

Pitcaple to Kintore: Violet and Orange Route Options

21.6.10 The aggregated construction emissions for comparison between the Violet and Orange route options are shown in Table 21.14.

Table 21.14 Construction Emissions Comparison – Violet and Orange Route Options

Emissions Source	Violet (tCO ₂ e)	Orange (tCO ₂ e)
Mainline and Junctions (excluding Structures)		
Construction: materials embodied	87,428	65,787
Construction: transport of materials and wastes	6,394	5,671
Construction: waste management	625	950
Construction: waste treatment	Not assessed	Not assessed
Construction: plant energy and fuel	Not assessed	Not assessed
Structures	138,300	136,500
Land use change	29,943	31,419
Total (tCO₂e)	262,744	240,327

Operational Stage Emissions

21.6.11 The assessment of operational emissions considers three main elements:

- Replacement of parts of the asset throughout its operational life across the 60-year study period;
- User carbon, representing the exhaust emissions from vehicles using the new end-to-end options; and
- Carbon sequestration opportunity loss (i.e. carbon which would have been sequestered each year by land given over to the scheme).

Maintenance and Replacement Emissions

21.6.12 Emissions for replacement of road surfaces, fencing etc. of the route options have been calculated using Transport Scotland's 'Project's Carbon Tool' using input data derived from the route options design and typical replacement periods. These emissions are estimated based on periodic replacement, and as such would not

be expected to occur in each and every operational year. To allow for comparison between route options these are presented in Table 21.15 as average annual emissions over the 60-year study period.

Table 21.15 Maintenance and Replacement Emissions for Each Route Option

Emissions	Cyan	Red	Pink	Brown	Violet	Orange
Average annual replacement emissions (tCO ₂ e)	581	498	370	428	833	671
Total 60-year replacement emissions (tCO ₂ e)	34,487	29,852	22,199	25,682	49,986	40,287

User Emissions

21.6.13 User emissions are calculated for end-to-end options, rather than for individual route options, due to the way in which the underlying traffic modelling has been carried out. The three pairs of route options allow for eight possible end-to-end options.

21.6.14 Absolute emissions for each of these end-to-end options have been presented in Chapter 10, Air Quality and are included in Table 21.16, with further detail in Volume 4b, Appendix A21.5 Vehicle Exhaust Emissions for Each End-to-End Option. These have been developed for 2030 and for 2045.

Table 21.16 2030 and 2045 User Emissions for Each End-to-End Option

End-to-End Option	Total Emissions (ktCO ₂ e) for 2030	Total Emissions (ktCO ₂ e) for 2045 ³¹²
Cyan-Pink-Violet (C-P-V)	86.3	66.5
Cyan-Pink-Orange (C-P-O)	87.2	67.5
Cyan-Brown-Violet (C-Br-V)	84.1	65.1
Cyan- Brown-Orange (C-Br-O)	88.4	66.6
Red-Pink-Violet (R-P-V)	85.6	65.7
Red-Pink-Orange (R-P-O)	86.3	67.6
Red-Brown-Violet (R-Br-V)	85.7	66.2
Red-Brown-Orange (R-Br-O)	87.7	67.3

³¹² These values include a decarbonisation trend as set out in Paragraph 21.2.39.

- 21.6.15 The emissions from each end-to-end option in 2030 are broadly similar, ranging from 84.1 ktCO₂e/year to 88.4 ktCO₂e/year.
- 21.6.16 The emissions from each end-to-end option in 2045 are also broadly similar, ranging from 65.7 ktCO₂e/year to 67.6 ktCO₂e/year.
- 21.6.17 The calculation of emissions as shown in Table 21.17 for the end-to-end options also allows for comparison with the 'Do-Minimum' scenario, and comparison in individual years, and over the 60-year study period. It should be noted that while Table 21.16 shows total CO₂ emissions in 2030 and 2045, Table 21.17 shows the net increase over baseline is lower for the year 2045 than for 2035, due to decarbonisation trends external to the project.

Table 21.17 Comparison of User Emissions against 'Do-Minimum' Scenario

End-to-End Option	2030 Do-minimum Emissions (tCO ₂ e)	2030 Net Emissions Increase (tCO ₂ e)	2045 Do-minimum Emissions (tCO ₂ e)	2045 Net Emissions Increase (tCO ₂ e)	60-year Emissions Net Increase (tCO ₂ e)
C-P-V	40,832	45,493	31,468	35,060	1,308,283
C-P-O	44,032	43,152	34,104	33,421	1,244,630
C-Br-V	38,260	45,841	29,637	35,509	1,322,299
C-Br-O	44,688	43,722	33,684	32,956	1,240,900
R-P-V	40,892	44,702	31,407	34,334	1,282,941
R-P-O	44,124	42,163	34,548	33,013	1,224,064
R-Br-V	40,359	45,289	31,205	35,018	1,304,977
R-Br-O	44,777	42,946	34,339	32,936	1,231,447

Land Use Emissions

- 21.6.18 Emissions arising from land use during operation have been estimated by assigning land use classes to areas of land impacted by construction and applying a carbon factor representing the annual sequestration for that land type, to represent the opportunity for sequestration of carbon per hectare when that land is lost.
- 21.6.19 The aggregated operational emissions for comparison between route options is shown in Table 21.18.

Table 21.18 Annual Sequestration Opportunity Loss for Each Route Option

Emissions tCO ₂ e	Cyan	Red	Pink	Brown	Violet	Orange
Average annual sequestration opportunity loss	261	297	173	222	332	344
Aggregate sequestration opportunity loss (60-year)	15,642	17,820	10,379	13,308	19,912	20,656

Assessment of Significance

Construction Impacts

- 21.6.20 The aggregated impact of the scheme will depend on the Preferred Option, as the GHG emissions vary according to which option is selected.
- 21.6.21 To assess overall impact, and the significance of emissions, the worst case has been assumed across all emissions categories for comparison against the Scottish carbon budget for 2030.
- 21.6.22 The annual Greenhouse Gas emissions target set by the Scottish Parliament for 2030 is 28,089,000 ktCO₂e.
- 21.6.23 The Scottish Government is in the process of updating the 2018 Plan to reflect the increased ambition of the targets set in the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019, which are to reach net-zero by 2045. The Act requires that the annual Greenhouse Gas emissions target is updated to reflect a 75% reduction against the national baseline.
- 21.6.24 For the Construction stage, the construction programme is assumed as lasting three years with scheme completion in 2030. The worst-case construction impacts are summarised in Table 21.19.

Table 21.19 Worst Performing Construction Emissions Comparison with Scotland Carbon Budget for 2030

Geographical Section	Worst Performing Route Option	Construction CO ₂ Emissions
East of Huntly to Colpy	Cyan	126,096 tCO ₂ e
Colpy to Pitcaple	Brown	134,718 tCO ₂ e
Pitcaple to Kintore	Violet	262,744 tCO ₂ e
Total emissions		523,558 tCO ₂ e
20% allowance for plant emissions		104,712 tCO ₂ e
Total embodied emissions		628,269 tCO ₂ e
Average per year (for three year construction)		209,423 tCO ₂ e / year
Scotland 2030 carbon target		28,089,000 tCO ₂ e
Proportion of Scotland 2030 carbon target		0.75%

- 21.6.25 The current 2030 target (from the 2018 Climate Change Plan) reflects a 64% reduction against the 1990/1995 baseline period. The Climate Change (Emissions Reductions Targets) (Scotland) Act 2019 sets a more rapid decarbonisation trajectory requiring a 75% reduction from the 1990/1995 baseline by 2030.
- 21.6.26 The value of the revised national target for 2030 will be affected by the methodology adopted by the Scottish Government, and any methodological changes to the calculation of the relevant inventory. However, a reasonable estimate for the 2030 target, based on a 75% national reduction, is approximately 19,275,000 tCO₂e. Were this to be the revised target then the Cyan-Brown-Violet

option (as set out in Table 21.19) would represent 1.09% of the national emissions target for 2030.

- 21.6.27 There is no published standard definition for assessing the significance of emissions levels. The relevant IEMA guidance notes that all emissions might be considered significant, but that it relies on professional judgement to contextualise emissions within an appropriate framework, in this case the Scotland carbon targets.
- 21.6.28 DMRB LA 114 notes that the assessment only needs to report significant effects where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets.
- 21.6.29 It is good practice in assessments of GHG impacts, and the formation of GHG inventories, to apply thresholds to the inclusion of small emissions components. Guidance for these assessments are not directly analogous to considering material impact on national targets, but does provide some guidance as follows:
- *RICS Whole life carbon assessment for the building environment* states that 1% is an appropriate maximum limit on exclusions (albeit this document takes a cost-based approach);³¹³
 - *PAS 2080 Carbon Management in Infrastructure* allows for the omission of up to 5% of energy usage and mass without compromising the integrity of the analysis of the system;³¹⁴
 - *PAS 2050 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services* sets a 'materiality threshold' of 1% to ensure that very minor sources of GHG emissions do not require the same treatment as more significant sources³¹⁵;
- 21.6.30 Assessment of the worst-case end-to-end option construction emissions for 2030 against current carbon targets indicates that emissions will fall below 1% of the national annual target for 2030. Considering that net emissions changes less than 1% can be discounted on a de minimis basis, the assessment concludes that the scheme is unlikely to compromise the ability of the Scottish Government to meet its current emissions targets.
- 21.6.31 However, should the carbon targets be reduced to a level equivalent to an approximate 75% reduction on the existing baseline then the estimated worst-case end-to-end option emissions would exceed 1% by a small proportion. This in itself does not necessarily imply that emissions are therefore significant, but does indicate that further consideration is required to determine this.
- 21.6.32 The assessment of emissions within this chapter incorporates various assumptions and stated limitations which could mean that actual emissions are higher than forecast. In addition, the assessment has also not fully quantified the potential emissions reductions that could be achieved through mitigation activities. The assessment of significance is also based on an assumption of a three-year construction programme completing in 2030. It is expected that early identification

³¹³ RCIS [Royal Institute of Chartered Surveyors], *Whole life carbon assessment for the building environment_2017*, Available: <https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf>

³¹⁴ BSI PAS 2080 Carbon Management in Infrastructure, 2016, available at <https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/>

³¹⁵ BSI PAS 2050 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services 2011, available at <http://shop.bsigroup.com/upload/shop/download/pas/pas2050.pdf> /.

of carbon saving opportunities, and effective implementation through subsequent design stages could reduce the overall construction emissions of the scheme. On this basis, the conclusion is that even with further reductions to Scottish carbon targets, be these in line with a 75% reduction against the baseline by 2030, then the scheme will still not compromise the ability of the Scottish Government to meet these hypothetical carbon targets.

- 21.6.33 On this basis, it is concluded that the emissions from the scheme are not significant.

Operational Impacts

- 21.6.34 The assessment of operational impacts is based on assessing the worst performing end-to-end option against the Scotland carbon target for 2030, as detailed in Table 21.20. The larger value of total user emissions for the worst performing end-to-end option has been used, rather than the net increase in the year over the 'Do-Minimum'.

Table 21.20 Worst Performing Operational Emissions Comparison with National Carbon Budget

Emissions Source	Worst Performing End-to-end Option	2030 CO ₂ Emissions
Maintenance and replacement (annual average)	C-Br-O	1,680 tCO ₂ e
User emissions (worst performing option for 2030)		88,410 tCO ₂ e
Land use (annual)		827 tCO ₂ e
Total worst-case annual emissions		90,917 tCO₂e
Scotland 2030 carbon target		28,089,000 tCO ₂ e
Proportion of national carbon target		0.32%

- 21.6.35 This assessment of the aggregate emissions confirms that emissions for 2030 are small compared to existing national carbon targets. Against an amended 2030 target (as discussed in Paragraph 21.6.26) these would still represent less than 1% of the national emissions target.
- 21.6.36 Future carbon targets beyond 2032 have not yet been produced for Scotland, although these are expected to be available for the DMRB Stage 3 assessment of climate change impacts. When these are available, along with the wider policy context arising from increased long-term carbon targets, a fuller appraisal of impact will be possible at DMRB Stage 3.
- 21.6.37 On the basis that the worst-case estimate for operational emissions is below 1% of the national target, it is concluded that the scheme will not have a material impact

on the ability of the Scottish Government to meet its carbon reduction targets. The GHG impact from operation of the scheme is considered not significant.

Comparison Between Route Option Pairs

21.6.38 In order to provide a comparison and conclusion of preference between route option pairs it is necessary to combine construction and operational emissions over the 60-year study period which takes into account the following:

- The emissions for the construction, maintenance, and land use have been calculated individually for each route option; and
- The emissions from vehicles have been calculated for end-to-end options.

21.6.39 In addition, to provide a comparison between individual route option pairs, it has also been necessary to calculate the life cycle emissions (over 60 years) for each end-to-end option. Total emissions for the 60-year study period for each end-to-end option are presented in Table 21.21.

Table 21.21 60-Year Emissions for Each End-to-End Option

End-to-End Option	Construction Emissions	Replacement and Land Use	User Emissions	Total 60-year Emissions
C-P-V	496,154	152,964	1,308,283	1,957,401
C-P-O	473,737	144,009	1,224,064	1,862,376
C-Br-V	523,558	159,376	1,322,299	2,005,233
C-Br-O	501,141	150,422	1,240,293	1,892,463
R-P-V	493,912	150,148	1,282,941	1,927,001
R-P-O	471,495	141,193	1,224,064	1,836,752
R-Br-V	521,316	156,560	1,304,977	1,982,853
R-Br-O	498,899	147,605	1,231,447	1,877,951

21.6.40 Following the calculation of all end-to-end option life cycle emissions, the combinations of route options can be compared to identify which end-to-end option

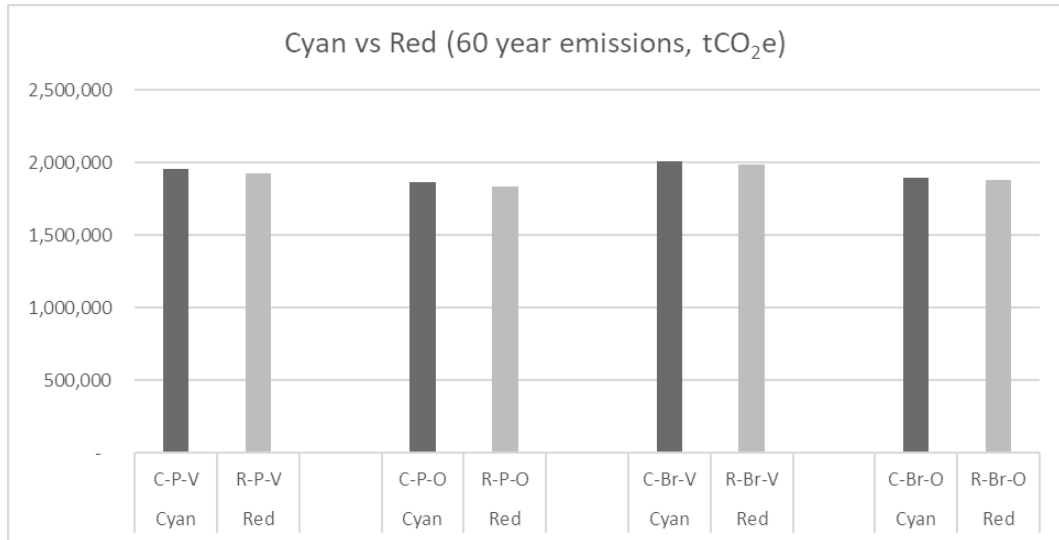
containing each route option pairs (i.e. Red versus Cyan, Pink versus Brown and Violet versus Orange) achieves the lower emissions.

21.6.41 The following sections provide this comparison for each of the route option pairs.

Cyan vs Red Route Options

21.6.42 The comparison of the end-to end options containing either the Cyan or the Red route options is shown in Figure 21.2 with the Red route option resulting in lower aggregated emissions across the 60-year study period.

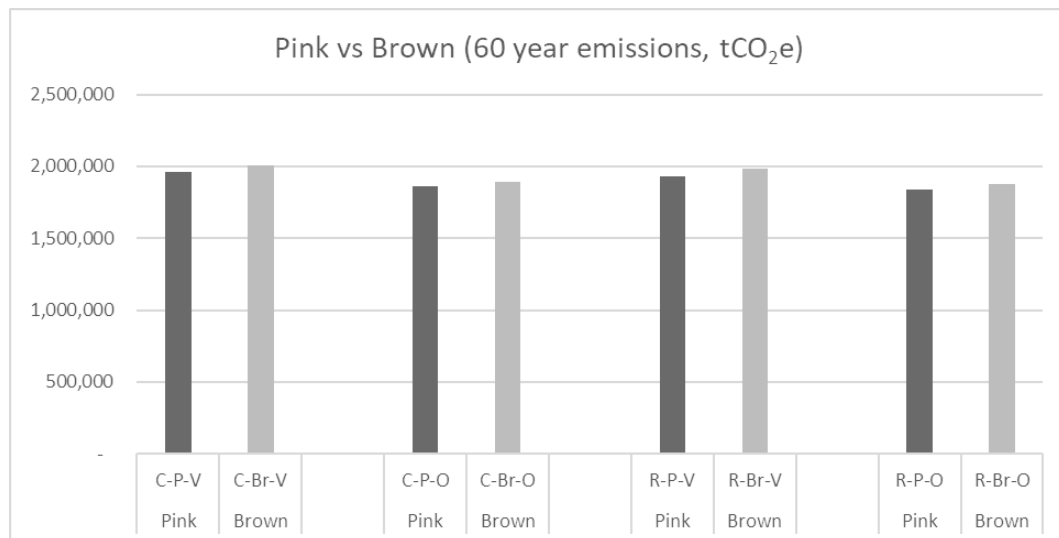
Figure 21.2 Comparison of Cyan and Red Route Options



Pink vs Brown Route Options

21.6.43 The comparison of the end-to end options containing either the Pink or the Brown route options is shown in Figure 21.3 with the Pink route option resulting in lower aggregated emissions across the 60-year study period.

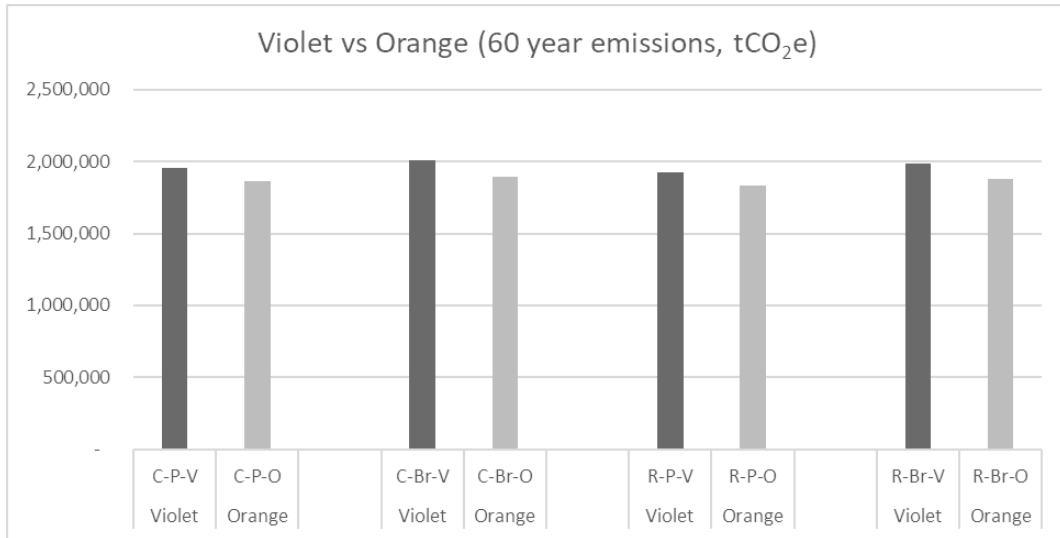
Figure 21.3 Comparison of Pink and Brown Route Options



Violet vs Orange Route Options

21.6.44 The comparison of the end-to end options containing either the Violet or the Orange route options is shown in Figure 21.4 with the Orange route option resulting in lower aggregated emissions across the 60-year study period.

Figure 21.4 Comparison of Violet and Orange Route Options



Benchmarking GHG emissions with other Road Schemes

21.6.45 DMRB LA 114 requires that benchmarking of the scheme is carried out by considering and comparing emissions from other comparable road schemes. A comparison with other road schemes has been carried out³¹⁶ by comparing overall emissions, and normalised emissions (per lane.km) with other schemes for which comparable publicly available information can be found. There are currently no other comparable road schemes in Scotland on which embodied emissions have been measured. This is based on construction emissions only.

21.6.46 Table 21.22 provides a comparison of the worst performing end-to-end option (for construction emissions only) on this scheme against other UK road schemes.

Table 21.22 Comparison of Construction Emissions for Worst Performing End-to-End Option with Other Road Schemes

Road Scheme	Approx. Lane kms	Embodied Emissions tCO ₂ e (including 10% contingency)	Embodied tCO ₂ e / lane.km
C-Br-V option	168	670,000*	3,988
A14 Cambridge to Huntingdon	204	740,000	3,627

³¹⁶ <http://assets.highwaysengland.co.uk/roads/road-projects/M2+Junction+5/Environmental/Volume+1+Environmental+Statement+Main+Text.pdf>

Road Scheme	Approx. Lane kms	Embodied Emissions tCO ₂ e (including 10% contingency)	Embodied tCO ₂ e / lane.km
M4 New Relief Road	138	522,600	3,787

* This value includes an additional allowance of 20% construction plant energy based on the embodied materials and structures-related CO₂ emissions (Refer to Table 21.19).

21.6.47 The initial benchmarking with other road schemes indicates that the normalised emissions per lane.km are high, compared with other schemes. There are several reasons why this could be as follows:

- The difference could be due to the physical parameters of this scheme being significantly different to others - e.g. due to landscape and topography considerations;
- The scope of the comparison projects may not align with the new DMRB LA 114 guidance, and they may not include all emissions sources included in this chapter assessment;
- This DMRB Stage 2 assessment includes a number of assumptions (refer to Section 21.2) and a conservative approach has been taken to allow the assessment of a reasonable worst case. As these assumptions are clarified then the overall footprint of the assessed emissions would be expected to reduce; and
- Other comparator schemes may include mitigation measures that have not been included in the DMRB Stage 2 assessment for this scheme.

21.6.48 Additionally, the value in the benchmarking exercise is not just comparative, but also to allow a review in subsequent design stages, to demonstrate how the overall impact of the scheme has been mitigated. The benchmarking exercise will be repeated at DMRB Stage 3 to reflect the emerging design.

Climate Change Resilience and Adaptation

21.6.49 The potential climate impacts are described in Section 21.4 of this chapter. Due to the accuracy of the available projected data, and the geographical proximity of the route options, these impacts are determined as being the same across all the route options.

21.6.50 An assessment of significance has been undertaken through a Climate Risk Assessment, as described in Section 21.2 of this chapter. The assessment identifies the climate hazards and risks associated with each impact, the likelihood and consequence of the risk occurring and from these components determines a significance.

21.6.51 Each risk was considered in relation to each of the route options, considering the location and alignment of each route option. Following the assessment, it was determined that none of the risks identified are classified as significant. The full assessment table can be found in Volume 4b, Appendix A21.6 CCRA Assessment - Potential Climate Impacts, Hazards and Assessment.

21.6.52 It should be noted that no specific mitigation measures have been presented for climate resilience impacts and risks, and the assessment has been undertaken based on the existing and known embedded mitigation measures.

- 21.6.53 Despite the climate resilience risks being non-significant, it is possible to consider the geographic differences between the route options and how the climate impacts identified would affect each route option. This exercise is provided below, comparing route options within each geographic section.

East of Huntly to Colpy: Cyan and Red Route Options

- 21.6.54 The Cyan route option follows the route of the existing A96 through the Glens of Foudland and requires a number of bridges and underpasses for both the new and existing A96 around Glen Water and its tributaries. There is a risk of pluvial flooding associated with the runoff from the adjacent Hills of Foudland and Skares, which would require further consideration were this route option to be taken forward.
- 21.6.55 The Red route option follows high ground between the Hill of Foudland and the Hill of Skares. The Red route option is located at a higher elevation within the catchment of various watercourses, where the risk of flooding is low, however, the route option is at risk of pluvial flooding from overland flow as it passes the Hill of Foudland.
- 21.6.56 Further information on the flood risk for both the Cyan and Red route options is provided in the FRSA, which can be found in Volume 4b, Appendix A20.4.
- 21.6.57 Both route options are similar in terms of their risk from impacts from climate change, and would experience exposure to high wind speeds, snow and ice. The Red route option is aligned through a higher and more exposed landscape and, therefore, would be more likely to experience these exposed conditions on a more regular basis.

Colpy to Pitcaple: Pink and Brown Route Options

- 21.6.58 Both route options between Colpy and Pitcaple are partly located in or are in close proximity to flood plains and cross watercourses including the River Urie, the Bonnyton Burn, The Shevock, The Kellock and the Burn of Durno. The topography in this area is gently undulating, with no large water catchment expected to shed large runoff volumes towards the route options. Subsequently, the risk of flooding is reduced for both route options. Further information on the flood risk for both the Pink and Brown route options is provided in the FRSA, which can be found in Volume 4b, Appendix A20.4.
- 21.6.59 The elevation of both route options is similar, with the Pink route option following higher ground than the Brown route option. Both the Pink and Brown route options are subject to wind conditions which are comparable with the existing A96 and A920 in this area.
- 21.6.60 Both the Pink and Brown route options are similar in terms of their potential risk from impacts associated with climate change. They will both experience similar climate change impacts, and both are located within similar geographies.

Pitcaple to Kintore: Violet and Orange Route Options

- 21.6.61 The Violet route option crosses over or near to a number of watercourses, in particular, Ides Burn, Lochter Burn, with a long bridge crossing over the floodplain of the River Don. In addition, there are a number of crossings and diversions of minor tributaries of the named watercourses.
- 21.6.62 The Orange route option crosses over or near to a number of watercourses, specifically the Strathnaterick Burn, River Urie, River Don, and watercourses

connected to Pitscurry Moss. The crossing of the River Urie at Pitcaple is significant, requiring a long crossing over the river and open floodplain.

- 21.6.63 Sections of both the Orange and Violet route options pass through undulating topography to the east and west of Inverurie, and there is potential for overland run-off during periods of extended precipitation or from snow melt from the adjacent areas onto both route options.
- 21.6.64 Further information on the flood risk can be found in the FRSA, in Volume 4b, Appendix A20.4. This includes the findings of the flood modelling which has been undertaken for the Violet route option crossing of the River Don and the Orange route options crossing of the River Urie at Pitcaple.
- 21.6.65 Both the Violet and Orange route options are similar in terms of their potential risk from impacts associated with climate change. They will both experience similar climate change impacts, and both are located within similar geographies.

21.7 Cumulative Effects

GHG Emissions - GHG Climate Change Resilience and Adaptation

- 21.7.1 Cumulative effects are those generated by multiple projects acting on one of more receptors. The Climate Change Resilience assessment is concerned with the impact of climate change on the scheme itself, subsequently a cumulative assessment is not appropriate.
- 21.7.2 As described in Table 21.18 of this chapter, an in-combination climate assessment will be carried out within the specific topic chapters, with climate change data provided at DMRB Stage 3.

21.8 Summary of Effects

GHG Emissions Residual Effects

Construction

- 21.8.1 All route options result in the generation of GHG emissions from construction processes. Construction emissions for each route option are summarised in Table 21.23.

Table 21.23 Construction GHG Emissions for Each Route Option³¹⁷

Emissions tCO ₂ e	Cyan	Red	Pink	Brown	Violet	Orange
Construction: Materials Embodied	34,482	29,781	21,852	32,428	87,428	65,787
Construction: transport of materials and wastes	13,966	19,958	3,475	2,800	6,394	5,671

³¹⁷ Figures for construction material, transport, and waste management are taken directly from the Transport Scotland carbon tool which calculates emissions based on material quantities, transport distances etc. Due to the calculation process this produces a value that indicates the calculated emissions to a level of detail that is beyond the actual accuracy of the calculation as a whole. However, it has been decided to provide these values in detail to ensure consistency with calculator tool outputs.

Emissions tCO ₂ e	Cyan	Red	Pink	Brown	Violet	Orange
Construction: waste management	1,375	2,325	575	625	625	950
Structures	52,500	44,700	65,700	78,600	138,300	136,500
Land use change	23,773	27,090	15,712	20,265	29,943	31,419
Total	126,096	123,854	107,314	134,718	262,744	240,327

21.8.2 The aggregated emissions for each combination of route options is developed by summing the total emissions for each of the three:

- The end-to-end option with the greatest construction emissions is Cyan-Brown-Violet option, totalling 523,558 tCO₂; and
- The end-to-end option with the smallest construction emissions is Red-Pink-Orange option, totalling 471,495 tCO₂.

21.8.3 The assessment has considered the aggregated construction emissions for a single year (2030) against the relevant Scottish carbon target in Paragraph 21.6.20 onwards. This concludes that the emissions are considered not significant in that they do not compromise the ability of Scotland to meet its carbon targets.

Operation

21.8.4 The opening year of 2030 has been used for the assessment of operational emissions (which includes emissions from vehicles, maintenance and replacement emissions, and land use emissions) and existing carbon targets for Scotland extend up to 2032 at present, although these are currently under review.

21.8.5 The assessment of operational emissions is set out in Paragraph 21.6.34 onwards and considers the worst performing route option across each emissions category and compares these to the Scottish annual carbon target for 2030 as shown in Table 21.24.

Table 21.24 Worst Performing Operational Emissions Comparison with National Carbon Budget

Emissions Source	Worst Performing End-to-end Option	2030 CO ₂ Emissions
Maintenance and replacement (annual average)	C-Br-O	1,680 tCO ₂ e
User emissions (worst performing option for 2030)		88,410 tCO ₂ e
Land use (annual)		827 tCO ₂ e
Total worst-case annual emissions		90,917 ktCO₂e
Scotland 2030 carbon target		28,089,000 tCO ₂ e
Proportion of national carbon target		0.32%

21.8.6 The assessment concludes that operational emissions represent less than 1% of the annual carbon target for 2030. These emissions are considered not significant and do not compromise the ability of Scotland to meet its carbon targets.

Whole life assessment

- 21.8.7 An assessment of emissions from each route option, and from each end-to-end option, across the 60-year study period (Table 21.21 60-Year Emissions for Each End-to-End Option) concludes that the lowest aggregated emissions arise from the Red-Pink-Orange option.

Climate Change Resilience and Adaptation**Construction**

- 21.8.8 Climate change impacts on the scheme during the construction phase have been assessed and are found to be not significant. This is due to the duration and nature of construction activities, when it is anticipated that all potential impacts and hazards can be managed by applying appropriate design standards and construction site management practices. The details of these measures and the significance assessment are contained in Volume 4b, Appendix A21.6 CCRA - Potential Climate Impacts, Hazards and Assessment.

Operation

- 21.8.9 Climate change impacts on the A96 infrastructure assets designed and constructed as part of the scheme have been assessed during operation. All climate change risks are found to be not significant as a result of the mitigation measures built into the design, by ensuring the application of the relevant standards and scheme specific specifications, the application of appropriate management practices and the assumed projected change to climate parameters. Details of these mitigation measures and the significance assessment are contained in Volume 4b, Appendix A21.6 CCRA Assessment - Potential Climate Impacts, Hazards and Assessment.
- 21.8.10 The A96 trunk road provides an important strategic transport link for the north of Scotland and is a part of the strategic road network. The scheme is expected to increase the resilience of transport systems in the region to a range of hazards, including climatic hazards arising from climate change and hence provide benefit for the overall resilience of the region.

21.9 Scope of DMRB Stage 3 Assessment

- 21.9.1 Following the selection of the Preferred Option, the DMRB Stage 3 Assessment for Climate Change will be undertaken in accordance with DMRB LA 114 Climate.

GHG Assessment

- 21.9.2 A more detailed assessment of the Preferred Option will be carried out which will address data gaps in the DMRB Stage 2 assessment.
- 21.9.3 A more detailed understanding of likely sources for materials will be developed to inform the construction GHG assessment.
- 21.9.4 The benefits and impacts arising from the reuse of material between geographical sections will be quantified and assessed.
- 21.9.5 Maintenance impacts for the existing A96 and the Preferred Option will be developed.

- 21.9.6 Estimates for plant energy will be developed to allow the calculation of construction plant emissions, and the impact of any potential mitigation.

Climate Change Resilience

- 21.9.7 A risk assessment of the Preferred Option will be undertaken to determine route specific risks in more detail and develop appropriate mitigation where necessary.
- 21.9.8 H++ climate scenarios (Typically extreme climate change scenarios such as: heat waves, cold snaps, low and high rainfall, droughts, floods and windstorms) will be used to test the sensitivity of vulnerable safety critical features.
- 21.9.9 An Expert Team on Climate Change Detection and Indices (ETCCDI) parameters for extreme weather will be used to provide additional context to the assessment.

22 Human Health

22.1 Introduction

- 22.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment of the predicted effects on human health. For the purpose of this assessment, human health is defined as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.’³¹⁸
- 22.1.2 An appraisal of the likely health effects of the route options has been undertaken in accordance with DMRB LA 112 Population and Human Health, Revision 1 released in January 2020 (hereafter referred to as the ‘New Guidance’). However, it should be noted that this is a new DMRB Volume 11 environmental assessment topic which combines the former DMRB Volume 11 topics: Section 3, Part 6 (Land), Volume 11, Section 3, Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and Volume 11, Section 3, Part 9 (Vehicle Travellers). The new topic assesses both ‘Land use and accessibility’ and ‘Human health’. For this DMRB Stage 2 assessment, the land-use and accessibility elements are reported in Chapter 12 of this report (People and Communities) and the human health element is reported in this chapter.
- 22.1.3 In addition to the DMRB LA 112 guidance, the following guidance documents have been taken into account:
- Health in Environmental Impact Assessment - A Primer for a Proportionate Approach. Institute of Environmental Management and Assessment (IEMA), 2017
 - Health Impact Assessment Guidance for Practitioners, Scottish Health and Inequality Impact Assessment Network (SHIAN), 2016
- 22.1.4 This appraisal is in line with the wider requirements and advice provided in:
- DMRB LA 101 Introduction to environmental assessment;
 - DMRB LA 102 Screening projects for Environmental Impact Assessment (EIA);
 - DMRB LA 103 Scoping projects for environmental assessment; and
 - DMRB LA 104 Environmental assessment and monitoring.
- 22.1.5 This appraisal considers the likely effects of the route options on health outcomes at population level. In line with the New Guidance, the following health determinants are considered:
1. Environmental conditions relevant to human health, including:
 - a) Ambient air quality and Air Quality Management Areas (AQMA);
 - b) Ambient noise and areas sensitive to noise (e.g. noise important areas (NIA), noise management areas (NMA));

³¹⁸ World Health Organisation. Constitution, Geneva, 1946. Available at: http://www.who.int/governance/eb/who_constitution_en.pdf

- c) Sources of pollution (e.g. light, odour, contamination etc.); and
- d) Landscape amenity.

2. Severance / accessibility and the ability of communities to access community land, assets and employment.

22.1.6 Relevant DMRB guidance notes that changes in accessibility / severance for communities that can influence human health outcomes include (but are not limited to):

- Reduced or increased access to open greenspace/ recreational facilities;
- Reduced or increased opportunities for walkers, cyclists and horse-riders (WCH); and
- Reduced or increased opportunities for accessing healthcare facilities.

22.1.7 This chapter is supported by the following figures (Volume 5) and appendices (Volume 4b):

- Figure 22.1: Human Health Relevant Intermediate Zones Overview
- Figure 22.2: Human Health Relevant Data Zones Overview
- Figure 22.3: Human Health Key Receptors Cyan Route Option
- Figure 22.4: Human Health Key Receptors Red Route Option
- Figure 22.5: Human Health Key Receptors Pink Route Option
- Figure 22.6: Human Health Key Receptors Brown Route Option
- Figure 22.7: Human Health Key Receptors Violet Route Option
- Figure 22.8: Human Health Key Receptors Orange Route Option
- Figure 22.9: Human Health Key Receptors and Zones - Huntly
- Figure 22.10: Human Health Key Receptors and Zones - Inverurie
- Appendix A22.1: Scottish Index of Multiple Deprivation Data Zones and Route Options
- Appendix A22.2: Scottish Public Health Observatory (2020) Data
- Appendix A22.3: Scottish Index of Multiple Deprivation (2020) Lowest Ranking Data Zones in the Study Area
- Appendix A22.4: Scottish Index of Multiple Deprivation – Rankings by Data Zones
- Appendix A22.5: Analysis of Scottish Index of Multiple Deprivation Data
- Appendix A22.6: Health Evidence Literature Review

Policy Context

22.1.8 In February 2020, Transport Scotland published a National Transport Strategy (NTS2) for 2020 to 2040³¹⁹. The NTS2 sets out the Scottish Government's vision for transport for the next 20 years. It is supported by four interconnected priorities that will help deliver the vision:

- reduce inequalities;
- take climate action;
- help deliver inclusive economic growth; and
- improve health and well-being.

22.1.9 To help deliver these four priorities, Transport Scotland outlines a series of policies. The most relevant priorities to this assessment of effects on human health are set out in Table 22.1.

Table 22.1 Vision for Transport

Priority	Policy
Reduce Inequalities	Minimise the connectivity and cost disadvantages faced by island communities and those in rural and remote rural areas, including safeguarding of lifeline services
	Ensure transport in Scotland is accessible for all by supporting the implementation and development of Scotland's Accessible Travel Framework
	Remove barriers to public transport connectivity and accessibility within Scotland
	Improve sustainable access to healthcare facilities for staff, patients and visitors
	Ensure sustainable public and active travel access to employment, education and training locations
Improve our health and well-being	Reduce the negative impacts which transport has on safety, health and well-being of people
	Provide a transport system that promotes and facilitates active travel choices which help to improve people's health and well-being across mainland Scotland and the islands

22.1.10 This assessment relates to those policies highlighted above. It assesses the issue of accessibility and barriers to access to key services, community facilities, employment and healthcare facilities. It also assesses the potential negative effects of transport on health with regard to air quality and noise impacts and impacts on landscape amenity. The assessment of the route options does not directly assess their potential impacts on the NTS2 but recognises the connection between the priorities set out in the strategy and the aspects assessed within this chapter.

³¹⁹ Transport Scotland. National Transport Strategy for 2020 to 2040:
<https://www.transport.gov.scot/media/47052/national-transport-strategy.pdf>

22.2 Approach to Assessment

Introduction

- 22.2.1 The following section provides an overview of the methodology for identifying potential effects on human health during the DMRB Stage 2 assessment. This methodology is based on the New Guidance and other guidance documents listed in Section 22.1.
- 22.2.2 In accordance with the guidance referred to in Section 22.1, the following principles and definitions apply to the appraisal of health effects in this chapter:
- The approach is based on the 'wider determinants of health' model³²⁰, which states that, in addition to individual physiological factors, health is determined by social, economic and environmental factors;
 - The appraisal considers potential effects on population health, rather than the health of individuals; and
 - The appraisal considers the potential for avoidable and unfair differences in health status between groups of people or communities, or health inequalities.
- 22.2.3 At this stage in the design and assessment process, the likely nature, location and scale of the construction activities (e.g. location of construction compounds) is not known. The predicted effects reported in this chapter therefore focus on the permanent effects of the route options and not construction.

Sources of Information

- 22.2.4 In accordance with the New Guidance, the following process has been used to develop the health baseline:
- Data collection;
 - Spatial data mapping (including mapping of community facilities); and
 - Consultation with NHS Grampian.
- 22.2.5 The health baseline has been developed using the following sources:
- Scottish Census (2011)³²¹;
 - Scotland's Annual Population Survey (2019),³²²
 - Scottish Public Health Observatory (ScotPHO) (2020)³²³; and
 - Scottish Index of Multiple Deprivation (SIMD) (2020)³²⁴.

³²⁰ IEMA (2017) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach. Institute of Environmental Management and Assessment (IEMA)

³²¹ Scotland's Census (2020). Scottish Census (2011). Available here: <https://www.scotlandscensus.gov.uk/ods-web/area.html>.

³²² Scottish Government (2020). Scottish Annual Population Survey: results for year to December 2019. Available here: <https://www.gov.scot/publications/annual-population-survey-results-for-year-to-31-december-2019/>

³²³ The Scottish Public Health Observatory (2020). ScotPHO Profiles. Available here: <https://www.scotlandscensus.gov.uk/ods-web/area.html>.

³²⁴ Scottish Index of Multiple Deprivation (2020). Interactive Mapping. Available here: <https://simd.scot/#/simd2020/BTTTTFTT/9/-4.0000/55.9000/>

Consultation

- 22.2.6 AmeyArup met with Environmental Health Officers from Aberdeenshire Council and Aberdeen City Council in May 2019 to discuss baseline conditions and the proposed approach for DMRB Stage 2, with regard to Air Quality and Noise and Vibration. This approach was accepted with no concerns. AmeyArup confirmed that further liaison will be undertaken as required and at commencement of the DMRB Stage 3 process.
- 22.2.7 In addition to consultation relating to Air Quality and Noise and Vibration, consultation was undertaken in relation to the People and Communities assessment. This consisted of an initial information request on the location of, and any other information on, WCH routes and community land/facilities within the study area and a record of consultations has been made. In some circumstances, consultation responses were followed up with meetings to gain more information including meetings with Aberdeenshire Council, Aberdeen City Council and Nestrans.
- 22.2.8 To ensure a comprehensive consultation exercise, AmeyArup approached NHS Grampian to inform them of the proposed assessment approach undertaken. At the time of writing this report, no response has been received.
- 22.2.9 The information obtained from consultation has been used to:
- understand the existing site conditions within the study area;
 - establish key issues and identify potential impacts to be considered in the assessments;
 - inform the scope of the assessments and reporting; and
 - inform the design and the development of mitigation.

Scoping

- 22.2.10 Table 22.2 provides an overview of the human health determinants taken into account and their relevance to this assessment, and see also Appendix A22.6: Health Evidence Literature Review.

Table 22.2 Scope of Assessment

Human Health Determinant	In scope? (Y/N)	Rationale
Environmental conditions		
Ambient air quality and air quality management zones	Y	<p>Potential changes in exposure to road traffic emissions affecting community resources and/or overall population.</p> <p>Evidence on the links between road traffic emissions and health is well established, based on numerous research studies. The main health damaging pollutants released as emissions from road traffic are PM₁₀ and nitrogen dioxide. It is generally accepted that particles greater than 10µm in diameter (PM₁₀) do not penetrate the lungs to cause respiratory health problems. However, dust can cause eye, nose and throat irritation and lead to deposition on cars, windows and property³²⁵.</p> <p>Populations thought particularly vulnerable to the effects of PM₁₀ are those with pre-existing lung or heart disease, the elderly and children^{326, 327}.</p>
Ambient noise and areas sensitive to noise (e.g. noise important areas (NIA), noise management areas (NMA))	Y	<p>Potential changes in exposure to road traffic noise affecting community resources and/or overall population.</p> <p>According to the World Health Organization (WHO), 'in some situations noise may adversely affect the health and wellbeing of individuals or populations'. The WHO recognises the health linkages between environmental noise and annoyance, sleep disturbance and physiological responses such as cardiovascular disease. There are a wide range of non-auditory health effects that may be associated with exposure to environmental noise. In the everyday environment, the response of an individual to noise is more likely to be behavioural or psychological (i.e. non-auditory) than physiological.</p> <p>The WHO suggests that some people may be less able to cope with the impacts of noise exposure and be at greater risk of harmful effects, including the elderly, the physically ill, those with existing mental illness, people with hearing impairment, and young children.</p>

³²⁵ The control of dust and emissions from construction and demolition Best Practice Guidance, Greater London Authority (2006)

³²⁶ World Health Organization. (2013). Health effects of particulate matter. Denmark: World Health Organization Europe.

³²⁷ Defra, Netcen, Department for Communities and Local Government, National Statistics. (2006). Air Quality and Social Deprivation in the UK: an environmental inequalities analysis (AEAT/ENV/R.2170). London: Defra.

Human Health Determinant	In scope? (Y/N)	Rationale
		Families with lower income tend to have lower mobility but greater exposure to adverse environmental conditions related to noise pollution ³²⁸ .
Sources of pollution: light	Y	Potential impacts on residential properties from lighting at junctions. The effects of junction lighting are included within the overall description of visual effects and discussed below in landscape amenity.
Sources of pollution: odour	N	No potential odour impacts identified.
Sources of pollution: contamination	N	<p>Potential impacts identified and mitigated against for human health from ground and water contamination. This will be a legal requirement. It is assumed that the project will comply with control measures required by the Scottish Environment Protection Agency, Scottish Water, Aberdeenshire Council and relevant health and safety standards.</p> <p>Risks to human health from contaminated land have been assessed within Chapter 19, Geology, Soils, Contaminated Land.</p>
Landscape amenity	Y	<p>Potential changes to visual amenity of residential areas, open green space, Non-motorised User routes (NMUs) and other resources.</p> <p>A literature review by Abraham et al in 2010 of over 120 studies³²⁹ identified a set of pathways that link landscape and health. The study found that:</p> <p><i>'Landscapes have the potential to promote mental well-being through attention restoration, stress reduction, and the evocation of positive emotions; physical well-being through the promotion of physical activity in daily life as well as leisure time and through walkable environments; and social well-being through social integration, social engagement and participation, and through social support and security.'</i></p>

³²⁸ World Health Organization. (2011). Burden of Disease from Environmental Noise. Geneva, Switzerland: World Health Organization Europe.

³²⁹ Abraham, A., Sommerhalder, K. and Abel, T. (2010), Landscape and well-being: a scoping study on the health-promoting impact of outdoor environments, International Journal of Public Health

Severance / accessibility		
Changes in accessibility and the ability of communities to access community land and assets	Y	<p>Potential changes in journey times associated with the new road and changes to traffic flows on the existing A96.</p> <p>Potential direct/indirect impacts on community land and assets.</p> <p>Research has suggested that 'access to local shops, post offices, places of entertainment and community activity all contribute to well-being'³³⁰. Results from a 2010/11 poll showed that 5% of adults in Great Britain feel 'isolated' as a result of difficulty in accessing local shops and services³³¹.</p>
Changes in accessibility and the ability of communities to access employment	Y	<p>Potential changes in journey times associated with the new road and changes to traffic flows on the existing A96.</p> <p>The Marmot Review (2010)³³² identified the importance of work for health: '<i>being in good employment is protective of health. Conversely, unemployment contributes to poor health</i>'.</p> <p>Employment is related to social and psychological wellbeing; a study commissioned by the Department of Work and Pensions³³³ found that '<i>work meets important psychosocial needs in societies where employment is the norm</i>' and that '<i>work is central to individual identity, social roles and social status</i>'.</p>
Reduced or increased access to open green space/recreational facilities	Y	<p>Potential changes in journey times associated with the new road and changes to traffic flows on the existing A96.</p> <p>A recent literature review of peer reviewed papers undertaken by the Forestry Commission³³⁴ has found evidence that proximity, size and amount of green space available to people in urban environments influences physical and mental health outcomes. The review identifies the key health benefits of green space as:</p> <ul style="list-style-type: none"> • 'Long and short term physical benefits associated with obesity, life expectancy, heart rate and blood pressure;

³³⁰ Harding, T., 1997, A Life Worth Living: the Independence and Inclusion of Older People, London: Help the Aged, cited in Randall, C., 2012, Measuring National Well-being – Where we Live, 2012, Office for National Statistics

³³¹ Randall, C., 2012, Measuring National Well-being - Where we Live – 2012, Office for National Statistics

³³² Marmot, M., Allen, J., Goldblatt, P., Boyce, T., McNeish D., Grady, M. and Geddes, I., 2010, Fair society, healthy lives: Strategic review of health

³³³ Waddell, G., Burton, A. K., 2007, Is work good for your health and well-being?, The Stationery Office

³³⁴ O'Brien, L., Williams, K., Stewart, A., 2010, Urban health and health inequalities and the role of urban forestry in Britain: A review, The Research Agency of the Forest Commission

Severance / accessibility		
		<ul style="list-style-type: none"> • Attention and cognitive benefits associated with restoration, mood and self-esteem; • Physical activity benefits associated with the use of greenspace; • Self-reported benefits in terms of health and life satisfaction; and • Community cohesion benefits through social contact fostered by greenspace’. <p>A literature review by Greenspace Scotland³³⁵ identified links to mental health, stating that ‘studies consistently show a relationship between levels of stress and access to urban green spaces’ and identified ‘activity and exercise, natural daylight, stimulation of the senses and aesthetic experience’ as potential factors in reducing stress.</p>
Reduced or increased opportunities for walkers, cyclists and horse riders.	Y	<p>Potential changes in journey times associated with the new road and changes to traffic flows on the existing A96.</p> <p>Active travel applies to modes of transport that require physical activity (i.e. cycling and walking), in contrast to modes that require little physical effort such as motor vehicles. It is therefore the physical activity associated with active travel that brings about health effects.</p> <p>The positive effects of physical activity on physical health was summarised in the Department of Health’s 2011 report³³⁶ which suggests that:</p> <p><i>‘Regular physical activity can reduce the risk of many chronic conditions including coronary heart disease, stroke, type 2 diabetes, cancer, obesity, mental health problems and musculoskeletal conditions. Even relatively small increases in physical activity are associated with some protection against chronic diseases and an improved quality of life.’</i></p>

³³⁵ Croucher, K., Myers, L., and Bretherton, J., 2007, The links between greenspace and health: a critical literature review, Greenspace Scotland

³³⁶ CMO (2011) Start Active, Stay Active: A report on physical activity from the four home countries’ Chief Medical Officers, Department of Health, Physical Activity, Health Improvement and Protection.

Severance / accessibility		
Reduced or increased opportunities for accessing healthcare facilities.	Y	<p>Potential changes in journey times associated with the new road and changes to traffic flows on the existing A96.</p> <p>Access to health facilities has a direct positive effect on health³³⁷. Access to healthcare is important for communities as healthcare offers information, screening, prevention and treatments. Restricted access to healthcare prevents patients gaining necessary treatments and information.</p> <p>Access to healthcare services is affected by transport modes, availability of financial support for those on low incomes and the location of healthcare services. Groups impacted by disability, long-term illnesses and older people are more dependent on health and social care services³³⁸, and are therefore more vulnerable if access to health and social care services becomes restricted. According to the Department for Transport, 'over the course of a year over 1.4 million people miss, turn down or simply choose not to seek healthcare because of transport problems'³³⁹.</p>

Assessment Methodology: Introduction

22.2.11 The assessment identifies likely effects on the health and well-being of the population in areas where impacts on health determinants will occur as a result of the route options. This considers the following elements:

- impact on health determinant, referred to as 'criteria' (e.g. noise, air quality or access to open green space);
- sensitivity of the population, based on the size of the population exposed and characteristics, or vulnerability, of the community affected by the change;
- likelihood of changes in population health and well-being resulting from the change; and
- the significance of the potential effects on health.

22.2.12 Health outcomes have been identified in accordance with the following categories set out in the New Guidance:

- Positive: A beneficial health impact is identified;
- Neutral: No discernible health impact is identified;
- Negative: An adverse health impact is identified; and

³³⁷ HUDU. (2013). Planning for Health. Rapid Health Impact Assessment Tool. London: National Health Service, London Healthy Urban Development Unit.

³³⁸ Harner, L. (2004). Improving patient access to health services: a national review and case studies of current approaches. Health Development Agency.

³³⁹ Social Exclusion Unit, 2003, Making the Connections: Final Report on Transport and Social Exclusion

- Uncertain: Where uncertainty exists as to the overall health impact.

22.2.13 The New Guidance identifies a mitigation hierarchy to be applied where effects on health outcomes are identified. This prioritises avoidance and prevention of impacts, followed by reduction and lastly mitigation. Mitigation is considered in Section 22.5 of this chapter.

22.2.14 The following paragraphs provide an overview of how receptor sensitivity, magnitude of effects and significance are established.

Assessment Methodology: Sensitivity

22.2.15 The New Guidance includes assessment criteria for defining the sensitivity of receptors to changes in health determinants. The following paragraphs provide an overview of the approach undertaken for this DMRB Stage 2 Scheme Assessment Report.

22.2.16 Receptor sensitivity has taken account of those groups who are considered to be more vulnerable to potential health effects due to underlying characteristics³⁴⁰ including:

- Age related/ life stage groups such as children and young people, and the elderly;
- Income related groups including those on low income and the unemployed;
- Groups who suffer discrimination or other social disadvantage such as those from ethnic minority groups or other inequalities groups, and people with disabilities; and
- Geographical groups, such as those living in areas known to exhibit poor economic and/ or health indicators/health status.

Detail on those groups who are considered to be particularly vulnerable to health effects for a given route option is provided in the assessment tables.

22.2.17 Alongside information gathered from baseline data sources, receptor sensitivity has been evaluated on the information available in other relevant assessments including:

- People and communities assessment (Chapter 12); and
- Traffic and economic assessment (Volume 3, Part 4).

22.2.18 This information has been applied to this human health assessment by assessing population exposure and vulnerability to provide an overall sensitivity rating. Table 22.3 sets out the guidelines for establishing population exposure and vulnerability ratings.

³⁴⁰ Based on: Health Impact Assessment: A Practical Guide, Wales Health Impact Assessment Support Unit. Available from: https://whiasu.publichealthnetwork.cymru/files/1415/0710/5107/HIA_Tool_Kit_V2_WEB.pdf

Table 22.3 Assessment Guidelines for Population Exposure and Vulnerability³⁴¹

Rating	Guidelines	
	Population exposure	Population vulnerability
High	A high level of exposure would occur over a wide geographical area and/or be likely to affect a large number of people (e.g. over 500)	Affected population includes a higher than national average proportion of groups (see Paragraph 22.2.16) who are more likely to experience beneficial or adverse health effects as a result of the impact in question.
Medium	A medium level of exposure would occur over a relatively localised area and/or be likely to affect a moderate-large number of people (e.g. 100-500).	Affected population includes an average or close to average proportion of groups (see Paragraph 22.2.16) who are more likely to experience either beneficial or adverse health effects as a result of the impact in question.
Low	A low level of exposure would occur over a small area and/or affect a small number of people (e.g. fewer than 100).	Affected population includes a below average proportion of groups (see Paragraph 22.2.16) who are more likely to experience beneficial or adverse health effects as a result of the impact in question.

22.2.19 Table 22.4 identifies how population exposure and vulnerability is combined to provide a population sensitivity rating.

Table 22.4 Assessment Guidelines for Population Sensitivity

Population Exposure	Population Vulnerability		
	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

22.2.20 In accordance with Section 3.31 of the New Guidance, the sensitivity of a community/population shall be reported as:

- 1) Low;
- 2) Medium; or
- 3) High.

³⁴¹ Assessment Guidelines for Population Exposure and Vulnerability have been developed by the AmeyArup Health Impact Assessment team on previous schemes and are considered to be relevant on this scheme. They are based on a range of guidance documents including the IAIA paper (2019) 'Addressing Human Health in Environmental Impact Assessment'.

Assessment Methodology: Magnitude

22.2.21 Whilst the New Guidance does not identify the requirements for magnitude criteria, the following assessment has been undertaken to ensure a robust approach. Table 22.5 identifies how the magnitude of impacts on health determinants are identified. Where the characteristics of the impact on the determinant fall across more than one category, professional judgement has been used to determine the most likely, worst-case, magnitude of impact.

Table 22.5 Assessment Guidelines for Magnitude of Impact

Rating	Guidelines
High	<p>A substantial change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> • scale of impact assessed as 'major' by relevant environmental topics (where applicable*); • scale of impact likely to be perceived by the population as a major change; • severity - has the potential to affect the occurrence of acute or chronic mental or physical illness; • long term duration or permanent or continuous occurrence.
Medium	<p>A moderate change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> • scale of impact assessed as 'moderate' by relevant environmental topics (where applicable*); • scale of impact likely to be perceived by the population as a moderate change; • severity - has the potential to improve / reduce mental well-being or quality of life, or exacerbate / alleviate symptoms of existing illness; • medium to long-term duration or frequent occurrence.
Low	<p>A minor change to a health determinant, with two or more of the following characteristics:</p> <ul style="list-style-type: none"> • scale of impact assessed as 'minor' by relevant environmental topics (where applicable*); • scale of impact likely to be perceived by the population as a minor change; • severity - has the potential to lower or raise mental well-being or quality of life in terms of levels of comfort and contentment; • short to medium term duration or occasional occurrence.

22.2.22 The magnitude of impact is identified as either 'adverse' or 'beneficial'.

Assessment Methodology: Significance

22.2.23 Whilst the New Guidance does not identify the requirement for significance criteria, a significance assessment has been undertaken to ensure a robust approach. Table 22.6 identifies how the magnitude of impact and the population sensitivity are combined to reach a conclusion of the significance of effects.

Table 22.6 Assessment Guidelines for Significant Effects

	Population Sensitivity		
Magnitude of Impact	High	Medium	Low
High	Major	Major	Moderate
Medium	Major	Moderate	Minor
Low	Moderate	Minor	Minor

22.2.24 Major and moderate effects are considered to be significant, whilst minor effects are considered to be not significant.

Assessment Methodology: Outcomes

22.2.25 The New Guidance identifies that once community/population sensitivity and changes to health determinants likely to occur as a result of a project have been established, the likely health outcome(s) shall be identified in line with the categories identified in Table 22.7. Additional detail has been added to the health outcome description to provide clarification on how health outcome categories align with the assessment methodology.

Table 22.7 Assessment Guidelines for Human Health Outcomes

Health Outcome Category	Health Outcome Description
Positive	A major or moderate beneficial effect is identified through assessment
Neutral	A minor beneficial or adverse effect is identified through assessment or no predicted effect is identified through assessment.
Negative	A major or moderate adverse effect is identified through assessment
Uncertain	Where uncertainty exists as to the overall health effect

Assumptions and Limitations

22.2.26 This DMRB Stage 2 assessment has been carried out in accordance with DMRB LA 112 Population and Human Health and includes the following assumptions and limitations:

- The appraisal has relied on publicly available datasets to determine the presence and sensitivity of receptors;
- The baseline health profile uses publicly available information. Much of this data is only available at local authority level and, therefore, it is not possible to distinguish between the different route options for all the indicators specified in the New Guidance. A general overview of the vulnerability of the population in each identified route option is provided, using available data on employment, income, deprivation and general health;
- The appraisal has relied on the outputs from other topic assessments to determine the likely magnitude of impacts on health receptors;
- Potential impacts are described without mitigation and, therefore, represent a worst-case scenario; and

- The assessment of potential effects on health outcomes is qualitative and is based on professional judgement. This professional judgement is supported by evidence of health pathways and health outcomes from a review of relevant literature.

22.3 Baseline

Study Area Definition

- 22.3.1 The New Guidance provides an overview of defining an appropriate study area. The study area is defined by:
- the extent and characteristics of the project; and
 - the communities/wards directly and indirectly affected by the project.
- 22.3.2 The guidance notes that each study area is unique to the project in question, based upon the sensitivity of affected communities and the nature/extent of the project resulting in changes to health determinants.
- 22.3.3 It is considered that for this assessment the majority of impacts on health determinants within the study area populations and communities will occur within 500m of the centreline of each route option.
- 22.3.4 However, due to the rural geographical nature of the project and the significance of some centres of population within the Aberdeenshire region, it is likely that impacts will be experienced by communities outside this boundary. Where impacts related to the determinants of health occur outside this area, these will be identified and considered.

Study Area Context

Overall

- 22.3.5 The two largest communities relevant to this assessment are Huntly and Inverurie, situated adjacent to the A96 and at either end of the study area. Whilst Huntly is located outside the study area for the route options, it has been included due to its significance in terms of population within the Aberdeenshire region and as the location of key services for residents within the study area. Port Elphinstone, located along the existing A96, also lies within the study area. In addition to the key communities identified, the smaller settlements of Old Rayne and Colpy are within the 500m study area.
- 22.3.6 Other significant communities which are outside the study area but are deemed to be relevant to the assessment include; Oldmeldrum located to the north; plus multiple relevant smaller settlements which include but are not limited to Insch, Daviot, Durno, Pitcaple and Whiteford.
- 22.3.7 The study area is split into three smaller study areas:
- East of Huntly to Colpy;
 - Colpy to Pitcaple; and
 - Pitcaple to Kintore.

East of Huntly to Colpy

- 22.3.8 East of Huntly to Colpy study area includes the Cyan and Red route options. The key community relevant to this section is Huntly which is located along the existing A96 and is located approximately 3km west of the 500m study area. The smaller settlements of Thomastown, Ythanwells, Culsalmond and Colpy are also considered relevant due to the requirement for residents to use the A96 to access key services in the nearest large settlements.

Colpy to Pitcaple

- 22.3.9 Colpy to Pitcaple study area includes the Pink and Brown route options. Whilst no key communities are identified within 500m of these route options, the settlement of Old Rayne and the smaller settlements of Insch, Durno, Oyne and Pitcaple and Whiteford, are considered relevant as they are likely to use the A96 to access key services in the nearest large settlements.

Pitcaple to Kintore

- 22.3.10 Pitcaple to Kintore study area includes the Violet and Orange route options. The key communities relevant to this section are Inverurie, Port Elphinstone and Kintore. The smaller settlements of Chapel of Garioch, Daviot and Oldmeldrum are also considered relevant as although they are outside the 500m study area, they are likely to use the A96 to access key services in the nearest large settlements.

Health Profile Data Sources

- 22.3.11 A review of publicly available data has been undertaken to provide a profile of the demographic and health status relating to the study area and, where relevant, to provide a comparison with statistics and data for Aberdeenshire and Scotland. The data reviewed is consistent with the indicators included in the New Guidance. The sources listed in paragraph 22.2.5 above have been used to inform the health profile.
- 22.3.12 It should be noted that the geographical extent of data zones varies between the ScotPHO and SIMD datasets. Plans providing a visual representation of ScotPHO (2020) and SIMD (2020) zones are provided within Volume 5, Figures 22.1 and 22.2.

Demographic Profile

- 22.3.13 The Scottish Government annual population survey results for 2019 report an overall population in Scotland of 5,463,300 (a 0.4% increase from 2018). The annual population survey states the population of Aberdeenshire as 261,210.
- 22.3.14 The age profile of Aberdeenshire identifies that the area has a higher percentage of older people than the Scottish average with the largest percentage of the population (22.5%) between the ages of 45-59, 1.4% higher than the Scottish average. This is followed by the 30-44 age category (20.6%), 0.6% higher than the Scottish average and the 16-29 age category (15.2%) 3.3% less than the Scottish average of 18.5%.
- 22.3.15 Aberdeenshire fits the general ethnicity patterns of Scotland. According to the Scottish Census (2011)³⁴², 82.2% of Aberdeenshire's population identify as white

³⁴² Scotland's Census, Shaping our Future (2018). Scotland Census (2011). Available here: <https://www.scotlandscensus.gov.uk/>.

Scottish compared to the Scottish average of 84%. This is followed by 12.3% of the population who identify as white British compared to the Scottish average of 7.9%.

- 22.3.16 Information related to the population of the data zones identified as within the study area is provided within the Scottish Census (2011)³⁴³, with a total of 32,290 and an average of 734 residents within each identified data zone. Appendix A22.1 identifies the data zones relevant to each study area.

Health and Community Profile

Health Profile Data, Scottish Public Health Observatory (2020)

- 22.3.17 The Scottish Public Health Observatory³⁴⁴ (ScotPHO) is led by Public Health Scotland (Data and Intelligence) and NHS Health Scotland. ScotPHO provides a number of data sets relevant to health for multiple relevant intermediate zones. Relevant ScotPHO datasets, available at the appropriate geographical scale, include:

- 'People living in the 15% most 'access deprived' areas';
- 'Asthma hospitalisations';
- 'Child healthy weight in Primary 1';
- 'Working age population employment deprived';
- 'Population income deprived'; and
- COPD hospitalisations.

- 22.3.18 The above datasets have been obtained for the following intermediate zones and are shown in Volume 5, Figure 22.1:

- Barrahill;
- Clashindarroch;
- Durno-Chapel of Garioch;
- Huntly;
- Inch, Oyne and Ythanwells;
- Inverurie North;
- Inverurie South; and
- Kintore.

- 22.3.19 The following paragraphs provide a commentary on the data obtained. See Volume 4b, Appendix A22.2 for an overview of the data provided.

³⁴³ Scotland's Census, Shaping our Future (2018). Scotland Census (2011). Available here: <https://www.scotlandscensus.gov.uk/>.

³⁴⁴ ScotPHO (2020). The Scottish Public Health Observatory. Available here: <https://www.scotpho.org.uk/>. Datasets in Paragraph 22.3.18 are as named on this website.

East of Huntly to Colpy

- 22.3.20 For East of Huntly to Colpy, the majority of relevant intermediate zones have higher than average levels of access deprivation. However, the community of Huntly is considered to be well connected, with no people living within the 15% most access deprived areas.
- 22.3.21 The zones of Clashindarroch (50.31)³⁴⁵ and Inch, Oyne and Ythanwells (53.78) both perform poorly against the Aberdeenshire average (46.23) for the asthma hospitalisations dataset. The key community of Huntly (32.44) performs better than the Aberdeenshire average hospitalisations.
- 22.3.22 All relevant data zones perform favourably against the Aberdeenshire average (155) for the rate of COPD Hospitalisations. The intermediate zone of Clashindarroch performs best (104), followed by Inch, Oyne and Ythanwells (105) and Huntly (114).
- 22.3.23 In terms of the child healthy weight in Primary 1 dataset, the majority of relevant data zones perform in accordance with the Aberdeenshire average of 78.93%.
- 22.3.24 The majority of intermediate zones in this study area rank favourably for average levels of working age population employment deprivation, falling under the 4.87% Aberdeenshire average. Despite this overall trend, Huntly reports 9.08%, suggesting a pocket of deprivation within this community.

Colpy to Pitcaple

- 22.3.25 For Colpy to Pitcaple, the Inch, Oyne and Ythanwell intermediate zone is the only one considered relevant within this assessment.
- 22.3.26 This intermediate zone ranks below average for people living in the 15% most access deprived areas, with 59.52% of the population experiencing access deprivation compared to the 42.47% Aberdeenshire average.
- 22.3.27 The zone performs poorly for the rate of asthma hospitalisations (53.78) against the Aberdeenshire average (46.23).
- 22.3.28 The zone performs well for COPD Hospitalisations with a measure of 105 against the Aberdeenshire average rate of 155.
- 22.3.29 In terms of child healthy weight for Inch, Oyne and Ythanwell, this zone ranks below the Aberdeenshire average for children of healthy weight in Primary 1.

Pitcaple to Kintore

- 22.3.30 For Pitcaple to Kintore, the intermediate zones of Inverurie, Inverurie North and Inverurie South look to be well connected with 0% of people living within the 15% most access deprived areas. This compares to Durno-Chapel of Garioch that ranks poorly with 88.08% of residents identified as being in the 15% most access deprived areas. The communities of Barrahill and Kintore both rank better than the Aberdeenshire average.
- 22.3.31 The zones of Durno-Chapel of Garioch (25.56), Barrahill (9.47), and Kintore (37.39) all perform better than the Aberdeenshire average (46.23) for asthma hospitalisations, with Barrahill having exceptionally low levels. Inverurie North and South however both rank poorly, with hospitalisations above the Aberdeenshire average.

³⁴⁵ Numbers in brackets represent the age-sex standardised rate per 100,000.

- 22.3.32 In comparison to the other two route options, the majority of intermediate zones do not rank favourably against the Aberdeenshire average for COPD Hospitalisations. Inverurie North (171), Inverurie South (223), Kintore (173) and Barrahill (180) all rank below the Aberdeenshire Average of 155. Despite this trend, the intermediate zone of Durno-Chapel of Garioch scores favourably, with a measure of 21.
- 22.3.33 In terms of children of healthy weight in Primary 1, all data zones rank above 74%, aligning closely with the Aberdeenshire average of 77.47%.
- 22.3.34 Barrahill (2.72%), Durno-Chapel of Garioch (1.14%), Kintore (2.31%) and Inverurie North (4.43%) all rank favourably against the Aberdeenshire average of 4.87% for working age population employment deprivation. However, it should be highlighted that Inverurie South ranks at 7.54% deprivation, suggesting a pocket of employment deprivation within this community.

Health Profile Data, Scottish Indices of Multiple Deprivation (2020)

- 22.3.35 The Scottish Index of Multiple Deprivation (SIMD) (2020) divides the country into geographic data zones, which are then used as a means of displaying and comparing relative measure of deprivation across the country. Data at this unit level has been used to inform the health profile for the communities and populations within the study area. The relevant data zones can be viewed in Volume 5, Figure 22.2 and have been selected to correspond with the study area outlined in Paragraphs 22.3.1 to 22.3.4, and to encompass relevant communities outside this area.
- 22.3.36 A list of relevant data zones and associated route options is provided within Volume 4b, Appendix A22.1. Additional detailing on the SIMD baseline is provided within Volume 4b, Appendices A22.3 to A22.5.

East of Huntly to Colpy

- 22.3.37 The data demonstrates a clustering of deprivation within the west and south of Huntly (covered by data zones Huntly 04 & 05). Although not within the 20% most overall deprived areas in Scotland, these data zones are characterised by relatively higher levels of deprivation with regard to income, employment, health and housing compared with the rest of the study area.
- 22.3.38 Geographic access data identifies the data zones of Oyne and Ythanwell 02 and Insch, Oyne and Ythanwell 03 as consistently having some of the longest journey times to access key services compared with the Scottish average mean time in minutes (MTM) times, suggesting that the communities of Insch, Oyne and Ythanwell are particularly sensitive to any access improvements or journey time savings that may occur due to the development of the A96.

Colpy to Pitcaple

- 22.3.39 The data zones of Oyne and Ythanwell 02 and Insch, Oyne and Ythanwell 03 have relatively long journey times to access key services compared with the Scottish average MTM times, suggesting that the community of Insch is likely to be particularly sensitive to any access improvements or journey time savings that may occur due to the development of the A96.
- 22.3.40 The baseline conditions do not identify deprivation for residential communities. However, far fewer residential properties are identified within the Colpy to Pitcaple study area which may explain why areas of deprivation are not identified within SIMD data.

Pitcaple to Kintore

- 22.3.41 The data demonstrates a clustering of deprivation to the south of Inverurie. The southern area of Inverurie (covered by Inverurie South 01, Inverurie South 02 and Inverurie South 05 data zones), although not within the 20% most deprived areas in Scotland is characterised by relatively higher levels of deprivation with regard to income, employment, health, education, housing and crime rates compared with the rest of the study area.
- 22.3.42 Geographic access regularly identifies the data zones of Durno-Chapel of Garioch 03, Durno-Chapel of Garioch 04 and Kintore 07 as consistently having some of the longest journey times to access key services compared with the Scottish average MTM times, suggesting that these communities are particularly sensitive to any access improvements or journey time savings that may occur due to the development of the A96.

Key Community land and assets

- 22.3.43 Table 22.8 provides an overview of key existing community facilities relevant to this human health assessment within each geographical study area. This is not an exhaustive list of all facilities. In addition to the relevant community facilities, an extensive list of relevant existing WCH facilities, Core Paths, Public Rights of Way (PRoW) and existing local routes are provided within Chapter 12, People and Communities. Where community facilities are not easily identified within a specific community, they have been included in the nearest appropriate community. Plans showing these facilities are provided within Volume 5, Figures 22.3 to 22.8. Plans showing the key communities of Huntly and Inverurie have been provided below due to the larger concentration of facilities within these areas.

Table 22.8 Relevant Community Land and Assets

Study Area	Relevant Community Facilities
East of Huntly to Colpy	<p>Huntly: Huntly Swimming Pool, Huntly Football Club, Huntly Golf Course, Jubilee Hospital and Huntly Health Centre.</p> <p>Colpy: No relevant key community facilities identified.</p> <p>Culsalmond: Culsalmond Community Education Centre.</p> <p>Thomastown: No relevant key community facilities identified.</p> <p>Ythanwells: No relevant key community facilities identified.</p>
Colpy to Pitcaple	<p>Old Rayne: Strathorn Farm Stables.</p> <p>Insch: Loch Insch Fishery, Insch and District Memorial Hospital/ Insch Health Care Centre and Insch Golf Course.</p> <p>Durno: Durno and Logie Woodland area.</p> <p>Pitcaple: No relevant key community facilities identified.</p> <p>Whiteford: Logie Durno School and Logie Durno Village Hall.</p> <p>Oyne: Oyne Primary School.</p>

Study Area	Relevant Community Facilities
Pitcaple to Kintore	<p>Inverurie: Inverurie Health Centre, Inverurie Hospital, Garioch Sports Centre, Inverurie Golf Club and Garioch Indoor Bowling Centre.</p> <p>Port Elphinstone: Fyfe House (Girl Guides), Port Elphinstone Recreation Park, Kemnay Woods and Crichtiebank Business Centre Wood.</p> <p>Kintore: Overdon Care Home, Kintore Golf Club, Hogholm Stables.</p> <p>Chapel of Garioch: Chapel of Garioch School.</p> <p>Daviot: Mill Wood.</p> <p>Oldmeldrum: No relevant key community facilities identified.</p>

Health and Community Baseline Summary

East of Huntly to Colpy

- 22.3.44 The East of Huntly to Colpy study area includes the key community of Huntly and multiple smaller settlements including Colpy, Old Rayne, Culsalmond and Thomastown. The majority of community services in this study area are located in the town of Huntly, with only the Culsalmond Community Education Centre being located elsewhere, at Culsalmond. This aligns with both the ScotPHO (2020) and SIMD geographic access domain data that identifies that those areas outside the town of Huntly, such as the intermediate zones of Clashindarroch and Oyne and Ythanwells, generally have poorer access to services.
- 22.3.45 Whilst not identified as being within the top 20% of deprived communities in Scotland, SIMD (2020) data, the community of Huntly and particularly the data zones of Huntly 04 (western Huntly) and Huntly 05 (southern Huntly) consistently ranked poorly against the Aberdeenshire average for employment, income, education and housing. This suggests a pocket of higher levels of deprivation and an increased sensitivity of the residents within western and southern Huntly. ScotPHO (2020) data supports this trend, with 'average levels of working age population employment deprivation' almost doubling from the Aberdeenshire average (4.87%) for the community of Huntly (9.08%).
- 22.3.46 The prevalence of asthma hospitalisations varies across the study area, with the community of Huntly performing well, whilst the zones of Clashindarroch and Inch, Oyne and Ythanwells both perform poorly. All zones performed well for COPD hospitalisations.

Colpy to Pitcaple

- 22.3.47 The Colpy to Pitcaple study area does not include any key settlements. Multiple smaller settlements are identified including Old Rayne, Inch, Durno, Pitcaple, Whiteford and Oyne. Relevant community facilities include Logie Durno School, Durno and Logie Woodland and Inch and District Memorial Hospital.
- 22.3.48 SIMD (2020) identifies the data zones of Oyne and Ythanwell 02 and Inch, Oyne and Ythanwell 03 as underperforming against the Scottish average for journey times to key services, suggesting that these zones are particularly sensitive to any access improvements or journey time savings. This is also supported by the ScotPHO data which indicates that the Inch, Oyne and Ythanwell 03 zone ranks

worse than the Aberdeenshire average for people living in the 15% most access deprived areas.

- 22.3.49 The Inch, Oyne and Ythanwell ScotPHO (2020) Intermediate Zone also ranks worse than the Aberdeenshire average for asthma hospitalisations and healthy weight in Primary 1. This consistent poor performance suggests that despite low population numbers, residents within this zone are considered to be a more vulnerable population with regard to potential health effects.

Pitcaple to Kintore

- 22.3.50 The Pitcaple to Kintore study area includes the key community of Inverurie and multiple smaller settlements including Port Elphinstone, Kintore, Chapel of Garioch, Daviot and Oldmeldrum. Multiple key community facilities are scattered along this study area including Inverurie Health Centre, Garioch Sports Centre, Chapel of Garioch School and Overdon Care Home.
- 22.3.51 Increased access sensitivity is identified for the data zones of Durno-Chapel of Garioch 03, Durno-Chapel of Garioch 04 and Kintore 07, suggesting increased sensitivity of residents within these zones. This is supported by ScotPHO (2020) data, where Durno-Chapel of Garioch ranks poorly. In comparison to this, the key community of Inverurie is identified as being well connected.
- 22.3.52 The SIMD (2020) data identifies a pocket of deprivation in southern Inverurie, where the majority of assessed indicators (employment, income, health, education, housing and crime rates) experience higher levels of deprivation than elsewhere within this study area.
- 22.3.53 ScotPHO (2020) data identifies above average levels of asthma hospitalisations and COPD hospitalisations for the community of Inverurie.

Environmental Baseline Summary

Air Quality

- 22.3.54 There are no AQMAs located throughout the study area.
- 22.3.55 Aberdeenshire Council diffusion tube monitoring data and Scottish Air Quality background maps data indicate that annual mean concentrations of NO₂ and PM₁₀ are well below the annual SAOQs throughout the overall study area.
- 22.3.56 Further baseline provided in Chapter 10, Air Quality.

Noise

- 22.3.57 There is one Candidate Noise Management Area (CNMA) in the Drimmies to Port Elphinstone section of the existing A96, located south of Port Elphinstone on the B993 road.
- 22.3.58 Further information on the baseline noise environment is provided in Chapter 11, Noise and vibration.

Landscape Amenity

- 22.3.59 A full description of the baseline landscape and visual amenity for the study area is provided in Chapter 15, Visual Effects and Chapter 17, Landscape. These baselines provide a full description of the nature of the existing landscape along with any landscape designations. They also identify any existing visual receptors, including historic sites, designated landscapes, visual receptors, recreational receptors.

- 22.3.60 The study area is largely rural but there is a network of roads and a regular distribution of settlements including small villages and individual dwellings. There are a number of major and minor settlements within close proximity to the route options. The main settlement within the study area is Inverurie which lies to the eastern end of the scheme. There are limited views of the existing A96 due to embankments and vegetation protecting the nearest properties. There are limited large areas of built development so the main screens to existing views are variations in the landform and tree cover.
- 22.3.61 The area contains several heritage assets and several Inventory Gardens and Designed Landscapes. The most significant of these are Harlaw Battlefield, Leith Hall, Williamston House, Newton House, Keith Hall, Balbithan House, Aquhorthies Stone Circle and Kinkell Church.
- 22.3.62 The rural landscape within the study area is popular for recreation and contains a number of Aberdeenshire's core paths and cycle ways.
- 22.3.63 There are two LDP Special Landscape Areas within the overall study area.

22.4 Potential Impacts

- 22.4.1 No health specific mitigation is proposed during DMRB Stage 2; therefore, the assessment of potential effects is the same as per the predicted effects assessment in Section 22.6.

22.5 Mitigation

- 22.5.1 As is appropriate for DMRB Stage 2, designs have not been sufficiently developed to include detailed mitigation measures. The individual topic assessments from which the health assessment has drawn report mitigation measures that are assumed will be incorporated into the design to avoid, reduce or remediate adverse effects. Since the evaluation of impacts on health determinants and resources is based on these assessments, the same mitigation measures are assumed to apply to human health.
- 22.5.2 Further detailed mitigation measures for the Preferred Option will be developed during DMRB Stage 3. It is assumed that mitigation of health effects will apply best practice and follow the mitigation hierarchy. The types of mitigation likely to be applied will include:
- Avoidance and prevention: identifying alternatives in the detailed design that avoid compounding existing health issues in sensitive communities;
 - Reduction: minimising severance/isolating communities from facilities/services by providing connectivity over/under the Preferred Option, and providing mitigation to minimise health effects e.g. install noise fencing where appropriate; and
 - Remediation: where there is likely to be a significant change to a health determinant, e.g. loss of green open space, providing replacement equivalent facilities as close as possible to the original facility.

22.6 Predicted Environmental Effects

22.6.1 Predicted effects in relation to human health are presented in the Tables 22.9 to 22.14.

22.6.2 The assessment outcomes from the following topic assessments have been used to inform the assessment of potential effects on human health:

- Chapter 10, Air Quality;
- Chapter 11, Noise and Vibration;
- Chapter 12, People and Communities; and
- Chapter 15, Visual Effects.

East of Huntly to Colpy – Cyan Route Option

22.6.3 Table 22.9 provides an overview of the predicted health effects for the Cyan route option.

Table 22.9 Predicted Effects, Cyan Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Exposure to potential impacts is expected over a relatively localised area. The route option is rural in nature with few residential receptors. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: ScotPHO (2020) data identifies higher than average hospital admissions for asthma in the intermediate zones of Clashindarroch and Inch, Oyne and Ythanwells. Despite this, vulnerability is identified as being low due to very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>
Landscape Amenity	<p>Chapter 15, Visual Effects, identifies few significant effects for a wide range of residential and non-residential receptors due to existing woodland screening and the influence of existing topography.</p> <p>Whilst Chapter 15 identifies multiple receptors within 500m, the Glens of Foudland, the settlements of Thomastown and Colpy, the Culsalmond Community Education Centre are the only ones considered relevant to human health.</p> <p>Whilst these facilities will experience a loss of visual amenity, it is not expected to deter the population from continuing to access and use.</p> <p>Due to the proximity of the existing A96, this change is likely to be perceived as minor by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low - medium, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity, due to the low numbers of receptors considered relevant to this assessment.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessible/ Severance of Community Land, Assets and Employment</p>	<p>Chapter 12, People and Communities, identifies the Culsalmond Community Education Centre which is relevant to human health.</p> <p>Whilst it is expected the facility will experience a minor loss of land, loss of visual amenity and minor journey delays, these are not expected to deter the population from continuing to access and use this facility.</p> <p>Due to the proximity of the existing A96, this change is likely to be perceived as minor by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low- medium, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience adverse health effects as a result of impacts on access to / severance of community land and facilities, due to existing high levels of access deprivation in intermediate zones such as Clashindarroch and Oyne and Ythanwells.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor-moderate adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic flows on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life for communities along the route.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will likely experience beneficial effects from the reduction in traffic flows.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of improved amenity and access between local communities. The communities in the south-west of Huntly experience relatively high levels of deprivation across a range of indicators.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings are expected to result in improved access to nearby employment opportunities, particularly in Huntly and Colpy.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will benefit from the reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on access to / severance to employment. The communities in the south-west of Huntly experience employment and income deprivation levels higher than the national average.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings are expected to result in improved access between social networks, social venues and shops within Huntly and Colpy. Key community facilities include Culsalmond Community Education Centre, Huntly Football Club and Huntly Swimming Pool.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; it is likely that over 500 people will benefit from the reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of the impact in question due to existing high levels of access deprivation in intermediate zones such as Clashindarroch and Oyne and Ythanwells.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Accessibility/ Severance, Open Green Space	<p>Chapter 12, People and Communities, identifies a predicted minor effect from loss of land at the Culsalmond Community Education Centre.</p> <p>Large areas of rural open green space border this route option. However, most of this agricultural land is not publicly accessible and is close to the existing A96.</p> <p>This change is expected to be perceived by the population as minor.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: A low level of exposure would occur over a small area and affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question due to ready availability of open space and outdoor sporting facilities including Huntly Football Club and Huntly Golf Club.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>
Accessibility /Severance, WCH Facilities	<p>Chapter 12, People and Communities, identifies no relevant WCH facilities that are directly impacted.</p> <p>Magnitude: N/A</p>	<p>Chapter 12, People and Communities, identifies no relevant WCH facilities that are directly impacted.</p> <p>Overall sensitivity: N/A</p>	<p>Neutral: No predicted health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, healthcare facilities</p>	<p>Journey time savings are expected to result in improved access to key existing healthcare facilities included within the nearest town of Huntly including the Jubilee Hospital and Huntly Health Centre.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: A high level of exposure would occur over a wide geographical area and be likely to affect a large number of people (e.g. over 500).</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an average proportion of groups who are more likely to experience beneficial health effects as a result of the impact in question due to the differing access deprivation between Huntly, Clashindarroch, and Oyne and Ythanwells intermediate zones with Huntly having good access and Clashindarroch, and Oyne and Ythanwells having poor access to key services.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health effects at population level.</p>

22.6.4 Table 22.9 identifies multiple beneficial effects on human health from the Cyan route option, with major beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and reducing stress from congestion. Major beneficial effects are also anticipated as a result of journey time savings improving access to employment opportunities, community services and facilities and healthcare services. Improved access to services is particularly beneficial in this study area as the baseline data shows that access to services is currently relatively poor.

East of Huntly to Colpy – Red Route Option

22.6.5 Table 22.10 provides an overview of the predicted health effects for the Red route option.

Table 22.10 Predicted Effects, Red Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Exposure to potential impacts is expected over a relatively localised area. The route option is rural in nature with few residential receptors. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: ScotPHO (2020) data identifies higher than average hospital admissions for asthma in the intermediate zones of Clashindarroch and Inch, Oyne and Ythanwells. Despite this, vulnerability is identified as being low due to very small size of the population along the route option</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>
Landscape Amenity	<p>Chapter 15, Visual Effects, identifies multiple significant effects. This due to the elevation of the route option, existing topography and increased frequency of visual receptors.</p> <p>Whilst Chapter 15 identifies multiple receptors within 500m, the settlements of Thomastown and Colpy and the Culsalmond Community Education Centre, which is a key facility, are considered relevant to human health.</p> <p>Whilst these facilities will experience a loss of visual amenity, it is not expected to deter the population from continuing to access and use.</p> <p>Due to the proximity of the existing A96, this change is likely to be perceived as minor by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low-medium, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity due to the small number of visual receptors relevant to this assessment.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/ Severance of Community Land, Assets and Employment</p>	<p>Chapter 12, People and Communities, identifies the Culsalmond Community Education Centre relevant to human health.</p> <p>Whilst it is expected that the facility will experience a minor loss of visual amenity and minor journey delay, these are not expected to deter the population from continuing to access and use this facility.</p> <p>Due to the proximity of the existing A96, this change is likely to be perceived as minor by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low- medium, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience adverse health effects as a result of impacts on access to/ severance of community land and facilities, due to existing high levels of access deprivation in intermediate zones such as Clashindarroch and Oyne and Ythanwells.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Negative: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic flows on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life for communities along the route.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will likely experience beneficial effects from the reduction in traffic flows.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of improved amenity and access between local communities. The communities in the south-west of Huntly experience relatively high levels of deprivation across a range of indicators.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access to nearby employment opportunities, particularly in Huntly and Colpy.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will benefit from the reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of improved access to employment opportunities. The communities in the south-west of Huntly experience employment and income deprivation levels higher than the national average.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings are expected to result in improved access between social networks, social venues and shops within Huntly and Colpy. Key community facilities include Culsalmond Community Education Centre, Huntly Football Club and Huntly Swimming Pool.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will benefit from the reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of improved access between social networks, social venues and shops, due to the extensive amount of key community facilities identified within Huntly.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Accessibility/ severance, open green space	<p>Chapter 12, People and Communities, Identifies that large areas of rural open green space border this route option. However, most of this agricultural land is not publicly accessible and is close to the existing A96.</p> <p>This change is expected to be perceived by the population as minor.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: A low level of exposure would occur over a small area and affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question due to ready availability of open space and outdoor sporting facilities including Huntly Football Club and Huntly Golf Club.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>
Accessibility / severance, WCH facilities	<p>Chapter 12, People and Communities, identifies no relevant WCH facilities that are directly impacted.</p> <p>Magnitude: N/A</p>	<p>Chapter 12, People and Communities, identifies no relevant WCH facilities that are directly impacted.</p> <p>Overall sensitivity: N/A</p>	<p>Neutral: No predicted health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Accessibility/ severance, healthcare facilities	<p>Journey time savings are expected to result in improved access to key existing healthcare facilities included within the nearest town of Huntly including the Jubilee Hospital and Huntly Health Centre.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: A high level of exposure would occur over a wide geographical area and be likely to affect a large number of people (e.g. over 500).</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on access to / severance of community assets, due to the differing access deprivation between Huntly, Clashindarroch, and Oyne and Ythanwells intermediate zones.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health benefits at population level.</p>

22.6.6 Table 22.10 identifies multiple beneficial effects on human health from the Red route option, with major beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and reducing stress from congestion. Major beneficial effects are also anticipated as a result of journey time savings improving access to employment opportunities, community services and facilities and healthcare services. Improved access to services is particularly beneficial in this study area as the baseline data shows that access to services is currently relatively poor.

Colpy to Pitcaple – Pink Route Option

22.6.7 Table 22.11 provides an overview of the predicted effects and their significance for the Pink route option.

Table 22.11 Predicted Effects, Pink Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Exposure to potential impacts is expected over a relatively localised area. The route option is rural in nature with few residential receptors. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level</p>
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Landscape Amenity	<p>Chapter 15, Visual Effects, identifies multiple significant effects that are primarily related to individual or groups of residential properties.</p> <p>Whilst Chapter 15 identifies multiple receptors within 500m, the visual receptors relevant to human health include the Loch Inch Fishery, Durno and Logie Woodland, Logie Durno School, Logie Durno Village Hill and Williamston House Garden and Designed Landscape.</p> <p>In addition to the community facilities identified above, local route L3R and core path 415.02 are expected to experience a significant adverse effect to amenity or perceived safety of journey due to changes in existing views.</p> <p>Whilst the identified community facilities will experience a loss of visual amenity, it is not expected to deter the population from continuing to access and use these facilities. It is, however, expected that the changed perception in safety may impact upon the use of the Durno and Logie Woodland.</p> <p>Due to the amount of facilities and proximity to the existing A96, this change is likely to be perceived as moderate by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, adverse</p>	<p>Population exposure: It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity due to the low number of visual receptors relevant to this assessment.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Accessibility/ Severance of Community Land, Assets and Employment	<p>Chapter 12, People and Communities, identifies the Durno and Logie Woodland area relevant to human health.</p> <p>It is expected that the loss of publicly accessible woodland will adversely impact upon access to open green space. This change is likely to be perceived as major by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 will be adversely affected.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes a close to average proportion of groups who are more likely to experience adverse health effects as a result of the impact on access to /severance of community land and facilities. This route option has a lower amount of community land, assets and employment opportunities compared with East of Huntly to Colpy and Pitcaple to Kintore.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Negative: Major adverse effects on human health at population level.</p>
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic flows on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life for communities such as Colpy, Huntly and Inverurie.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects from improved amenity and access between local communities due to the size of population and the below average access times identified within the baseline.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: Medium</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access to nearby employment opportunities in Huntly, Colpy and Inverurie.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an average proportion of groups who are more likely to experience beneficial health effects from improved access to employment as there are not significant levels of employment deprivation in the area of the route option.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor beneficial effects on human health at population level.</p>
	<p>Journey time savings resulting in improved access between social networks, social venues and shops within Huntly, Colpy and Inverurie.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects from improved access between social networks, social venues and shops, due to the size of population and the below average access times identified within the baseline.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: Medium</p>	<p>Positive: Moderate beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, open green space</p>	<p>Chapter 12, People and Communities, identifies a predicted minor effect from changes to amenity and access to uses of the Durno and Logie Woodland area.</p> <p>This partial loss of woodland also results in a loss of core path provision (L3R, 404.01 and 415.020), severing access to the woodland and restricting access to open green space.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility / severance, WCH facilities</p>	<p>Chapter 12, People and Communities, identifies major and moderate adverse effects on multiple existing core paths.</p> <p>Core paths L3R and 415.02 are expected to experience a significant adverse effect to amenity or perceived safety of journeys due changes to existing views/traffic flows.</p> <p>Core path 404.01 is severed by the Pink route option with a potential diversion causing increases of up to 900m for pedestrians using these facilities.</p> <p>Predicted adverse effects include amenity and considerable hinderance to existing journeys.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: A medium level of exposure over a localised area, affecting a moderate number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Accessibility/severance, healthcare facilities	<p>Journey time savings are expected to result in improved access to key existing healthcare facilities included within the nearest towns of Inverurie and Huntly including; Jubilee Hospital, Huntly Health Centre, Inverurie Hospital, Inverurie Health Centre and the Insch and District Memorial Hospital.</p> <p>This change is expected to be considered by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: the affected population includes a higher than average proportion of groups who are more likely to experience beneficial health effects as a result of the impact in question due to existing poor levels of access to services including GP surgeries</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health effects at population level.</p>

22.6.8 Table 22.11 predicts multiple beneficial effects on human health from the Pink route option, with moderate beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and social networks and reducing stress from congestion. Major beneficial effects are anticipated as a result of journey time savings improving access to healthcare services. Improved access to services is particularly beneficial in this study area as the baseline data shows that access to services is currently relatively poor.

22.6.9 Major to Moderate adverse effects are anticipated in relation to accessibility and severance of both open space and WCH facilities due to impacts on the Durno and Logie Woodland area and a number of core paths.

Colpy to Pitcaple – Brown Route Option

22.6.10 Table 22.12 provides an overview of the predicted effects and their significance for the Brown route option.

Table 22.12 Predicted Effects, Brown Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Exposure to potential impacts is expected over a relatively localised area. The route option is rural in nature with few residential receptors. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: Not applicable due to the very small size of the population along the route option.</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Landscape Amenity</p>	<p>Chapter 15, Visual Effects, identifies multiple significant effects relevant to human health. Receptors include Loch Inch Fishery, Durno and Logie Woodland area, Logie Durno School, Logie Durno Village Hall, River Urie and Williamston House Garden and Designed Landscape.</p> <p>In addition to the community facilities identified above, a number of core paths and existing local routes (404.02, 404.01, GA2 and GA3) are expected to experience significant adverse effects due to the Brown route option including the severance caused by the Kellockbank and Carden Junctions. This severance may impact upon the use of the facilities identified above.</p> <p>Due to the amount of facilities and proximity to the existing A96, this change is likely to be perceived as moderate by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, adverse</p>	<p>Population exposure: It is not expected that over 100 people will be impacted upon for this route option.</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity due to the low number of visual receptors relevant to this assessment.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/ Severance of Community Land, Assets and Employment</p>	<p>Chapter 12, People and Communities, identifies major adverse effects on the Durno and Logie Woodland area resulting in land take and associated effects. Additional adverse effects are identified on the River Urie Logie Durno Village Hall and Logie Durno School.</p> <p>It is expected that this loss of woodland used by the community will be perceived as major by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 will be adversely affected.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes a close to average proportion of groups who are more likely to experience adverse health effects as a result of access to / severance of community land and facilities. This route option has a lower amount of community land, assets and employment opportunities compared with East of Huntly to Colpy and Pitcaple to Kintore.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Negative: Major adverse effects on human health at population level.</p>
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life for communities such as Colpy, Huntly and Inverurie.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects from improved amenity and access between local communities due to the size of population and the below average access times identified within the baseline.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: Medium</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access to nearby employment opportunities, particularly in local communities such as Huntly, Colpy and Inverurie.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an average proportion of groups who are more likely to experience beneficial health effects from improved access to employment as there are not significant levels of employment deprivation in the area of the route option.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor beneficial effects on human health at population level.</p>
	<p>Journey time savings resulting in improved access between communities. These savings will improve access to social networks, social venues and shops in Huntly, Colpy and Inverurie.</p> <p>This change is expected to be perceived by the population as moderate</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects from improved access between communities, due to the size of population and the below average access times identified within the baseline.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: Medium</p>	<p>Positive: Moderate beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, open green space</p>	<p>Chapter 12, People and Communities, identifies a predicted minor effect from changes to amenity and access to users of Durno and Logie Woodland Area.</p> <p>This partial loss of woodland also results in adverse effects on multiple core paths and existing local routes (404.01, 404.02, GA2 and GA3) severing and restricting access to open green space. Additional adverse impacts are expected on Kellockbank and Carden Junctions.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility / severance, WCH facilities</p>	<p>Chapter 12, People and Communities, identifies major and moderate adverse effects on multiple existing core paths.</p> <p>Core paths 404.02 and 404.01 are expected to experience a significant adverse effect to amenity or perceived safety of journeys due changes to existing views/traffic flows.</p> <p>It is expected that existing local routes GA1 and GA3 will be cut short, however a reduction in traffic flows will be experienced.</p> <p>Predicted adverse effects include amenity and considerable hinderance to existing journeys.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: A medium level of exposure over a localised area, affecting a moderate number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population includes a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, healthcare facilities</p>	<p>Journey time savings are expected to result in improved access to existing healthcare facilities included within the nearest towns of Inverurie and Huntly including: Jubilee Hospital, Huntly Health Centre, Inverurie Hospital, Inverurie Health Centre and the Inch & District Memorial Hospital.</p> <p>Improvements to journey times are expected to beneficially impact upon those using the identified facilities.</p> <p>This change is expected to be considered by the population as moderate.</p> <p>The change is expected to be long term or permanent in nature.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: the affected population includes a higher than average proportion of groups who are more likely to experience beneficial health effects as a result of the impact in question due to existing poor levels of access to services including GP surgeries</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health effects at population level.</p>

- 22.6.11 Table 22.12 predicts multiple beneficial effects on human health from the Brown route option, with moderate beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and reducing stress from congestion. Major beneficial effects are anticipated as a result of journey time savings improving access to community services and facilities and healthcare services. Improved access to services is particularly beneficial in this study area as the baseline data shows that access to services is currently relatively poor.
- 22.6.12 Moderate adverse effects are anticipated in relation to accessibility to and severance of both open space and WCH facilities due to impacts on the Durno and Logie Woodland area and a number of core paths.

Pitcaple to Kintore – Violet Route Option

22.6.13 Table 22.13 provides an overview of the predicted effects and their significance for the Violet route option.

Table 22.13 Predicted Effects, Violet Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: The route option is within close proximity to the key communities of Inverurie and Kintore and it is expected that a large number of people (over 500) will be impacted upon.</p> <p>Exposure: High</p> <p>The impacted population potentially includes a higher than average proportion of groups who are more likely to experience beneficial or adverse health effects as a result of the impact in question as the ScotPHO (2020) data identifies higher than average hospital admissions for asthma in the intermediate zone of Inverurie.</p> <p>Population vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Negative: Moderate adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, beneficial and adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is expected that between 100-500 people will be impacted upon for this route option.</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include an average or close to average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Medium</p>	<p>Neutral: Minor beneficial and adverse effects on human health at population level.</p>
Landscape Amenity	<p>Chapter 15, Visual Effects, identifies multiple significant adverse effects on human health. Receptors in relation to landscape amenity include Keith Hall Garden and Designed Landscape, Hogholm Farmhouse and Stables and Overdon Care Home.</p> <p>In addition to the facilities identified, multiple core paths and existing local routes (GA3, GG53, 408.06, 408.06R, 410.01) are expected to experience adverse effects due to severance. This severance may impact upon the use of facilities identified above.</p> <p>Due to the amount of facilities and proximity to the existing A96, this change is likely to be perceived as moderate by the wider population.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: Medium, adverse</p>	<p>Population exposure: The level of exposure is expected over a relatively localised area. It is expected that 100-500 people will be impacted upon for this route option due to the impact upon local routes and core paths.</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include a low proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/ Severance of Community Land, Assets and Employment</p>	<p>Chapter 12, People and Communities, identifies moderate effects on Overdon Care Home, Fyfe House (Girl Guides), and Hogholm Farmhouse and Stables.</p> <p>This change is likely to be perceived as moderate by the population.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: Medium, adverse</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population is likely to include an average or close to average proportion of groups who are more likely to experience adverse health effects as a result of impacts on access to / severance of community land and facilities.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Negative: Minor adverse effects at population level</p>
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life. This improvement is expected to be particularly beneficial for the community of Inverurie.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a major number of people; over 500 are likely to be positively affected by reductions in traffic flows.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on amenity and access between communities, due to pockets of relatively higher levels of deprivation with regard to income, employment, health, education, housing and crime rates at the southern end of the route option.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access to nearby employment opportunities, particularly in the local community of Inverurie.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a large number of people; over 500 are likely to be positively affected by reductions in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on access to employment opportunities, due to pockets of relatively higher levels of deprivation with regard to income, employment, health, education, housing and crime rates at the southern end of the route option.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access between communities. These savings will improve access to social networks, venues and shops, particularly within the community of Inverurie. Key facilities within the community of Inverurie include Garioch Sports Centre, Inverurie Golf Club and Garioch Indoor Bowling Centre.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a large number of people; over 500 people will benefit from the reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population has a varied vulnerability to impacts on access between communities. The community of Inverurie has a number of key facilities and relatively good access to key services, whilst the nearby community of Port Elphinstone is likely to maintain good access to these facilities.</p> <p>Smaller settlements in the north of the route option have been identified as rating poorly with regard to access to services.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>
<p>Accessibility/severance, open green space</p>	<p>Chapter 12, People and Communities, does not identify any direct impacts on areas of open green space.</p> <p>Magnitude: N/A</p>	<p>Sensitivity: N/A</p>	<p>Neutral: No predicted effects at population level</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, WCH facilities</p>	<p>Chapter 12, People and Communities, identifies multiple significant adverse effects on multiple core paths and existing routes.</p> <p>Core paths and local routes GG53, GA3, 408.06, 408.06R,410.01 are expected to experience an adverse effect to amenity or perceived safety of journeys due to changes in existing views/ traffic flows.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: A medium level of exposure over a localised area, affecting a moderate number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Moderate adverse health effects at population level.</p>
<p>Accessibility/severance, healthcare facilities</p>	<p>Journey time savings are expected to result in improved access to key existing healthcare facilities within the nearest settlements of Inverurie. Facilities include: Inverurie Hospital and Inverurie Health Centre.</p> <p>This change is expected to be considered by the population as moderate.</p> <p>The change is expected to be long term or permanent in nature.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a -large number of people; over 500 people will benefit from the proposed reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population has a varied vulnerability. The communities of Inverurie and Port Elphinstone have a good number of and relatively good access to key services, whilst smaller settlements in the north of the route option have been identified as rating poorly with regard to access to services.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health effects at population level.</p>

- 22.6.14 Table 22.13 predicts multiple beneficial effects on human health from the Violet route option, with major beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and reducing stress from congestion. Major beneficial effects are also anticipated as a result of journey time savings improving access to employment opportunities, community services and facilities and healthcare services. Improved access to services is particularly beneficial to the rural communities in the northern area of this route option as the baseline data shows that access to services is currently relatively poor.
- 22.6.15 Moderate adverse effects are predicted in relation to air quality due to existing higher than average hospital admissions for asthma in the intermediate zone of Inverurie making the population more vulnerable to even low, adverse changes to air quality.
- 22.6.16 Moderate adverse effects are also predicted in relation to impacts on WCH facilities due to impacts on a number of core paths and local routes. The long-term to permanent loss of these paths are assessed to affect a moderate number of people to a high magnitude, resulting in the potential loss of opportunities for physical activity and reduced access to green/open space which may impact on wellbeing.

Pitcaple to Kintore – Orange Route Option

22.6.18 Table 22.14 provides an overview of the predicted effects and their significance for the Orange route option.

Table 22.14 Predicted Effects, Orange Route Option

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Air Quality	<p>Chapter 10, Air Quality, identifies no significant predicted air quality effects on all receptors. Any potential changes remain minor at population level.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: The route option is within close proximity to key community of Inverurie and it is therefore expected that 100-500 people will be impacted upon.</p> <p>Exposure: Medium</p> <p>Impacted population includes a higher than average proportion of groups who are more likely to experience beneficial or adverse health effects as a result of the impact in question as the ScotPHO (2020) data identifies higher than average hospital admissions for asthma in the intermediate zone of Inverurie.</p> <p>Population vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Negative: Moderate adverse effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
Noise	<p>Chapter 11, Noise and Vibration, identifies both adverse and beneficial impacts on residential receptors. No significant effects at population level are expected.</p> <p>Magnitude: Low, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is expected that between 100-500 people will be impacted upon for this route option.</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include an average or close to average proportion of groups who are more likely to experience health effects as a result of the impact in question.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Medium</p>	<p>Neutral: Minor adverse health effects at population level.</p>
Landscape Amenity	<p>Chapter 15, Visual Effects, identifies multiple significant effects on human health. Receptors in relation to landscape amenity include Overdon Care Home, River Urie, the community of Inverurie, Mill Wood and multiple pockets of existing ancient woodland.</p> <p>In addition to the facilities identified, multiple core paths and existing local routes (GA2, GG52, 408.04, 408.05, 408.06) are expected to experience adverse effects due to severance of these local routes and core paths. This severance may impact upon the use of facilities identified above.</p> <p>Due to the amount of facilities and proximity of the existing A96, this change is likely to be perceived as moderate by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, adverse</p>	<p>Population exposure: Level of exposure is expected over a relatively localised area. It is expected that 100-500 people will be impacted upon for this route option due to the impact upon local routes and core paths.</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include a low proportion of groups who are more likely to experience adverse health effects as a result of impacts on visual amenity.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Minor adverse effects at population level</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/ Severance of Community Land, Assets and Employment</p>	<p>Chapter 12, People and Communities, identifies major adverse changes to Kemnay Woods-Roquharold Hill and surrounding woodland (woodland walks), River Urie, the community of Inverurie and Newseat walks and trails.</p> <p>It is expected that this loss of woodland used by the community will be perceived as major by the wider population.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a small number of people (e.g. fewer than 100).</p> <p>Exposure: Low</p> <p>Population vulnerability: The affected population is likely to include an average or close to average proportion of groups who are more likely to experience adverse health effects as a result of impacts on access to / severance of community land and facilities.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse effects at population level</p>
	<p>Chapter 12, People and Communities, identifies major beneficial effects from the reduction in traffic on the existing A96.</p> <p>This reduction is expected to improve amenity and access between local communities, decreasing stress from congestion and improving quality of life. This improvement is expected to be particularly beneficial for the community of Inverurie.</p> <p>This reduction is considered to be a substantial change that will be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, beneficial</p>	<p>Population exposure: Exposure is expected to affect a major number of people; over 500 will be adversely affected from the reduction in traffic flows.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on amenity and access between local communities, due to pockets of relatively higher levels of deprivation with regard to income, employment, health, education, housing and crime rates at the southern end of the route option.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings are expected to result in improved access to nearby employment opportunities, particularly in the local community of Inverurie.</p> <p>This change is expected to be perceived by the population as moderate.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate- major number of people; over 500 will be adversely affected from the proposed reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population includes an above average proportion of groups who are more likely to experience beneficial health effects as a result of impacts on access to employment opportunities, due to pockets of relatively higher levels of deprivation with regard to income, employment, health, education, housing and crime rates at the southern end of the route option.</p> <p>Vulnerability: High</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
	<p>Journey time savings resulting in improved access between communities. These savings will improve access to social networks, social venues and shops, particularly in the community of Inverurie. Key facilities within the community of Inverurie include Garioch Sports Centre, Inverurie Golf Club and Garioch Indoor Bowling Centre.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: Major, beneficial</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people; over 500 people will benefit from the proposed reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population has a varied vulnerability. The community of Inverurie has a number of key facilities and relatively good access to key services, whilst the nearby community of Port Elphinstone is likely to maintain good access to these facilities.</p> <p>Smaller settlements in the north of the route option have been identified as rating poorly with regard to access to services.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial effects on human health at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility/severance, open green space</p>	<p>Chapter 12, People and Communities, identifies major adverse effects due to partial loss of land and changes to amenity and access for Kemnay Woods-Roquharold Hill and surrounding woodland (woodland walks).</p> <p>It is expected that visitors to Newseat walks and trails will also experience major adverse effects as well as moderate impacts upon the Crichtiebank Business Centre Wood.</p> <p>Adverse impacts are expected on multiple core paths and existing local routes (GG55, 408.04R, 408.05P, 408.04, 408.06, GA3, GA2).</p> <p>Due to the potential loss of woodland, this change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in duration.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: Exposure is expected to affect a moderate-large number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Negative: Moderate adverse health effects at population level.</p>

Criteria / Health Determinant	Magnitude of Predicted Impacts on Health Determinant	Sensitivity of Population	Significance of Predicted Health Effects
<p>Accessibility / severance, WCH facilities</p>	<p>Chapter 12, People and Communities, identifies significant adverse effects on multiple core paths and existing local routes.</p> <p>Core paths and local routes GG55, 408.04R, 408.05P, 408.04, 408.06, GA2 and GA3 are expected to experience an adverse effect to amenity or perceived safety of journeys due to changes in existing views/ traffic flow.</p> <p>This change is expected to be perceived by the population as major.</p> <p>This change is expected to be long term or permanent in nature.</p> <p>Magnitude: High, adverse</p>	<p>Population exposure: A medium level of exposure over a localised area, affecting a moderate number of people (e.g. 100-500).</p> <p>Exposure: Medium</p> <p>Population vulnerability: The affected population is likely to include a below average proportion of groups who are more likely to experience adverse health effects as a result of the impact in question.</p> <p>Vulnerability: Low</p> <p>Overall sensitivity: Low</p>	<p>Neutral: Moderate adverse health effects at population level.</p>
<p>Accessibility/severance, healthcare facilities</p>	<p>Journey time savings are expected to result in improved access to key existing healthcare facilities within the nearest town of Inverurie. These include Inverurie Health Centre and Inverurie Hospital.</p> <p>This change is expected to be considered by the population as moderate.</p> <p>The change is expected to be long term or permanent in nature.</p> <p>Magnitude: Medium, beneficial</p>	<p>Population exposure: Exposure is expected to affect a large number of people; over 500 people will benefit from the proposed reduction in journey times.</p> <p>Exposure: High</p> <p>Population vulnerability: The affected population has a varied vulnerability. The communities of Inverurie and Port Elphinstone have a good number of and relatively good access to key services, whilst smaller settlements in the north of the route option have been identified as rating poorly with regard to access to services.</p> <p>Vulnerability: Medium</p> <p>Overall sensitivity: High</p>	<p>Positive: Major beneficial health effects at population level.</p>

- 22.6.19 Table 22.14 predicts multiple beneficial effects on human health from the Orange route option, with major beneficial effects predicted as a result of the reduction in traffic flows on the existing A96 improving amenity and access between local communities and reducing stress from congestion. Major beneficial effects are also anticipated as a result of journey time savings improving access to employment opportunities, community services and facilities and healthcare services. Improved access to services is particularly beneficial to the rural communities in the northern area of this route option as the baseline data shows that access to services is currently relatively poor.
- 22.6.20 Moderate adverse effects are predicted in relation to air quality due to existing higher than average hospital admissions for asthma in the intermediate zone of Inverurie making the population more vulnerable to even low, adverse changes to air quality.
- 22.6.21 Moderate adverse effects are also anticipated in relation to accessibility/severance of open green space as a result of partial loss of land and changes to amenity and access for Kemnay Woods- Roquharold Hill and surrounding woodland (woodland walks); impacts on visitors to Newseat walks and trails; impacts upon the Crichtiebank Business Centre Woods; and impacts on multiple core paths and existing local routes. The long-term permanent loss of these areas of open spaces, and walking routes may result in the loss of opportunities for physical activity and reduced access to green/open space which may impact on mental health and wellbeing.

22.7 Cumulative Effects

- 22.7.1 A review of the proposed future development areas has been undertaken to identify any potential for cumulative effects to occur on human health.
- 22.7.2 Most of the proposed developments identified are small scale developments (for instance, construction of single dwelling houses, general purpose agricultural storage barns/sheds and pathways, and erection of signage) which will have a minimal cumulative effect on population health when considered in combination with the route options.
- 22.7.3 There are however a number of larger development proposals identified in the Aberdeenshire LDP Settlement Statements, particularly around the towns of Inverurie and Kintore, which may give rise to cumulative effects on population health within the route option study areas. These are listed in Chapter 9, Policies and Plans.
- 22.7.4 The developments listed in Chapter 9 have already been taken into account in the future traffic flows that inform the air quality and noise assessments, so are inherent to those assessments, and the way they have informed the assessment of predicted health effects.
- 22.7.5 The People and Communities assessment in Chapter 12 has identified a cumulative effect for the assessment for the Inverurie & Port Elphinstone/OP4 & OP11: allocation within the study area of the Orange route option. The Inverurie & Port Elphinstone/OP4 & OP11: allocation is for 737 houses, business and industrial uses, community facilities and retail use. These developments include land take from a small area of what has been considered community used woodland west of Port Elphinstone. There is also a core path (Old Kemnay Road (Kemnay - Inverurie) - Proposed Link) that runs through OP4. The Orange route option already has adverse impacts on both of these receptors therefore this would

adversely add to the impact however it is not thought to be significant. This development would also include business and industrial uses, houses, community facilities including a primary school, retail and associated infrastructure and therefore would also have beneficial impacts to the community in that respect. Therefore, it would have both minor adverse and minor beneficial effects associated with it.

- 22.7.6 It is assessed that the cumulative effect of the Inverurie & Port Elphinstone/OP4 & OP11 allocation would be a minor adverse effect on health as a result of changes in access to/severance of community land; but minor to moderate beneficial effects as a result of increased access to a greater range of community facilities and retail services.
- 22.7.7 It also anticipated that the Old Rayne OP1/ OP2 allocations for houses, business and retail use could have a cumulative minor beneficial effect on health within the study area of the brown route option, and to a lesser extent the pink route option, as a result of improved access to shops in this rural area.

22.8 Summary of Effects

- 22.8.1 Tables 22.9 to 22.14 provide an overview of the predicted positive, neutral and negative effects in relation to human health. These tables have assessed information provided within a number of other environmental discipline chapters, whilst applying a judgement on likely outcomes for population health.
- 22.8.2 The tables demonstrate that changes in air quality and noise exposure are not expected to reach a level that will impact upon population health for the majority of the route options. This is largely due to the rural nature of the study area, and low population density. However, both route options for Pitcaple to Kintore (Violet and Orange) identify the potential for moderate effects on health due to the baseline data identifying higher than average hospital admissions for asthma in the intermediate zone of Inverurie. Health effects are likely to be beneficial for those populations alongside the existing A96 that would experience improvements in air quality but adverse for those closer to the new route options. It should be noted that impacts on air quality are assessed as minor adverse in magnitude in the Air Quality assessment (Chapter 10). It is the extent of exposure and the vulnerability of the population that already experiences rates of asthma higher than average hospital admissions for asthma, that have led to an assessment of moderate adverse with regard to potential health effects.
- 22.8.3 All route options predict minor adverse effects health effects as a result of impacts on landscape amenity. Minor effects are predicted on areas of woodland, existing communities, paths and cycle routes as well as a care home and farmhouse. This has the potential to influence people's satisfaction with their environment and their use of outdoor space for recreation and physical activity and may influence mental well-being.
- 22.8.4 All route options experience positive impacts in relation to access to community land, assets and employment due to the predicted traffic reduction on the existing A96. It is predicted that this reduction will not only decrease congestion and improve journey times but will improve access between communities and community facilities, employment opportunities and social networks and venues.

This would be likely to have beneficial effects for mental health associated with improved opportunities for social interaction.

- 22.8.5 Most route options predict some adverse health effects resulting from impacts on areas of community land, assets and employment. These include minor adverse health effects resulting from the loss of land at Culsalmond Community Centre (Cyan and red route options); major adverse health effects resulting from losses at Durno and Logie Woodland (Pink and Brown route options); minor adverse effects from impacts on Overdon Care Home, Fyfe House (Girl Guides), and Hogholm Farmhouse and Stables (Violet route option); and moderate adverse health effects as a result of impacts to Kemnay Woods- Roquharold Hill and surrounding woodland (woodland walks), River Urie, the community of Inverurie and Newseat walks and trails (Orange route option). Community land and assets provide opportunities for people to engage in social interaction with positive benefits for mental health. Losses of assets or impacts on the quality of assets may impact on social interactions.
- 22.8.6 The effect of route options differs when accessing open green space. The Violet route has no adverse effects on human health. Cyan and Red route options have only minor adverse effects on human health. The Pink and brown route option results in moderate adverse effects as a result of the losses at Durno and Logie Woodland and impacts on core paths. Effects for the Orange route option are also moderate adverse as a result of the impacts on Kemnay Woods- Roquharold Hill and surrounding woodland (woodland walks), River Urie, the community of Inverurie and Newseat walks and trails. This has the potential to influence people's satisfaction with their environment and their use of outdoor space for recreation and physical activity and may influence mental well-being.
- 22.8.7 The Pink and Brown route options are predicted to have moderate adverse effects upon WCH facilities with expected severance across multiple core paths and existing local routes that may result in increased journey times and diversions of up to 900m in length. The Violet and Orange route options predict minor negative effects, whilst the Cyan and Red route options do not result in any impacts on WCH facilities.
- 22.8.8 All route options have predicted positive effects on health as a result of improved access to healthcare facilities due to increased road capacity, reduced congestion on the A96 and improved journey times. These changes will allow faster access to key healthcare facilities in Huntly and Inverurie such as Inverurie Hospital and Huntly Health Centre. These will be particularly beneficial for those more rural communities that have been identified as currently having poor access to key services.

East of Huntly to Colpy

- 22.8.9 The predicted effects assessment identifies the same positive, neutral and negative predicted health effects for both the Cyan and Red route options.

Colpy to Pitcaple

- 22.8.10 Both route options have similar beneficial effects on health as a result of improved amenity and access between local communities, community services and facilities, and healthcare services.
- 22.8.11 Both route options have predicted adverse effects on health as a result of impacts on the Durno and Logie Woodland and the associated benefits of access to and enjoyment of open space. Both route options also impact on a number of local and core paths; although the Brown route option results in impacts on a greater number

of these routes. Overall, the Pink route option is considered to have slightly less impact on human health.

Pitcaple to Kintore

- 22.8.12 The assessment identifies multiple pockets of deprivation across Inverurie, which would be impacted by both the Violet and Orange route options. However, the lowest ranking data zones across a range of indicators are located in southern Inverurie (Inverurie South 01, 02 & 05) within closest proximity to the Orange route option. In these data zones the majority of assessed indicators, including employment, income, health, education, housing and crime rates experience higher levels of deprivation than elsewhere within this route option. The Orange route option may have some beneficial effects as a result of opening up access to employment opportunities for these communities, but existing high levels of deprivation could also exacerbate any adverse effects of the scheme due to increased population vulnerability.
- 22.8.13 There are no predicted health effects as a result of access to open green space from the Violet route option, compared with a range of moderate adverse effects in relation to accessibility/ severance of open green space along the Orange route option. Impacts on open space include the partial loss of land and changes to amenity and access for Kemnay Woods- Roquharold Hill and surrounding woodland (woodland walks); impacts on visitors to Newseat walks and trails; impacts upon the Crichtiebank Business Centre Woods; and impacts on multiple core paths and existing local routes.
- 22.8.14 Overall, the Violet route option is considered to have less impact on human health.

22.9 Scope of DMRB Stage 3 Assessment

- 22.9.1 The DMRB Stage 3 assessment for human health will be undertaken in accordance with DMRB (Volume 11, Section 3, Part 6, LA 112 Population and Human Health).
- 22.9.2 The following determinant of health has been scoped out of the DMRB Stage 3 assessment:

- Sources of pollution
 - Sources of pollution: light - Potential impacts on residential properties from lighting at junctions. The effects of junction lighting are included within the overall description of visual effects and discussed under landscape amenity.
 - Sources of pollution: odour - No potential odour impacts identified. If new odour impacts are identified during the course of the DMRB Stage 3 assessment, this may be scoped back in.
 - Sources of pollution: contamination - Potential impacts identified and mitigated against for human health from ground and water contamination. This will be a legal requirement. It is assumed that the project will comply with control measures required by the Scottish Environment Protection Agency, Scottish Water, Aberdeenshire Council and relevant health and safety standards. Risks to human health from contaminated land will be assessed within Chapter 19, Geology, Soils, Contaminated Land.

22.9.3 The DMRB Stage 3 assessment will include a more detailed assessment of the Preferred Option for the following:

- Air quality
 - Update the baseline profile, including gathering further information on any potentially air quality sensitive receptors in the study area;
 - Review the air quality assessment for DMRB Stage 3 and amend the assessment of health effects accordingly;
 - Update and define the level of significance impacts for health effects arising from changes in air quality, taking into account embedded mitigation and;
 - Propose appropriate mitigation measures based on more detailed assessments.
- Noise
 - Update the baseline profile, including gathering further information on any potentially noise sensitive receptors in the study area.
 - Review the noise assessment for DMRB Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in noise, taking into account embedded mitigation, and;
 - Propose appropriate mitigation measures based on more detailed assessments.
- Landscape amenity
 - Update the baseline profile, including gathering further information on any sensitive receptors in the study area.
 - Review the visual effects and landscape assessments for Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in landscape amenity, taking into account embedded mitigation, and;
 - Propose appropriate mitigation measures based on more detailed assessments.
- Accessibility/ severance of community land, assets and employment
 - Update the baseline profile, including gathering further information on any sensitive receptors in the study area.
 - Review the outcomes of the assessment on land-use and accessibility for Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in accessibility/ severance of community land, assets and employment, taking into account embedded mitigation, and;

- Propose appropriate mitigation measures based on more detailed assessments.
- Accessibility/ severance open green space
 - Update the baseline profile, including gathering further information on any sensitive receptors in the study area.
 - Review the outcomes of the assessment on land-use and accessibility for Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in accessibility/ severance open green space, taking into account embedded mitigation, and;
 - Propose appropriate mitigation measures based on more detailed assessments.
- Accessibility/severance of WCH facilities
 - Update the baseline profile, including gathering further information on any sensitive receptors in the study area.
 - Review the outcomes of the assessment on land-use and accessibility for Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in accessibility/severance of WCH facilities, taking into account embedded mitigation, and;
 - Propose appropriate mitigation measures based on more detailed assessments.
- Accessibility/ severance of healthcare facilities
 - Update the baseline profile, including gathering further information on any sensitive receptors in the study area.
 - Review the outcomes of the assessment on land-use and accessibility for Stage 3 and amend the assessment of health effects accordingly.
 - Update and define the level of significance impacts for health effects arising from changes in accessibility/ severance of healthcare facilities, taking into account embedded mitigation, and;
 - Propose appropriate mitigation measures based on more detailed assessments.

22.9.4 Further consultation will be undertaken with appropriate key consultees to discuss the impact of the Preferred Option and to incorporate appropriate mitigation into the scheme design.

23 Summary of Cumulative Effects

23.1 Introduction and Background

- 23.1.1 This chapter summarises the findings of the assessment of potentially significant cumulative effects which has been undertaken to support the route options assessment. A summary of the environmental assessment of the route options is set out in Volume 3, Part 5, Chapter 27, Assessment Summary and Preferred Option Recommendation.
- 23.1.2 The approach to assessment of cumulative effects is set out in Chapter 8, Introduction and Approach to Environmental Assessment. The assessment has been undertaken in accordance with HA 205/08 Assessment and Management of Environmental Effects Chapter 2 Part 4 Determining Significance of Cumulative Effects. Within each topic chapter, the cumulative assessment has focused on potentially significant effects in combination with future developments identified in the Aberdeenshire LDP 2017.
- 23.1.3 The in-combination effects, or multiple effects of each route option considers the receptors identified within each topic chapter. The study area for the cumulative assessment is taken as the outermost boundary of all study areas for the topic chapter assessments within Chapter 9, Policies and Plans to Chapter 22, Human Health. At DMRB Stage 2 the level of information and assessment does not enable the in-combination effects at all individual receptors to be assessed and further detailed assessment of cumulative effects will be undertaken at DMRB Stage 3.
- 23.1.4 The traffic modelling for the environmental assessment assumes that full dualling of the A96 between Inverness and Aberdeen is completed. This has informed some parts of the environmental assessment. Future land use change and its effects on traffic generation and demand has been accounted for in the air quality, and noise and vibration assessments which are based on the traffic model outputs.

23.2 Cumulative Effects with Other Development Proposals

- 23.2.1 The potential for significant cumulative effects of the route options in combination with other development proposals, identified in Chapter 9 Policies and Plans, has been assessed for each environmental topic and identified in the predicted effects sections of Chapters 9 to 22. The assessments identify, at a high level, whether potentially significant cumulative effects would influence the environmental findings for each route option.
- 23.2.2 A summary of the predicted significant cumulative effects in each topic is presented in Table 23.1.

Table 23.1 Summary of Cumulative Environmental Effects

Topic	Predicted Significant Cumulative Effects
Policies and Plans	<p>No significant cumulative effects are predicted.</p> <p>Information from the Aberdeenshire Local Development Plan 2017 land use allocations for future development has been used to inform each topic's assessment of cumulative effects. The assessments identify key areas where the development of long-term sites included in the LDP could have cumulative effects with the route options.</p>
Air Quality	<p>No significant cumulative effects are predicted.</p> <p>Cumulative effects have been considered in the end-to-end options assessments for predicted air quality effects. The assessments are based on traffic modelling data that includes traffic projections for predicted future development areas in the corridor.</p>
Noise and Vibration	<p>No significant cumulative effects are predicted.</p> <p>Cumulative effects have been considered in the end-to-end options assessments for predicted noise and vibration effects. The assessments are based on traffic modelling data that includes traffic projections for predicted future development areas in the corridor.</p>
People and Communities	<p>No significant cumulative effects are predicted.</p> <p>Cumulative effects are predicted along the Orange route option associated with future development at Inverurie and Port Elphinstone.</p>
Agriculture, Forestry, Sporting Interests	<p>Cumulative effects are predicted on prime agricultural land along the Violet route option. The route option passes close to proposed housing developments, which may result in significant cumulative loss of prime agricultural land.</p> <p>No other significant cumulative effects are predicted on the remaining route options.</p>
Materials	<p>No significant cumulative effects are predicted on material resources and waste generation.</p>
Visual Effects	<p>No significant cumulative effects are predicted.</p> <p>Cumulative visual effects are predicted on some receptors along parts of the options where potential wind farm proposals would also be visible. Receptors on high ground (Red route option) are more likely to be affected. Cumulative impacts are also predicted for some receptors along the Violet and Orange route options, where they are located close to future areas of development (Crichie on the Orange route option and Uryside, Portstown and Boynds Farm on the Violet route option).</p>

Topic	Predicted Significant Cumulative Effects
Cultural Heritage	<p>Significant cumulative effects are predicted on the setting of four heritage features located along the Orange route option where they are also in proximity to larger development proposals. These are Thainstone House Category B Listed Building (LB9152), Thainstone Policies Gate Lodge and Gate Pilks Category B Listed Building (LB9153), Broomend henge, standing stones and symbol stone (SM18) and Bruce's Camp, Hillfort (SM12523).</p> <p>No other significant cumulative effects are predicted on the remaining route options.</p>
Landscape	<p>No significant cumulative effects are predicted.</p> <p>Cumulative effects on the landscape are predicted along the Orange route option due to housing developments south of Inverurie, and along the Violet route option due to housing developments at Uryside, Portstown and Boynds Farm. The developments would form a new settlement edge to Inverurie but would not alter the landscape character.</p>
Nature Conservation	<p>The planned loss of approximately 22ha of long-established woodlands of plantation origin (LEPO) associated with mineral works at Tom's Forest Quarry is predicted to result in a significant cumulative effect with the Orange route option. The cumulative extent of woodland removal and works associated with the Orange route option is predicted to have a negative impact on wider-ranging woodland species such as pine marten and bats.</p> <p>No other significant cumulative effects are predicted on the remaining route options.</p>
Geology, Soils, Contaminated Land and Groundwater	<p>No significant cumulative effects are predicted on geology, soils, contaminated land or groundwater.</p>
Road Drainage and Water Environment	<p>No significant cumulative effects are predicted on road drainage and the water environment.</p>
Climate	<p>No significant cumulative effects are predicted on Climate.</p> <p>A cumulative assessment of greenhouse gas (GHG) would have to include all development projects in Scotland (as the impact of GHGs is not related to their emission location). For this reason, the approach for managing the cumulative GHG emissions across Scotland is through the adoption of carbon budgets as set by the Scottish Government. The GHG assessment for this scheme has considered whether the scheme materially impacts on Scotland's ability to meet its carbon reduction targets and carbon budgets for 2030.</p> <p>As a result of the trans-boundary nature of GHG, with individual projects assessing their impact against a national target, a specific cumulative assessment chosen from projects within a specific geographic location, is not considered relevant.</p> <p>The Climate Change Resilience assessment is concerned with the impact of climate change on the scheme itself, subsequently a cumulative assessment is not appropriate.</p>

Topic	Predicted Significant Cumulative Effects
Human Health	<p>It is predicted that the cumulative effect of Orange route option and the Inverurie & Port Elphinstone/OP4 and OP11 allocation would be a minor adverse effect on health as a result of changes in access to/severance of community land; but minor to moderate beneficial effects as a result of increased access to a greater range of community facilities and retail services.</p> <p>It is also predicted for the Pink and Brown route options that the Old Rayne OP1/ OP2 allocations for houses, business and retail use could have a cumulative minor beneficial effect on health as a result of improved access to shops in this rural area.</p> <p>No other significant cumulative effects are predicted.</p>

23.3 In-Combination Effects

23.3.1 In-combination environmental effects have been considered for each route option based on the findings of each topic within the environmental assessment and in particular, where significant effects are predicted. The assessment identifies where a concentration of significant effects is predicted on sensitive receptors such as key habitats, heritage features, important recreational areas and groups of residential properties. The findings of this assessment are considered below. Where significant effects are predicted, these will influence the scheme design development and mitigation at DMRB Stage 3.

East of Huntly to Colpy

23.3.2 There is potential for significant in-combination effects along the Cyan route option from the following:

- Loss of agricultural land;
- Loss of ancient woodland;
- Changes in visual amenity (receptors within 500m of the route option);
- Changes in traffic noise (receptors within 600m of the route option);
- Noticeable changes in landscape character around the Hill of Skares and at the village of Colpy;
- Changes to amenity around Morgan McVeighs Restaurant and Culsalmond Community Education Centre; and
- Changes to the setting of Colpy Cottages Palisaded Enclosure Scheduled Monument (SM1511).

23.3.3 There is potential for significant in-combination effects along the Red route option from the following:

- Loss of agricultural land;
- Loss of ancient woodland;
- Changes in traffic noise (receptors within 600m of the route option);
- Noticeable changes in landscape character around Saddle Hill, Hill of Foudland, the Hill of Skares and Hill of Bainshole; and

- Changes in visual amenity experienced by receptors at higher elevations, at the village of Colpy, Morgan McVeighs Restaurant and Culsalmond Community Education Centre.

Colpy to Pitcaple

23.3.4 There is potential for significant in-combination effects along the Pink route option around the Durno and Logie woodland area from the following:

- Loss of woodland resource and habitat;
- Changes in traffic noise (receptors within 600m of the route option);
- Severance (i.e. changes to journey lengths or additional bridge or underpass crossings) to key NMU routes; and
- Visual effects on sensitive receptors.

23.3.5 Some receptors outwith the Durno and Logie area will also experience the following:

- Visual effects and noise from increased traffic for example: Loch Inch Fishery, St Cloud, and Freefield House Non-Inventory Designed Landscape (NJ63SE0059);
- Loss of a large area of prime agricultural land; and
- Changes to the settings of four Scheduled Monuments: Durno Roman Camp (SM4123), The Law Cairn (SM12113), Newton of Lewesk Enclosure (SM12137) and Pitscurry Cairn (MS12302).

23.3.6 There is potential for significant in-combination effects along the Brown route option around the Durno and Logie woodland area and Logie House Estate due to the following:

- Loss of woodland resource and habitat;
- Changes in traffic noise;
- Severance to key NMU routes; and
- Visual effects on sensitive receptors.

23.3.7 Some receptors outwith the Durno and Logie area will also experience the following:

- Visual effects and noise from increased traffic for example: Loch Inch Fishery, Strathorn and Longcroft;
- Changes to the setting of two Scheduled Monuments Durno Roman Camp (SM4123) and Pitscurry Cairn (MS12302);
- Changes to setting of Logie House Non-Inventory Designed Landscape (NJ72NW01016);

- Visitors to the River Urie and Kellockbank Country Emporium and Coffee Shop are expected to experience adverse effects on amenity;
- Loss of a large area of prime agricultural land; and
- Requirements for compensatory flood storage could add to loss of Prime agricultural land.

Pitcaple to Kintore

23.3.8 There is potential for significant in-combination effects at receptors along the Violet route option from the following:

- Loss of prime agricultural land (Mainly around the Daviot, Uryside West and Uryside East Junctions);
- Loss of woodland (Keith Hall);
- Loss of habitats (Pitscurry LNCS);
- Visual intrusion (e.g. at the Daviot, Uryside West and Uryside East Junctions and the new large bridge structure River Don crossing);
- Changes in landscape character (E.g. Daviot, Uryside West and Uryside East Junctions and the new bridge structure over);
- Severance of key NMU routes around the Daviot Junction, Lethenty and the Tavelty Junction; and
- Changes in traffic noise.

23.3.9 The Orcadia equestrian facility will be affected by the Violet route option through loss of land, visual intrusion and changes in traffic noise. In addition, Category A Listed Bourtie House, Overdon Care Home, Fyfe House (Girl guide camp site), Hogholm Stables and Kintore Cemetery are predicted to experience significant adverse effects to amenity and/or journey length.

23.3.10 There is potential for significant in-combination effects along the Orange route option from the following:

- Loss of woodland;
- Loss of habitats (Pitscurry LNCS and River Don corridor);
- Visual intrusion related to new large bridge structures (River Don crossing and River Urie crossing at Inveramsay);
- Changes to landscape character;
- Changes in traffic noise;
- Severance of key NMU facilities at Kemnay Wood, Roquharold Hill and surrounding woodland; and
- Adverse effects on access and amenity predicted at Newseat walks and trails, and Crichtiebank Business Centre Woodland area.

23.3.11 In addition, changes in landscape character and traffic noise along the Orange route option will affect the setting of nine heritage features:

- Mains of Balquhain Stone Circle (SM3961);
- St Apolinaris' Chapel and Burial Ground (SM12118);
- Balquhain Castle (SM90);
- Dillyhill Enclosure (SM12195);
- Pitscurry Cairn (SM12302);
- Bruce's Camp Hillfort (SM12523);
- Category B Listed Thainstone House (LB9152);
- Thainstone House Non-Inventory Designed Landscape (NJ71ME0161); and
- Regionally Significant Mill of Pitcaple (NJ72NW0052).

23.4 End-to-End Options

23.4.1 The cumulative assessment for each route option has been reviewed to provide an assessment of the potential cumulative effects for each of the end-to-end options and this is presented in Table 23.2.

23.4.2 The end-to-end options are identified from the route options as follows:

- Cyan-Pink-Violet (C-P-V);
- Cyan-Pink-Orange (C-P-O);
- Cyan-Brown-Violet (C-Br-V);
- Cyan-Brown-Orange (C-Br-O);
- Red-Pink-Violet (R-P-V);
- Red-Pink-Orange (R-P-O);
- Red-Brown-Violet (R-Br-V); and
- Red-Brown-Orange (R-Br-O).

Table 23.2 Cumulative Effects for Each End-to-End Option

End-to-End Option	Potential Cumulative Effects
<p>C-P-V</p>	<p>There are potential combined changes in visual amenity and traffic noise for receptors within 500m of the option. There are also noticeable changes in landscape character around the Hill of Skares and at the village of Colpy, leading to changes to amenity around Morgan McVeighs Restaurant and Culsalmond Community Education Centre and affecting the setting of Colpy Cottages Palisaded Enclosure Scheduled Monument.</p> <p>Around the Durno and Logie woodland area there is loss of woodland resource and habitat, changes in traffic noise, severance to key NMU routes (i.e. changes to journey lengths or additional bridge or underpass crossings) and visual effects. Outwith this area some receptors will experience visual effects and noise from increased traffic, for example: Loch Inch Fishery, St Cloud, and Freefield House Non-Inventory Designed Landscape and the setting of four Scheduled Monuments.</p> <p>There is loss of prime agricultural land (mainly around the Daviot, Uryside West and Uryside East Junctions), loss of woodland (Keith Hall) and loss of habitats at Pitscurry LNCS. There would be visual intrusion at the Daviot, Uryside West and Uryside East Junctions and the new large bridge structure (River Don crossing) which also leads to changes to landscape character and severance of key NMU routes around the Daviot Junction, Lethenty and the Tavelty Junction. The Orcadia equestrian facility will be affected through loss of land, visual intrusion and changes in traffic noise. In addition, Category A Listed Bourtie House, Overdon Care Home, Fyfe House (Girl Guides), Hogholm Stables and Kintore Cemetery are predicted to experience significant adverse effects to amenity and/or access journey length.</p> <p>There is potential for additional loss of prime agricultural land and adverse effects to the landscape at Uryside, Portstown and Boynds Farm from future development.</p>

End-to-End Option	Potential Cumulative Effects
<p>C-P-O</p>	<p>There are potential combined changes in visual amenity and traffic noise for receptors within 500m of the option. There are also noticeable changes in landscape character around the Hill of Skares and at the village of Colpy, leading to changes to amenity around Morgan McVeighs Restaurant and Culsalmond Community Education Centre and affecting the setting of Colpy Cottages Palisaded Enclosure Scheduled Monument.</p> <p>Around the Durno and Logie woodland area there is loss of woodland resource and habitat, changes in traffic noise, severance to key NMU routes (i.e. changes to journey lengths or additional bridge or underpass crossings) and visual effects. Outwith this area some receptors will experience visual effects and noise from increased traffic, for example: Loch Insch Fishery, St Cloud, and Freefield House Non-Inventory Designed Landscape and the setting of four Scheduled Monuments.</p> <p>There is visual intrusion related to new large bridge structures (River Don crossing and River Urie crossing at Inveramsay) which also lead to changes to landscape character. There is loss of woodland and habitats from Pitscurry LNCS and the River Don corridor, with severance of key NMU facilities at Kemnay Wood, Roquharold Hill and the surrounding woodland leading to effects on access and amenity at Newseat walks and trails, and Crichtiebank Business Centre Woodland area. In addition, changes in landscape character and traffic noise along the Orange route option will affect the setting of nine cultural heritage features.</p> <p>There is potential for additional severance of NMU routes, and setting impacts on Thainstone House Category B Listed Building, Thainstone Policies Gate Lodge and Gate Pilks Category B Listed Building, Broomend henge, standing stones and symbol stone and Bruce’s Camp, Hillfort from future development at Inverurie and Port Elphinstone.</p> <p>The planned loss of woodlands of plantation origin (LEPO) associated with mineral works at Tom’s Forest Quarry is predicted to result in a significant cumulative effect.</p>

End-to-End Option	Potential Cumulative Effects
<p>C-Br-V</p>	<p>There are potential combined changes in visual amenity and traffic noise for receptors within 500m of the option. There are also noticeable changes in landscape character around the Hill of Skares and at the village of Colpy, leading to changes to amenity around Morgan McVeighs Restaurant and Culsalmond Community Education Centre and affecting the setting of Colpy Cottages Palisaded Enclosure Scheduled Monument.</p> <p>Around Durno and Logie woodland area and Logie House Estate there will be combined loss of woodland resource and habitat, changes in traffic noise, severance to key NMU routes (i.e. changes to journey lengths or additional bridge or underpass crossings) and visual effects on sensitive receptors. Some receptors outwith the Durno and Logie area will also experience visual effects and noise from increased traffic, for example: Loch Inch Fishery, Strathorn and Longcroft. There would be changes to the setting of two Scheduled Monuments Durno Roman Camp and Pitscurry Cairn, the setting of Logie House Non-Inventory Designed Landscape and visitors to the River Urie and Kellockbank Country Emporium and Coffee Shop are expected to experience adverse effects on amenity. Requirements for compensatory flood storage could add to the loss of prime agricultural land.</p> <p>There is loss of prime agricultural land (mainly around the Daviot, Uryside West and Uryside East Junctions), loss of woodland (Keith Hall) and loss of habitats at Pitscurry LNCS. There would be visual intrusion at the Daviot, Uryside West and Uryside East Junctions and the new large bridge structure (River Don crossing) which also leads to changes to landscape character and severance of key NMU routes around the Daviot Junction, Lethenty and the Tavelty Junction. The Orcadia equestrian facility will be affected through loss of land, visual intrusion and changes in traffic noise. In addition, Category A Listed Bourtie House, Overdon Care Home, Fyfe House (Girl Guides), Hogholm Stables and Kintore Cemetery are predicted to experience significant adverse effects to amenity and/or access journey length.</p> <p>There is potential for additional loss of prime agricultural land and adverse effects to the landscape at Uryside, Portstown and Boynds Farm from future development.</p>

End-to-End Option	Potential Cumulative Effects
<p>C-Br-O</p>	<p>There are potential combined changes in visual amenity and traffic noise for receptors within 500m of the option. There are also noticeable changes in landscape character around the Hill of Skares and at the village of Colpy, leading to changes to amenity around Morgan McVeighs Restaurant and Culsalmond Community Education Centre and affecting the setting of Colpy Cottages Palisaded Enclosure Scheduled Monument.</p> <p>Around Durno and Logie woodland area and Logie House Estate there will be combined loss of woodland resource and habitat, changes in traffic noise, severance to key NMU routes (i.e. changes to journey lengths or additional bridge or underpass crossings) and visual effects on sensitive receptors. Some receptors outwith the Durno and Logie area will also experience visual effects and noise from increased traffic, for example: Loch Inch Fishery, Strathorn and Longcroft. There would be changes to the setting of two Scheduled Monuments Durno Roman Camp and Pitscurry Cairn, the setting of Logie House Non-Inventory Designed Landscape and visitors to the River Urie and Kellockbank Country Emporium and Coffee Shop are expected to experience adverse effects on amenity. Requirements for compensatory flood storage could add to the loss of prime agricultural land.</p> <p>There is visual intrusion related to new large bridge structures (River Don crossing and River Urie crossing at Inveramsay) which also lead to changes to landscape character. There is loss of woodland and habitats from Pitscurry LNCS and the River Don corridor, with severance of key NMU facilities at Kemnay Wood, Roquharold Hill and the surrounding woodland leading to effects on access and amenity at Newseat walks and trails, and Crichtiebank Business Centre Woodland area. In addition, changes in landscape character and traffic noise along the Orange route option will affect the setting of nine cultural heritage features.</p> <p>There is potential for additional severance of NMU routes, Thainstone House Category B Listed Building, Thainstone Policies Gate Lodge and Gate Pilks Category B Listed Building, Broomend henge, standing stones and symbol stone and Bruce's Camp, Hillfort from future development at Inverurie and Port Elphinstone.</p> <p>The planned loss of woodlands of plantation origin (LEPO) associated with mineral works at Tom's Forest Quarry is predicted to result in a significant cumulative effect.</p>

End-to-End Option	Potential Cumulative Effects
<p>R-P-V</p>	<p>There are changes in visual amenity experienced by receptors at higher elevations, at the village of Colpy, Morgan McVeighs Restaurant and Culsalmond Community Education Centre and changes in traffic noise for receptors within 600m of the option. In addition there would be noticeable changes in landscape character around Saddle Hill, Hill of Foudland, the Hill of Skares and Hill of Bainshole.</p> <p>Around the Durno and Logie woodland area there is loss of woodland resource and habitat, changes in traffic noise, severance to key NMU routes (i.e. changes to journey lengths or additional bridge or underpass crossings) and visual effects. Outwith this area some receptors will experience visual effects and noise from increased traffic, for example: Loch Inch Fishery, St Cloud, and Freefield House Non-Inventory Designed Landscape and the setting of four Scheduled Monuments.</p> <p>There is loss of prime land agricultural land (mainly around the Daviot, Uryside West and Uryside East Junctions), loss of woodland (Keith Hall) and loss of habitats at Pitscurry LNCS. There would be visual intrusion at the Daviot, Uryside West and Uryside East Junctions and the new large bridge structure (River Don crossing) which also leads to changes to landscape character and severance of key NMU routes around the Daviot Junction, Lethenty and the Tavelty Junction. The Orcadia equestrian facility will be affected through loss of land, visual intrusion and changes in traffic noise. In addition, Category A Listed Bourtie House, Overdon Care Home, Fyfe House (Girl Guides), Hogholm Stables and Kintore Cemetery are predicted to experience significant adverse effects to amenity and/or access journey length.</p> <p>There is potential for additional loss of prime agricultural land and adverse effects to the landscape at Uryside, Portstown and Boynds Farm from future development.</p>

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23.4.3 From the assessment, the main cumulative effects are considered to be on:

- Habitats – from end-to-end options containing the Red and Orange route options;
- Prime agricultural land – from end-to-end options containing the Brown and Violet route options;
- Plans and policies – from end-to-end options containing the Violet and Orange route options; and
- Landscape and visual – from end-to-end options containing the Red, Brown or Violet route options.

23.4.4 The cumulative assessment at this stage does not take into account additional mitigation, and this will be developed during the detailed design for the Preferred Option at DMRB Stage 3.



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