



A96 Dualling Inverness to Nairn (including Nairn Bypass)

DMRB Stage 2 Scheme Assessment Report Volume 1 – Main Report Part 2 – Engineering Assessment

October 2014



A96 Dualling Inverness to Nairn (including Nairn Bypass)

DMRB Stage 2 Scheme Assessment Report

Part 2: Engineering Assessment

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4 Engineering Overview

4.1 Introduction

- 4.1.1 This chapter presents an overview of the relevant engineering design considerations in relation to the scheme.
- 4.1.2 The engineering assessment is then presented in two sections:
- Chapter 5 contains the engineering assessment overview for Inverness to Gollanfield; and
 - Chapter 6 contains the engineering assessment overview for the Nairn Bypass.
- 4.1.3 The engineering assessment considers each route option independently. However, for the discussion of some topics, grouping the route options is considered more appropriate, such as in relation to the River Nairn Bridge.
- 4.1.4 The engineering assessment presents key engineering issues and the findings of the assessment. A concluding statement is provided for each engineering issue which identifies if any route options are more or less favourable with regard to that issue.

4.2 Design Considerations

- 4.2.1 The following physical features have been considered during the design process and are shown on the engineering drawings in Volume 2 and the environmental figures in Volume 3 of this report:
- **Properties and local communities:** where possible, the route options have been developed seeking to minimise the need for property demolition and potential impacts on communities. Where possible, the horizontal alignments been developed to follow property boundaries to minimise severance.
 - **Existing topography:** the vertical geometry of each route option has been designed to minimise earthworks embankments and attempt to achieve an overall earthworks balance while still achieving the required headroom clearances to road, rail, and watercourse crossings, ensuring adequate road drainage and where possible, screening for adjacent properties.
 - **Aberdeen to Inverness Railway Line:** following consultation with Network Rail, the design of the railway crossings take into account the necessary headroom and span requirements to accommodate potential improvements to the Aberdeen to Inverness Railway Line.
 - **Public utilities:** there are two major underground pipelines, a major overhead power transmission line and other utilities described in paragraph 4.3.23 of this chapter.
 - **Environmental constraints:** there are a number of designated protected areas such as Sites of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Ramsar sites, Historic Battlefield and scheduled monuments.
 - **Local Road network:** the route options have been developed taking account of the existing local road network.
 - **Junctions and accesses:** there are numerous existing direct accesses onto the existing A96 and the local road strategy maintains access to all properties. The number of junctions and accesses is identified in Part 1, Chapter 2 (Existing Conditions) of this report.

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- 4.2.2 The design of route options have been developed using a ground survey model. Produced from a Light Detection And Ranging (LiDAR) survey purchased from a supplier in 2010, the model provides a 5m x 5m grid with a vertical level at every point. The survey does not recognise specific features associated with the existing topography such as trees and fences. Ordnance Survey MasterMap data has been used to identify these features and the mapping used in the study was obtained in March 2013, with further updates received in September 2013 and March 2014.
- 4.2.3 In March 2013, a detailed topographical survey was carried out to provide additional detail at each potential crossing point of the River Nairn. This information was required to progress the design development of the River Nairn crossing options.
- 4.2.4 A detailed ground topographical survey was completed in 2013 which will be used for development of the design of the preferred option at DMRB Stage 3.

4.3 Design Approach

- 4.3.1 Preliminary designs for each of the route options have been developed for the DMRB Stage 2 assessment. The preferred option will be developed further at the next stage of the assessment process (i.e. DMRB Stage 3 assessment). For the current Stage 2 assessment the following design principles have been applied.

Alignment and Road Layout

- 4.3.2 The DMRB sets out the principles to be used for coordinating various elements of road design, to ensure the layout as a whole is acceptable in terms of the safety, operation, economics and environmental effects. Inconsistencies in the layout can introduce ambiguity, and as such continuity of road category is preferable where practicable.
- 4.3.3 For a Dual 2 Lane Carriageway All Purpose (D2AP) road, three categories of road are described, Categories 5, 6 and 7A. The requirements in terms of access and junction treatments for each category are outlined in Table 4 of TD 9/93 of the DMRB and the requirements of road category 7A are reproduced in Table 4.1.

Table 4.1 Rural Road Layouts (Based on TD 9/93 Table 4)

Category	Type of Road	Edge Treatment	Access Treatment	Minor Road Treatment	Major Junction Treatment
7A	D2AP	1m hard strips	No access except isolated existing access with left turns only. Clearway.	No minor junctions at-grade. No gaps in the central reserve.	Full grade separation.

- 4.3.4 Category 7A has been adopted for the A96 Inverness to Aberdeen Dualling programme to meet the aspirations of the Scottish Ministers for a high quality dual carriageway between Scotland's two most northern cities. Category 7A is the highest category for a dual carriageway all-purpose road, where all junctions shall be grade separated. A smooth flowing alignment is required for sustained high speeds, which is accomplished using a set of design principles to achieve a satisfactory alignment.
- 4.3.5 As described in Part 1, Chapter 2 (Existing Conditions) of this report, the 850m section of the existing A96 from Raigmore Interchange to the at-grade roundabout for the Inverness Retail Park is already dual carriageway with a speed limit of 50mph extending to east of the Smithton roundabout. The section of the A96 between Raigmore Interchange and the Inverness Retail Park roundabout is outside the extents of this Scheme, and will be retained.

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- 4.3.6 The route options have been designed in accordance with the DMRB, in particular the following technical guidance and design standards as applicable:
- TD 9/93 Highway Link Design;
 - TD16/07 Geometric Design of Roundabouts
 - TD 27/05 Cross-Sections and Headrooms;
 - TD 22/06 Layout of Grade Separated Junctions;
 - TD 41/95 Vehicular Access to All-Purpose Trunk Roads; and,
 - TD 42/95 Geometric Design of Major/Minor Priority Junctions.
- 4.3.7 The design of the local roads takes account of The Highland Council's Roads and Transport Guidelines for New Developments, though this has no basis in the DMRB.
- 4.3.8 The mainline alignment of all route options has been designed to a 120kph design speed in accordance with TD 9/93.
- 4.3.9 The following Rural All-Purpose Dual Carriageway (D2AP) cross-section has been adopted for the mainline design in accordance with TD 27/05:
- 7.3m carriageways;
 - 1.0m hardstrip on both sides of each carriageway;
 - 2.5m central reserve, with widening for visibility where required; and
 - 2.5m verges, with widening for visibility where required.
- 4.3.10 The headroom clearance at new structures over the dual carriageway and local roads under the dual carriageway at grade separated junctions will be a minimum of 6.45m. This provides the standard maximum clearance provided for a High Load Route in accordance with TD 27/05.
- 4.3.11 At the eastern extent of all Nairn Bypass route options the proposed dual carriageway will tie into the existing single carriageway. The tie-in has been designed in accordance with the guidance in TD 27/05 and TD 9/93.

Junctions

- 4.3.12 A strategy of providing only grade separated junctions has been adopted for this scheme as a result of the Scottish Governments "Infrastructure Investment Plan" (2011) which identified improving the connectivity between Inverness and Aberdeen as a strategic transport priority.
- 4.3.13 The junction configurations shown with each route option are indicative layouts at this stage, capable of maintaining/improving access between local and strategic connections. The preferred option junction configurations will be developed further at the DMRB Stage 3 assessment.

Local Roads

- 4.3.14 For each route option, an individual local road strategy has been developed for consideration and consultation has been undertaken with The Highland Council Roads Department. In general, a consistent approach has been adopted for each local road across all route options.
- 4.3.15 The local road strategy considers permeability of the proposed dual carriageway. It is proposed that many of the local roads will be maintained on bridges over or under the dual carriageway to mitigate potential community or agricultural land severance. However, to

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reduce the number of bridges which would increase costs and potential environmental impacts, where there is a reasonable diversion route it is proposed to stop up the local road. In other instances, it is proposed to provide a diversion route to a proposed bridge for another side road or at a grade separated junction.

Drainage

- 4.3.16 A preliminary drainage design has been carried out in accordance with the DMRB to identify potential outfalls, catchment areas and SuDS measures to attenuate or treat surface run-off, which will inform the engineering and environmental assessments of each route option.

Earthworks

- 4.3.17 A desk-based assessment of the likely ground conditions has been undertaken. The geotechnical assessment is based on the Preliminary Sources Study Report prepared by Atkins in 2010 and a subsequent Jacobs addendum in 2013. Other data sources include:

- British Geological Survey (BGS) 1:50,000 and 1:10,000 series geological maps;
- BGS historical borehole records;
- Historical mapping;
- Topographical mapping;
- As-built geotechnical information from the A96 Gollanfield railway bridge and the A96 Auldearn Bypass;
- Contaminated land assessment received from The Highland Council;
- Aerial Photography;
- Site Visits; and
- Peat probing carried out in Blàr Nam Fiadh peat bog in March 2013.

- 4.3.18 The geotechnical assessment was used to determine earthworks slopes to be implemented in the designs. The following earthworks slopes have been adopted:

- For embankments less than 5m high: 1m vertical in 2m horizontal (1V in 2H);
- For embankments between 5m and 10m high: 1V in 2.5H;
- For embankments over 10m high: 1V in 3H;
- For all embankments over alluvium: 1V in 3H; and
- For all cut slopes: 1V in 3H.

- 4.3.19 The potential for re-use of excavated material within the works and potential material acceptability has been assessed and is discussed in the geotechnical assessment of each route option.

Pavement Design

- 4.3.20 The preliminary pavement design, to inform the cost estimate, has been designed in accordance with the DMRB, in particular the following design standards:

- HD 24/06 Traffic Assessment; and
- HD 26/06 Pavement Design.

- 4.3.21 New and reconstructed sections of carriageway are to standard flexible pavement design in accordance with HD 26/06 with a 40 year design life. Pavement surfacing materials promoting reduced traffic noise and reduced surface spray in wet conditions will be

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considered at Stage 3 and it is noted that Transport Scotland's current pavement standards for Trunk Roads provide for these benefits.

Road Restraint Systems

4.3.22 An outline design for road restraint systems has been developed for inclusion in the cost estimates.

Utilities

4.3.23 There are a significant number of buried and overhead public and private utility services within the study area including:

- Scottish and Southern Electricity – Major sub-stations, Extra High Voltage, High Voltage, Medium Voltage and Low Voltage overhead and buried services;
- British Telecom – Overhead and buried services;
- Scottish Water supply network;
- Scottish Water sewer network;
- Scotia Gas – High and medium pressure pipeline including major above ground installations;
- Government Pipeline and Storage Systems – Underground fuel pipeline between Inverness and Lossiemouth;
- THUS – Major fibre-optic network; and
- Street lighting.

4.3.24 In accordance with the New Roads and Street Works Act (1991), C2 notices were issued to each of the utility providers to request details of their networks within the study area. This enabled potential clashes between route options and utility infrastructure to be identified. Where possible route options have been developed to avoid or minimise conflict with key utility services. Where such a conflict has been unavoidable a C3 notice has been issued to the utility provider requesting an outline design and costing for any necessary diversion or protection works.

Structures

4.3.25 All structure proposals described in this report comply with the DMRB and it is not envisaged that any Departures from Standard will be required at this stage of the scheme development in relation to the proposed structures.

4.3.26 Structures will be required for grade separated junctions, local road crossings, railway crossings, river and watercourses crossings, and drainage features. Outline design options have been prepared for the River Nairn crossing. This will be a major structure and is a significant cost item.

Non-Motorised Users

4.3.27 The following objectives have been set in terms of Non-Motorised User (NMU) provision for this scheme:

- Improve safety for NMU traffic within the study area;
- Enhance provision for NMUs in the A96 corridor with facilities to supplement the local Core Path Network, National Cycle Network and Green Networks;
- Provide suitable facilities for NMUs to cross the A96 dual carriageway;

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- Combine NMU crossings with junctions, accommodation works and local road/access crossings where possible;
- Provide grade separated crossings solely for NMUs where site specific considerations can be demonstrated;
- Maintain connectivity between communities and to amenities.

NMU provision on the preferred option will be designed and developed during the DMRB Stage 3 assessment.

5 Engineering Assessment– Inverness to Gollanfield

5.1 Introduction

5.1.1 This section of the report describes the findings of the engineering assessment of the eight route options between Inverness and Gollanfield. It includes a description of the engineering features of each route option including mainline alignment, proposed junctions and structures. The potential effects of each route option are discussed including effects on the local road network, geotechnics, and utilities.

5.1.2 The route options are shown on drawings B1557601/MLA/1100 to 1428 (Volume 2)

5.1.3 References used in this section of the report are included in Section 5.15 of this chapter.

5.2 Engineering Constraints

5.2.1 Each of the eight route options between Inverness and Gollanfield have been designed to take into consideration the following physical constraints:

- The topography of the area, which is generally low-lying ground, but gradually rising to the south;
- The existing A96 Aberdeen – Inverness Trunk Road corridor which is discussed in Part 1, Chapter 2 (Existing Conditions) of this report;
- Roundabouts at the Inverness Retail Park junction, the C1032 western junction to access Smithton, and the C1017 junction to access Inverness Airport;
- 17 junctions, 23 access and 33 field accesses along the existing A96;
- The existing local road network;
- The Aberdeen to Inverness Railway Line, which runs east to west through the study area to the north of and parallel to the existing A96. This is currently a single track but Network Rail is investigating options to twin track some elements of the line;
- The settlements of Smithton, Culloden and Balloch;
- Scattered residential development around the local road network;
- Inverness Airport and its access road;
- Agricultural holdings which are the predominant land use in the area;
- Local businesses including the Norbord timber processing facility;
- Areas of peat and alluvium deposits;
- The Scretan Burn and its associated flood plain, which flows on the east side of the Inverness Retail Park before continuing north, and passing below the existing A96, before feeding into the Moray Firth;
- The Cairnlaw Burn and its associated flood plain, which flows close to the south-east side of the roundabout at the C1032 western junction, under C1032 Barn Church Road, under the existing A96 near Milton of Culloden, and then under the Aberdeen to Inverness Railway Line and outfalls into the Moray Firth. North of the Aberdeen to Inverness Railway Line, the Cairnlaw Burn is joined by a tributary, which has a wide floodplain in the vicinity of Milton of Culloden;
- Environmentally significant areas (refer to Part 3 – Environmental Assessment) such as Sites of Special Scientific Interest (SSSI), areas of ancient woodland and Special Protected Areas (SPAs);

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- Significant areas of cultural heritage (refer to Part 3 – Environmental Assessment) such as listed buildings and scheduled monuments; and
- Public Utilities.

5.3 Engineering Description of Mainline Alignments

5.3.1 There is an existing dual carriageway from Raigmore Interchange to the Inverness Retail Park junction. East of the roundabout, the existing A96 is single carriageway. All route options in this section commence at the eastern side of Inverness Retail Park junction and run east to the settlement of Gollanfield, an approximate length of 14km. Chainages are measured from Raigmore Interchange, so all route options begin at ch850.

5.3.2 The eight route options for this section of the scheme are described in detail below. The descriptions follow the alignments eastbound, from Inverness to Gollanfield.

Route Option 1A

5.3.3 Route Option 1A is detailed in drawings B1557601/MLA/1100 to 1114 (Volume 2). This route option is 14.2km in length.

5.3.4 East of the Inverness Retail Park junction, the route option diverges south-west from the existing A96 and rises on embankment to pass over the existing western end of the C1032 Barn Church Road, which would form the proposed Smithton Junction. Once beyond Barn Church Road the alignment falls to approximately existing ground level past Milton of Culloden.

5.3.5 From Milton of Culloden to Allanfearn, the route option is on the line of the existing A96 Aberdeen – Inverness Trunk Road. Under this route option, all existing private accesses and junctions on this section of the existing A96 are proposed to be stopped up and alternative private accesses provided. At Allanfearn the existing A96 turns sharply to the right, while this route option continues offline to the north of the existing A96 single carriageway. A new link is proposed near Lower Cullernie Farm, crossing over the proposed dual carriageway and the Aberdeen to Inverness Railway Line on bridges. This would provide access from the existing A96 to Alturle Point, the waste water treatment works, Redhill Farm, and Lower Cullernie Farm.

5.3.6 Near the eastern end of the C1032 Barn Church Road, a new junction is proposed which is referenced as Newton Junction A. As the proposed dual carriageway crosses existing A96 approximately 400m to the east of the proposed Newton Junction A, this junction connects to the existing A96 on both the north and south sides as well as connecting to the C1032.

5.3.7 The proposed route option continues north-east close to the existing A96, and passes between it and Morayston House, south of the existing A96. At the Norbord timber processing facility, the proposed dual carriageway crosses the existing A96, which is realigned over the proposed dual carriageway. A 1.2km private access to Morayston House is proposed, which connects to the existing single carriageway east of its crossing of the proposed dual carriageway.

5.3.8 The route option continues north-west close to existing ground level from the Norbord timber processing facility through Tornagain Wood to the C1017 Kerrowgair – Croy Road. The C1020 Dalcross Station Road from Petty Church to a railway level crossing is severed by this route option, so it is proposed to realign this road over the proposed dual carriageway.

5.3.9 At the C1017 Kerrowgair – Croy Road, a 'diamond' junction is proposed, which is referenced as Mid Coul Junction A. This would serve Inverness Airport, Mid Coul, Croy and also Tornagain. The alignment is in slight cutting through this junction which facilitates the level

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difference required for the grade separated junction which crosses above the main carriageway.

- 5.3.10 On exit from Mid Coul Junction, the route option turns in an easterly direction on a 1020m radius right hand curve towards the existing A96. A 1440m radius left hand curve brings the route option back onto the line of the existing A96 at Brackley.
- 5.3.11 The final section of the route option travels through the proposed Brackley Junction on the line of the existing A96 at approximately existing ground level. It is proposed that the existing A96 would form the westbound carriageway with new eastbound lanes constructed to the north. A single carriageway link to the south of the existing A96 is proposed to connect the existing A96 to the proposed Brackley Junction, but there is no proposed parallel single carriageway to the east of the proposed Brackley Junction.

Route Option 1A – Morayston Variant

- 5.3.12 Route Option 1A (MV) is detailed in drawings B1557601/MLA/1120, 1124 to 1127 (Volume 2). This route option is 14.5km in length and only differs from Route Option 1A between Newton and Kerrowaird.
- 5.3.13 At Newton, after crossing the existing A96, the Morayston Variant turns east on a 1440m radius right hand curve. Instead of a junction at the eastern end of the C1032 Barn Church Road, this route option connects to the local road network with a proposed grade separated junction near the existing junction of the B9039 Newton – Castle Stuart – Ardersier Road and the existing A96. This junction is referenced as Newton Junction C. Due to the topography to the south of the existing A96, the dual carriageway is climbing and on embankment as it passes through Newton Junction C.
- 5.3.14 A left hand 1020m curve takes the route option back towards the existing A96, bypassing Morayston to the south. The proposed route option follows the existing topography through most of this curve, rising to its highest point near Morayston House, before falling towards the existing A96.
- 5.3.15 At Kerrowaird, the proposed route option curves right again on a 1020m radius curve. It crosses over the existing A96 on an embankment, but a minor realignment of the existing A96 to the south is proposed to keep it open for local access.

Route Option 1B

- 5.3.16 Route Option 1B is detailed in drawings B1557601/MLA/1200 to 1214 (Volume 2). This route option is 13.9km in length.
- 5.3.17 East of the Inverness Retail Park junction, the route option diverges south-west from the existing A96 and rises on embankment to pass over the existing western end of the C1032 Barn Church Road, which would form the proposed Smithton Junction. Once beyond Barn Church Road the alignment falls to approximately existing ground level past Milton of Culloden.
- 5.3.18 From Milton of Culloden to Allanfearn, the route option is on the line of the existing A96 Aberdeen – Inverness Trunk Road. Under this route option, all existing private accesses and junctions on this section of the existing A96 are proposed to be stopped up and alternative private accesses provided. At Allanfearn the existing A96 turns sharply to the right, while this route option continues offline to the north of the existing A96 single carriageway. A new link is proposed near Lower Cullernie Farm, crossing over the proposed dual carriageway and the Aberdeen to Inverness Railway Line on bridges. This would provide access from the existing A96 to Alturle Point, the waste water treatment works, Redhill Farm, and Lower Cullernie Farm.

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- 5.3.19 Near the eastern end of the C1032 Barn Church Road, a new junction is proposed which is referenced as Newton Junction A. As the proposed dual carriageway crosses existing A96 approximately 400m to the east of the proposed Newton Junction A, this junction connects to the existing A96 on both the north and south sides as well as connecting to the C1032.
- 5.3.20 The proposed route option continues north-east close to the existing A96, and passes between it and Morayston House, south of the existing A96. At the Norbord timber processing facility, the proposed dual carriageway crosses the existing A96, which is realigned over the proposed dual carriageway. A 1.2km private access to Morayston House is proposed, which connects to the existing single carriageway east of its crossing of the proposed dual carriageway.
- 5.3.21 The route option continues north-west close to existing ground level from the Norbord timber processing facility through Tornagain Wood to the C1017 Kerrowgair – Croy Road. The C1020 Dalcross Station Road from Petty Church to a railway level crossing is severed by this route option, so it is proposed to realign this road over the proposed dual carriageway.
- 5.3.22 Through Tornagain Wood, the proposed route option joins the line of the existing A96 and continues online for approximately 1.3km. To maintain local road connectivity, the existing single carriageway is proposed to be realigned over a length of 2.4km, to the south of Mid Coul. The C1017 junction, which is the existing roundabout providing access Inverness Airport and Mid Coul, is proposed to be replaced with a grade separated junction, referenced as Mid Coul Junction B.
- 5.3.23 East of Mid Coul, the proposed route option is then offline for approximately 1.0km because the existing A96 single carriageway contains a below standard right-left S-curve. The proposed route option also has a right-left S-curve, but as it is to a higher standard, it is north of the existing A96
- 5.3.24 The final section of the route option travels through the proposed Brackley Junction on the line of the existing A96 at approximately existing ground level. It is proposed that the existing A96 would form the westbound carriageway with new eastbound lanes constructed to the north. A single carriageway link to the south of the existing A96 is proposed to connect the existing A96 to the proposed Brackley Junction, but there is no proposed parallel single carriageway to the east of the proposed Brackley Junction.

Route Option 1B – Morayston Variant

- 5.3.25 Route Option 1B (MV) is detailed in drawings B1557601/MLA/1220, 1224 to 1228 (Volume 2). This route option is 14.2km in length and only differs from Route Option 1B between Newton and Kerrowaird.
- 5.3.26 At Newton, after crossing the existing A96, the Morayston Variant turns east on a 1440m radius right hand curve. Instead of a junction at the eastern end of the C1032 Barn Church Road, this route option connects to the local road network with a proposed grade separated junction near the existing junction of the B9039 Newton – Castle Stuart – Ardersier Road and the existing A96. This junction is referenced as Newton Junction C. Due to the topography to the south of the existing A96, the dual carriageway is climbing and on embankment as it passes through Newton Junction C.
- 5.3.27 A left hand 1020m curve takes the route option back towards the existing A96, bypassing Morayston to the south. The proposed route option follows the existing topography through most of this curve, rising to its highest point near Morayston House, before falling towards the existing A96.
- 5.3.28 At Kerrowaird, the proposed route option curves right again on a 2040m radius curve. It crosses over the existing A96 close to ground level, and so the existing A96 is realigned over the dual carriageway to maintain local access.

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Route Option 1C

- 5.3.29 Route Option 1C is detailed in drawings B1557601/MLA/1300 to 1314 (Volume 2). This route option is 14.2km in length.
- 5.3.30 East of the Inverness Retail Park junction, the route option diverges south-west from the existing A96 and rises on embankment to pass over the existing western end of the C1032 Barn Church Road, which would form the proposed Smithton Junction. Once beyond Barn Church Road the alignment falls to approximately existing ground level past Milton of Culloden.
- 5.3.31 East of Milton of Culloden, the route option passes on a 1020m radius curve, away from the existing A96, to the south of Allanfearn. This is followed by a short left hand 1020m radius curve.
- 5.3.32 The route option is slightly below existing ground level where it crosses the eastern end of the C1032 Barn Church Road, near the existing C1032 eastern junction. A new grade separated junction, Newton Junction B, is proposed over the dual carriageway to connect to the C1032 to the south and the existing A96 to the north.
- 5.3.33 The proposed route option continues north-east close to the existing A96, and passes between it and Morayston House, south of the existing A96. At the Norbord timber processing facility, the proposed dual carriageway crosses the existing A96, which is realigned over the proposed dual carriageway. A 1.2km private access to Morayston House is proposed, which connects to the existing single carriageway east of its crossing of the proposed dual carriageway.
- 5.3.34 The route option continues north-west close to existing ground level from the Norbord timber processing facility through Tornagain Wood to the C1017 Kerrowgair – Croy Road. The C1020 Dalcross Station Road from Petty Church to a railway level crossing is severed by this route option, so it is proposed to realign this road over the proposed dual carriageway.
- 5.3.35 At the C1017 Kerrowgair – Croy Road, a 'diamond' junction is proposed, which is referenced as Mid Coul Junction A. This would serve Inverness Airport, Mid Coul, Croy and also Tornagain. The alignment is in slight cutting through this junction which facilitates the level difference required for the grade separated junction which crosses above the main carriageway.
- 5.3.36 On exit from Mid Coul Junction, the route option turns in an easterly direction on a 1020m radius right hand curve towards the existing A96. A 1440m radius left hand curve brings the route option back onto the line of the existing A96 at Brackley.
- 5.3.37 The final section of the route option travels through the proposed Brackley Junction on the line of the existing A96 at approximately existing ground level. It is proposed that the existing A96 would form the westbound carriageway with new eastbound lanes constructed to the north. A single carriageway link to the south of the existing A96 is proposed to connect the existing A96 to the proposed Brackley Junction, but there is no proposed parallel single carriageway to the east of the proposed Brackley Junction.

Route Option 1C – Morayston Variant

- 5.3.38 Route Option 1C (MV) is detailed in drawings B1557601/MLA/1320, 1324 to 1327 (Volume 2). This route option is 14.4km in length and only differs from Route Option 1C between Newton and Kerrowaird.
- 5.3.39 At Newton, the Morayston Variant turns east on a 2040m radius right hand curve. Due to the topography to the south of the existing A96, the dual carriageway climbs and requires an embankment through this curve.

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- 5.3.40 A left hand 1020m curve takes the route option back towards the existing A96, bypassing Morayston to the south. The proposed route option follows the existing topography through most of this curve, rising to its highest point near Morayston House, before falling towards the existing A96.
- 5.3.41 At Kerrowaird, the proposed route option curves right again on a 1020m radius curve. It crosses over the existing A96 on an embankment, but a minor realignment of the existing A96 to the south is proposed to keep it open for local access.

Route Option 1D

- 5.3.42 Route Option 1D is detailed in drawings B1557601MLA/1400 to 1414 (Volume 2). This route option is 13.9km in length.
- 5.3.43 East of the Inverness Retail Park junction, the route option diverges south-west from the existing A96 and rises on embankment to pass over the existing western end of the C1032 Barn Church Road, which would form the proposed Smithton Junction. Once beyond Barn Church Road the alignment falls to approximately existing ground level past Milton of Culloden.
- 5.3.44 East of Milton of Culloden, the route option passes on a 1020m radius curve, away from the existing A96, to the south of Allanfearn. This is followed by a short left hand 1020m radius curve.
- 5.3.45 The route option is slightly below existing ground level where it crosses the eastern end of the C1032 Barn Church Road, near the existing C1032 eastern junction. A new grade separated junction, Newton Junction B, is proposed over the dual carriageway to connect to the C1032 to the south and the existing A96 to the north.
- 5.3.46 The proposed route option continues north-east close to the existing A96, and passes between it and Morayston House, south of the existing A96. At the Norbord timber processing facility, the proposed dual carriageway crosses the existing A96, which is realigned over the proposed dual carriageway. A 1.2km private access to Morayston House is proposed, which connects to the existing single carriageway east of its crossing of the proposed dual carriageway.
- 5.3.47 The route option continues north-west close to existing ground level from the Norbord timber processing facility through Tornagain Wood to the C1017 Kerrowgair – Croy Road. The C1020 Dalcross Station Road from Petty Church to a railway level crossing is severed by this route option, so it is proposed to realign this road over the proposed dual carriageway.
- 5.3.48 Through Tornagain Wood, the proposed route option joins the line of the existing A96 and continues online for approximately 1.3km. To maintain local road connectivity, the existing single carriageway is proposed to be realigned over a length of 2.4km, to the south of Mid Coul. The C1017 junction, which is the existing roundabout providing access Inverness Airport and Mid Coul, is proposed to be replaced with a grade separated junction, referenced as Mid Coul Junction B.
- 5.3.49 East of Mid Coul, the proposed route option is then offline for approximately 1.0km because the existing A96 single carriageway contains a below standard right-left S-curve. The proposed route option also has a right-left S-curve, but as it is to a higher standard, it is north of the existing A96.
- 5.3.50 The final section of the route option travels through the proposed Brackley Junction on the line of the existing A96 at approximately existing ground level. It is proposed that the existing A96 would form the westbound carriageway with new eastbound lanes constructed to the north. A single carriageway link to the south of the existing A96 is proposed to

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connect the existing A96 to the proposed Brackley Junction, but there is no proposed parallel single carriageway to the east of the proposed Brackley Junction.

Route Option 1D – Morayston Variant

- 5.3.51 Route Option 1D (MV) is detailed in drawings B1557601/MLA/1420, 1424 to 1428 (Volume 2). This route option is 14.1km in length and only differs from Route Option 1D between Newton and Kerrowaird.
- 5.3.52 At Newton, the Morayston Variant turns east on a 2040m radius right hand curve. Due to the topography to the south of the existing A96, the dual carriageway climbs and requires an embankment through this curve.
- 5.3.53 A left hand 1020m curve takes the route option back towards the existing A96, bypassing Morayston to the south. The proposed route option follows the existing topography through most of this curve, rising to its highest point near Morayston House, before falling towards the existing A96.
- 5.3.54 At Kerrowaird, the proposed route option curves right again on a 2040m radius curve. It crosses over the existing A96 close to ground level, and so the existing A96 is realigned over the dual carriageway to maintain local access.

5.4 Junction Layouts

- 5.4.1 Preliminary junction layout designs have been prepared for each proposed grade separated junction location. The junction layout designs for the preferred option will be developed further during the DMRB Stage 3 assessment. Each route option has a proposed grade separated junction at the following locations:
- Smithton;
 - Newton;
 - Mid Coul; and
 - Brackley.
- 5.4.2 Table 5.1 details which proposed junction each route option utilises.

Table 5.1: Proposed Grade Separated Junction and Route Option Matrix

Proposed Grade Separated Junction	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
Smithton	X	X	X	X	X	X	X	X
Newton A	X		X					
Newton B					X	X	X	X
Newton C		X		X				
Mid Coul A	X	X			X	X		
Mid Coul B			X	X			X	X
Brackley	X	X	X	X	X	X	X	X

- 5.4.3 A description of the layout and design assumptions made in the development of the outline design of each proposed grade separated junction layout is provided below.

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Smithton Junction

- 5.4.4 The proposed Smithton Junction applies to all route options. It is approximately 1.5km east of Raigmore Interchange, near Smithton and Culloden, and provides access to the existing A96 to the north and C1032 Barn Church Road to the south.
- 5.4.5 The proposed junction includes a 'dumbbell' arrangement, that is, a roundabout on each side of the proposed dual carriageway, connected by a short link road. The roundabouts and link road are at existing ground level, and the dual carriageway is raised over the link road. This form of junction was chosen because it uses the existing roundabout at the C1032 western junction as the northern roundabout, and since most of the junction layout is constructed offline of existing roads, impacts during construction would be minimised.
- 5.4.6 The existing roundabout at the C1032 western junction would be modified to form a five arm roundabout, connecting to:
- the existing A96 east;
 - the existing A96 west;
 - the eastbound diverge from the proposed A96;
 - the eastbound merge to the proposed A96; and
 - the link to the southern roundabout.
- 5.4.7 A new three arm roundabout would be created on the C1032 Barn Church Road connecting to:
- the C1032 Barn Church Road;
 - the proposed A96 westbound merge and diverge in a hook and loop arrangement; and
 - the link to the northern roundabout.
- 5.4.8 The westbound merge and diverge slip roads were chosen as a hook and loop arrangement to maximise the length from the end of the westbound merge to the Inverness Retail Park roundabout at the western end of the scheme extents.

Newton Junction A

- 5.4.9 The proposed Newton Junction A applies to Route Options 1A and 1B, but not their Morayston Variants. It is north of Balloch, approximately 5.2km east of Raigmore Interchange, and lies between the existing A96 and the Aberdeen to Inverness Railway Line. It connects to C1032 Barn Church Road, as well as re-connecting the existing A96 single carriageway, which is severed by the proposed A96 dual carriageway slightly east of this proposed junction.
- 5.4.10 The proposed junction is a dumbbell arrangement with the roundabouts and link road on embankment and an overbridge, as the mainline is close to existing ground level.
- 5.4.11 The northern roundabout would be a three arm roundabout connecting to:
- the existing A96 east;
 - the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
 - the link to the southern roundabout.
- 5.4.12 The southern roundabout would also be a three arm roundabout connecting to:
- the C1032 Barn Church Road and the existing A96 west;
 - the proposed A96 westbound merge and diverge in a hook and loop arrangement; and

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- the link to the northern roundabout.

5.4.13 This form of junction was chosen because the proposed hook and loop arrangement of slip roads fits well with the proposed re-alignment of the local roads and it is expected to have a lower construction cost than a conventional diamond grade separated junction.

Newton Junction B

5.4.14 The proposed Newton Junction B applies to Route Options 1C and 1D and their Morayston Variants (Route Options 1C (MV) and 1D (MV)). It is approximately 5.0km east of Raigmore Interchange, to the north of Balloch. It lies on the existing C1032 eastern junction and connects to the existing A96 and the C1032 Barn Church Road.

5.4.15 The proposed junction is a dumbbell arrangement in a conventional diamond shape with the roundabouts and link road on minor embankments and an overbridge, as the mainline is slightly below existing ground level. There are a number of constraints at this location including the existing road network, utilities, watercourses and a cultural heritage site. The form of junction was chosen to minimise the effect of the junction on these constraints.

5.4.16 The northern roundabout would be a five arm roundabout connecting to:

- the existing A96 east;
- the existing A96 west;
- the proposed A96 eastbound diverge;
- the proposed A96 eastbound merge; and
- the link to the southern roundabout.

5.4.17 The southern roundabout would be a four arm roundabout connecting to:

- the C1032 Barn Church Road;
- the proposed A96 westbound merge;
- the proposed A96 westbound diverge; and
- the link to the northern roundabout.

Newton Junction C

5.4.18 The proposed Newton Junction C applies to Route Options 1A (MV) and 1B (MV). It is approximately 6.5km east of Raigmore Interchange, south of Newton of Petty. It connects to the B9039 Newton – Castle Stuart – Ardersier Road, which runs to the north of Inverness Airport, and re-connects the existing A96 single carriageway, which is severed by the proposed A96 dual carriageway slightly west of this proposed junction.

5.4.19 The proposed junction is a dumbbell arrangement with the roundabouts and link road in slight cut, as the mainline is on embankment. This form of junction was chosen because the proposed hook and loop arrangement of slip roads fits well with the proposed re-alignment of the local roads and it is expected to have a lower construction cost than a conventional diamond grade separated junction

5.4.20 The northern roundabout would be a four arm roundabout connecting to:

- the B9039 Newton – Castle Stuart – Ardersier Road;
- the existing A96 east;
- the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and

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- the link to the southern roundabout.

5.4.21 The southern roundabout would be a three arm roundabout connecting to:

- the existing A96 west;
- the proposed A96 westbound merge and diverge in a hook and loop arrangement; and
- the link to the northern roundabout.

Mid Coul Junction A

5.4.22 The proposed Mid Coul Junction A applies to Route Options 1A and 1C and their Morayston Variants (Route Options 1A (MV) and 1C (MV)). It is approximately 10.2km east of Raigmore Interchange at the access to Inverness Airport, between the existing A96 and the Aberdeen to Inverness Railway Line. This proposed junction connects to the C1017 Kerrowgair – Croy Road, the link from the airport, across the existing A96, to Croy to the south.

5.4.23 The proposed junction is a dumbbell, diamond arrangement with the roundabouts and link road on embankments and an overbridge, as the mainline is slightly below existing ground level. This junction arrangement was chosen in order to minimise the width of the footprint of the proposed junction in proximity of the Aberdeen to Inverness Railway Line.

5.4.24 The northern roundabout would be a four arm roundabout connecting to:

- the C1017 Kerrowgair – Croy Road north to the airport;
- the proposed A96 eastbound diverge;
- the proposed A96 eastbound merge; and
- the link to the southern roundabout.

5.4.25 The southern roundabout would also be a four arm roundabout connecting to:

- the C1017 Kerrowgair – Croy Road south to the existing A96;
- the proposed A96 westbound merge;
- the proposed A96 westbound diverge; and
- the link to the northern roundabout.

Mid Coul Junction B

5.4.26 The proposed Mid Coul Junction B applies to Route Options 1B and 1D and their Morayston Variants (Route Options 1B (MV) and 1D (MV)). It is approximately 10.2km east of Raigmore Interchange, where these route options are online, and lies over the C1017 junction, the existing roundabout to access Inverness Airport. Significant local road realignments are anticipated at this proposed junction to connect to the airport, the existing A96 east and west of the online section of the proposed A96 dual carriageway, and the C1017 Kerrowgair – Croy Road.

5.4.27 The proposed junction consists of hook and loop slip roads on both sides connecting to a link over the dual carriageway at T-junctions. This junction arrangement was chosen in order to minimise the overall footprint of the junction and is expected to have a lower construction cost than a conventional diamond grade separated junction.

Brackley Junction

5.4.28 The proposed Brackley Junction applies to all eight route options. It is approximately 13.4km east of Raigmore Interchange, where all route options are online, and lies over the existing

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B9006 northern junction and the B9006 southern junction, which form an existing staggered cross-roads. These existing junctions connect the B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road to the existing A96. The proposed junction connects to the B9006, and a single carriageway link road connects to the existing A96 to the west.

5.4.29 The proposed junction is a dumbbell arrangement with the roundabouts and link road on embankment and an overbridge, as the mainline is close to existing ground level. This form of junction was chosen because the proposed hook and loop arrangement of slip roads fits well with the proposed re-alignment of the local roads and is expected to have a lower construction cost than a conventional diamond grade separated junction.

5.4.30 The northern roundabout would be a three arm roundabout connecting to:

- the B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road;
- the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
- the link to the southern roundabout.

5.4.31 The southern roundabout would be a three arm roundabout connecting to:

- the existing A96 west;
- the proposed A96 westbound merge and diverge in a hook and loop arrangement; and
- the link to the northern roundabout.

5.5 Local Roads and Private Accesses

5.5.1 This section of the report discusses the existing local road network and private accesses and the diversion strategy proposed with regard to each route option.

Existing Local Road Network and Private Accesses

5.5.2 There are a number of B class, C class and unclassified local roads along with numerous private accesses within this section of the study area, which are described below. The existing road network is shown on Drawings B155701/EX1/0001 to 0002 (Volume 2).

Seafield Farm access

5.5.3 This is a direct private access from the north side of the existing A96 approximately 300m east of Inverness Retail Park junction, providing access to a farm situated north of the existing A96.

Ashton Farm access

5.5.4 This is a private access road approximately 300m east of Inverness Retail Park junction, commencing from its junction with the A96 in a south-easterly direction towards Ashton Farm.

C1032 Barn Church Road

5.5.5 The C1032 Barn Church Road is a local road linking the communities of Culloden and Balloch to the existing A96 at two locations: a roundabout at the C1032 western junction and a ghost island T-junction at the C1032 eastern junction. The two junctions are approximately 3.4km apart.

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U1144 Milton of Culloden Road

- 5.5.6 The U1144 Milton of Culloden Road is a local road linking the existing A96 to Milton, which is located to the north of the existing A96 and Aberdeen to Inverness Railway Line.

Direct accesses at Milton of Culloden

- 5.5.7 Four private properties take direct access off the existing A96 at Milton of Culloden, between 80m west and 190m east of the U1136 junction.

U1136 Milton Road

- 5.5.8 The U1136 Milton Road originates in Culloden and travels in a northerly direction, through Milton of Culloden, before forming a T-junction with the A96 approximately 1km east of the C1032 west junction.

Allanfearn Cottage access

- 5.5.9 This is a direct private access approximately 400m west of the U1136, on the south side of the A96.

Allanfearn western access road

- 5.5.10 This is a private access road to Allanfearn approximately 1.8km east of the C1032 western junction, on the south side of the A96.

Allanfearn access

- 5.5.11 This is a direct access immediately next to Allanfearn western access road, approximately 1.8km east of the C1032 western junction, on the south side of the A96.

U1347 Allanfearn – Alturlie Road

- 5.5.12 This is a local road that commences at the U1347 junction, approximately 1.8km east of the C1032 western junction, and travels in a generally north-easterly direction towards Alturlie Point, approximately shadowing the coastline of the Moray Firth.

Allanfearn eastern access road

- 5.5.13 This is a private access road that commences at the northern extents of Culloden and travels north-east on a straight alignment until reaching the A96 where it forms a T-junction. The junction is situated approximately 1.3km west of the C1032 eastern junction. This road is blocked between the east end of Culloden and Allanfearn due to bollards limiting access to non-motorised users only.

Redhill Farm access

- 5.5.14 This is a private access road onto the existing A96, located approximately 600m west of the C1032 east junction, providing access to Redhill and Lower Cullernie farms north of the existing A96.

Balmachree access

- 5.5.15 This is a private access road which originates at the A96, approximately 300m east of the C1032 eastern junction. The road travels in a generally southern direction, providing access to Balmachree farm.

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Newton of Petty access

- 5.5.16 This is a direct private access for a farm on the north side of the existing A96, located approximately 500m west of the B9039 junction.

B9039 Newton – Castle Stuart – Ardersier Road

- 5.5.17 The B9039 Newton – Castle Stuart – Ardersier Road serves as a secondary access to Inverness Airport. The B9039 has a junction with the existing A96 at Newton of Petty, from which it travels in a generally north-east direction. The B9039 provides access to Castle Stuart and Castle Stuart Golf Links as it approaches the Moray Firth. From here, it approximately shadows the coastline of the Moray Firth, travelling past Inverness Airport and towards Ardersier where the B9039 terminates.

Newton of Petty Cottages access

- 5.5.18 This is a private access road for Newton of Petty Cottages on the north side of the existing A96, located approximately 150m east of the B9039 junction, opposite Chestnut Cottage. This private access road forms a loop, joining with the existing A96 twice, approximately 40m apart.

Chestnut Cottage access

- 5.5.19 This is a private access road to property on the south side of the existing A96, located approximately 150m east of the B9039 junction opposite Newton of Petty Cottages.

U1008 Morayston – Castle Stuart Road

- 5.5.20 This is a local road that commences at the existing A96, approximately 650m east of the B9039 junction. The U1008 travels in a generally north-westerly direction, crossing the railway before forming a junction with the B9039 Newton – Castle Stuart – Ardersier Road.

Morayston access

- 5.5.21 This is a private access road to a farm located on the south side of the existing A96, approximately 800m east of the B9039 junction.

Morayston Cottages access

- 5.5.22 This is a direct access to four properties located on the north side of the existing A96, approximately 1km east of the B9039 junction.

Morayhill access

- 5.5.23 This is a private access road to the Norbord timber processing facility located on the north side of the existing A96, approximately 1.1km east of the B9039 junction.

Kerrowaird Farm Cottages access

- 5.5.24 This is a direct private access to properties located on the north side of the existing A96, approximately 2.1km east of the B9039 junction.

Kerrowaird access

- 5.5.25 This is a private access road to properties located on the south side of the existing A96, approximately 2.1km east of the B9039 junction.

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C1024 Tornagrain – Cantray Road

- 5.5.26 This is a local road that travels south, from the existing A96 through Tornagrain and Dalcross. The junction is situated approximately 2.6km east of the B9039 junction.

C1020 Dalcross Station Road

- 5.5.27 This is a local road that connects the B9039 Newton – Castle Stuart – Ardersier Road and the existing A96. It travels in a generally north-westerly direction and sits to the west of Inverness Airport. The junction with the existing A96 is approximately 2.9km east of the B9039 junction.

C1017 Kerrowgair – Croy Road

- 5.5.28 This is a local road that provides the main access to Inverness Airport from the existing A96. It runs both north-west and south-east from a roundabout on the existing A96 at Mid Coul.

Culblair Farm access

- 5.5.29 This is a private access road approximately 600m east of the C1017 junction, providing access to a farm north of the existing A96.

The Bungalow access

- 5.5.30 This is a direct private access approximately 1.8km east of the C1017 junction, on the south side of the existing A96.

Drumine Farm access

- 5.5.31 This is a private access road approximately 1.9km east of the C1017 junction, providing access to a farm south of the existing A96.

U1025 Milton Of Breachlich Road

- 5.5.32 This is a local road approximately 2.3km east of the C1017 junction, providing access to a number of properties north of the existing A96, including Milton of Gollanfield and Ballaggan.

Polfalden access

- 5.5.33 This is a private access road approximately 650m west of the B9006 junction, providing access to a farm north of the existing A96.

B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road

- 5.5.34 This is a local road that originates near Culloden and travels in a generally north-east direction towards Croy. At Croy the B9006 turns north and crosses the existing A96 with a staggered junction at Brackley. North of the existing A96 the B9006 continues north-west, on an approximately straight alignment, through Ardersier and towards Fort George where the B9006 terminates.

- 5.5.35 The C1013 Gollanfield Road and U1017 Wester Glackton – Balcroy – Kilvarock – Cawdor Road form a staggered junction with the existing A96 at Gollanfield, which is the boundary between the Inverness to Gollanfield section and the Nairn Bypass section. These junctions can be seen in drawing B1557601/EXI/0001 and are referred to as the C1013 junction and U1017 junction. These local roads have been included in the Nairn Bypass assessment.

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5.5.36 33 field accesses have been identified along this section of the existing A96, and consideration has been given to maintaining access to fields for each route option. Maintaining field accesses will be considered further in future design development for the preferred option in consultation with landowners.

Local Road and Private Access Strategy

5.5.37 All route options cross or affect the local road network and individual private accesses to a differing extent. To minimise severance, a preliminary local road strategy has been developed for each route option in consultation with The Highland Council. The local road strategy for local roads, private accesses and field access for the preferred option will be refined and developed further in consultation with The Highland Council and affected landowners at the DMRB Stage 3 assessment. The existing road network is shown on Drawings B155701/EXI/0001 and 0002.

5.5.38 The strategy being adopted for individual local roads generally fits into one of the following four categories:

- Local road is maintained with a structure to allow the road to pass over or under the proposed A96 dual carriageway. The local road may be realigned to suit the appropriate structural solution;
- A grade separated junction with the proposed A96 is provided;
- Local road is stopped up at the interface with the proposed dual carriageway as alternative routes are available; or
- Local road is stopped up, and a local road diversion is provided to connect road back into local road network.

5.5.39 The extent of interfaces with the local road network differs for each route option and a consistent approach has been adopted for each instance that a route option crosses a local road. Table 5.2 describes the proposed local road strategy for each route option. Private accesses that are not affected by any of the route options have been omitted from this table.

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Table 5.2: Local Road and Private Access Strategy

Local Road/Private Access	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
Seafield Farm access	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
Ashton Farm access	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
C1032 – western end	J	J	J	J	J	J	J	J
U1144	-	-	-	-	-	-	-	-
U1136	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
Allanfearn Cottage access	SU*	SU*	SU*	SU*	-	-	-	-
Allanfearn western access road	SU*	SU*	SU*	SU*				
Allanfearn access	SU*	SU*	SU*	SU*	-	-	-	-
U1347	SU*	SU*	SU*	SU*	-	-	-	-
Allanfearn eastern access road	-	-	-	-	SU	SU	SU	SU
Redhill Farm access	B	B	B	B	-	-	-	-
C1032 – eastern end	J	-	J	-	J	J	J	J
Balmachree access	SU*	-	SU*	-	J	J	J	J
B9039	-	J	-	J	-	-	-	-
U1008	-	-	-	-	-	-	-	-
Morayston House access	SU*	-	SU*	-	SU*	-	SU*	-
C1024	-	-	-	-	-	-	-	-
C1020	B	B	B	B	B	B	B	B
C1017	J	J	J	J	J	J	J	J
Culblair Farm access	-	-	SU	SU	-	-	SU	SU
Drumine Farm Access	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
U1025	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
Polfalden access	SU*	SU*	SU*	SU*	SU*	SU*	SU*	SU*
B9006	J	J	J	J	J	J	J	J

Key to table:

B – Bridge to be provided over or under A96 allowing continuation of road.

J – Road to be diverted to/connected with a proposed grade separated junction, maintaining continuity of road and connectivity to the A96 dual carriageway.

SU – Road/access to be stopped up. Diversion to be provided via existing road network.

SU* – Road/access to be stopped up. Alternate access to be provided onto different road.

- Road/access not affected by route option.

5.5.40 Table 5.3 summarises the effect of each route option on the local road network and private accesses.

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Table 5.3: Local Road and Private Access Strategy Summary

Route Option	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
B – Bridge	2	2	2	2	1	1	1	1
J – Connect to Junction	4	4	4	4	5	5	5	5
SU – Stopped Up	0	0	1	1	1	1	2	2
SU* – Stopped Up with alternate access provided	11	9	11	9	7	6	7	6
Total No of local roads and private accesses Stopped Up	11	9	12	10	8	7	9	8
Total No of local roads and private accesses affected	17	15	18	16	14	13	15	14

5.5.41 All route options will affect the local road network. The local road and private access strategy will retain connectivity of the local road network by diverting traffic to new under/overbridges and grade separated junctions.

5.5.42 None of the 'B' and 'C' class roads bisected by the scheme would require to be stopped up for any of the route options. The online section to the east of the proposed Smithton Junction for 1A, 1A (MV), 1B and 1B (MV) would result in 9 to 12 local roads and private accesses being stopped up compared to the other route options which result in 7 to 9 local roads and private accesses being stopped up. The strategy for Route Option 1B proposes that 12 local roads and private accesses are stopped up, the most of all route options. The strategy for Route Option 1C (MV) proposes that 7 local roads and private accesses are stopped up, the least of all route options.

5.6 Departures from Standard

5.6.1 At this stage in the design process, the geometric design standards proposed are all at or above the desirable minimum standards in the DMRB. There are no Relaxations or Departures from Standard for any of the proposed mainlines, junctions or local roads between Inverness and Gollanfield. However, Departures or Relaxations may be introduced during future design development to reduce environmental impacts or improve value for money, if appropriate.

5.7 Topography and Land Use

5.7.1 The topography is generally flat, low-lying, open ground. To the north, the land gently drops towards the Moray Firth. To the south, the land gradually rises towards Drummosie Muir.

5.7.2 All options would introduce changes to the existing topography through the introduction of new road embankments and cuttings, grade separated junctions, local road re-alignments and structures.

5.7.3 The landscape surrounding the existing A96 Aberdeen – Inverness Trunk Road is predominately pastoral and arable farm land, with sporadic pockets of woodland. The largest woodland in the area is Tornagrain, which all route options pass through. Landscape

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and visual impacts are assessed in greater detail in Part 3, Chapter 10 (Landscape and Visual) and Land Use is assessed in greater detail in Part 3, Chapter 16 (Community and Private Assets) of this report.

5.8 Geotechnics and Earthworks

Existing ground conditions

5.8.1 An assessment of the likely ground conditions affecting the various route options has been determined largely from the 1:10,000 and 1:50,000 British Geological Survey maps for the area and the memoir for the 1:50,000 British Geological Survey map for the area. Reference has been made during the study to the Preliminary Sources Study Report (PSSR) prepared by Atkins in March 2010. Existing ground investigation (GI) coverage within the study area is limited to a number of areas, generally following the existing A96 Aberdeen – Inverness Trunk Road, and related to previous road improvement schemes. These are summarised in Table 5.4.

Table 5.4: Existing Ground investigation Information for Study Area

Scheme	Coverage	General Findings
Raigmore to Smithton Jn., Highland Regional Council, 1987.	Limited number of exploratory holes at west end of study area near proposed Smithton Jn.	Localised soft clay/silt and peat to a maximum depth of 1.2m followed by silty sands and gravels.
Inverness Trunk Link Road (2008), undertaken by Soil Mechanics for Scott Wilson on behalf of The Highland Council.	Limited number of exploratory holes within area of proposed Smithton Junction.	Thin Made Ground deposits (<2m) overlying sandy gravel/gravelly sands with cobbles and boulders. Rock encountered at depths of between 21m and 30m.
Morayston to Tornagrain (1991), undertaken by Highland Regional Council.	Covers section of existing A96 between Morayston and Tornagrain (Kerrowaird). GI comprises mainly shallow (<2m) trial pits.	Near surface superficial deposits comprise a mixture of essentially granular materials typically silty sands and gravel and sands/gravels.
Dalcross Airport Access Road (1997), undertaken by Grampian Soil Surveys for Highland Council.	Covers existing A96 from immediately east of Kerrowaird to east of Tornagrain before heading northwards off line through Tornagrain Wood, comprising trial pits and boreholes.	Ground conditions comprise mainly sands and gravels, silty in places. Locally thin surface peat and soft silts (< 1.25m) are present. Granular deposits proved to a max. depth of 40m.
A96 Petty Church to Mid Coul (1983), Highland Regional Council.	Covers section of existing A96 around existing Mid Coul Jn. on A96. Limited number of exploratory holes.	Ground conditions comprise sands and gravels and silty sands and gravels to a max. depth of 7.2m.
A96 Drumine to Gollanfield (1988), Highland Regional Council.	Covers section of A96 between Drumine and Brackley. GI comprises mainly shallow trial pits, typically <2m.	Ground conditions comprise silty sands and gravels, and sands and gravels. Peat and organic silt/clay present locally to depths of up to 1.65m.

5.8.2 The study area occupies the coastal lowland backing the southern shores of the Inverness and Moray Firths and is extensively covered by superficial deposits with only very localised exposures of bedrock occurring. The memoir for 1:50,000 British Geological Survey map Sheet 84W (Chapter 8 Quaternary, Introduction, Page 64) records that 'few parts of the British Isles can rival this area in the range, quality and accessibility of glacially related features and Quaternary (0 – 1.8 million years ago) sediments'. The route options corridor is underlain primarily by superficial deposits of glacial and late glacial origin of Late Devensian (10,000 to 26,000 years ago) age laid down in a variety of environments, summarised in

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Table 5.5, and shown on the geological map of the area in Drawing B1557601/GEO/0101 (Volume 2).

Table 5.5: Late Glacial/glacial Deposits Present within Study Area

Geological Unit	General Description
Raised Shoreface and Beach Deposits	Mainly medium sand and well-rounded shingle
Raised Tidal Flat deposits	Fine sand, silt and clay with lenses of gravel
Raised Marine Fan-Delta Deposits	Sand and gravel
Raised Glaciomarine deposits (Alturlie Gravels Formation)	Mainly cross-bedded sand and well-rounded gravel capped locally by marine washed shingle
Raised Glaciomarine deposits (Ardersier Silts Formation)	Mainly silty diamicton with lenses of gravel and clay, capped by rhythmically bedded silt and fine sand; locally contorted glaciectonically
Glaciofluvial Sheet Deposits	Mainly terraced spreads of gravel with lenses of sand
Glaciofluvial Fan and Fan-delta deposits	Sand and gravel, typically coarsening upwards
Glaciofluvial ice contact Deposits	Undulating spreads and mounds of sand and gravel, including flat topped mounds
Eskers	Steep sided ridges of gravel
Glaciolacustrine Deposits	Very fine sand, silt and clay, typically thinly laminated and with dropstones and lenses of diamicton
Hummocky Glacial Deposits	Poorly stratified sandy diamicton, sand, gravel, silt and rock debris
Tills (undifferentiated)	Stiff, stony, clayey diamictons, typically massive, but stratified and more sandy locally, including lenses of gravel

Notes:

1. Diamicton – defined as poorly sorted sediment with a wide clast size range.

- 5.8.3 As identified in Table 5.5 there is a considerable variety of superficial deposits of glacial/late glacial origin and their distribution throughout the area is relatively complex. Geological cross-sections (see Drawing B1557601/GEO/0103 (Volume 2)) extracted from the 1:50,000 British Geological Survey map of the area indicate the anticipated vertical distribution of the superficial deposits at either end of the route options corridor. In general, glacial till deposits are extensive in their distribution and are likely to be present at depth beneath a sequence of more recent deposits of glacial/late glacial origin and other more recent superficial deposits. Glacial till is generally exposed at surface on the higher ground behind the coastal fringe and is only anticipated to be present at surface within the study area in the vicinity of the Morayston Variant.
- 5.8.4 More recent deposits of Flandrian (< 10,000 years ago) age occur only locally throughout the study area, comprising mainly peat and alluvium. Made Ground and areas of worked ground are also present, the most significant of these are associated with historic sand and gravel extraction or other surface workings.
- 5.8.5 In terms of the current route options ground conditions are generally anticipated to be favourable, being dominated by predominantly granular glacial deposits. Glacial deposits such as Raised Tidal Flat deposits, Raised Glaciomarine deposits (Ardersier Silts Formation), and Glaciolacustrine deposits may present engineering difficulties in terms of their fine grained nature and potential compressibility, although these are subordinate in occurrence to the more granular deposits. The actual nature, thickness and distribution of these deposits would however require to be confirmed at ground investigation stage (DMRB Stage 3). Peat and alluvium present constraints to route development but only affect relatively small sections of the various route options. Similarly, there are few recorded occurrences of Made Ground or worked ground affecting the route options.

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- 5.8.6 The solid geology of the area comprises Old Red Sandstone strata of Devonian (345 to 395 million years ago) age belonging to the Inverness Sandstone Group. The majority of the route options are underlain by the Hillhead Sandstone Formation (HSa) which comprises red coarse grained sandstones, flaggy siltstones, calcareous mudstone and thin shaley mudstones. In the vicinity of Morayston, the underlying Inshes Flagstone Formation (InF) subcrops, this formation comprising grey and purplish-red flaggy sandstones and siltstones with numerous dark grey and greenish-grey shaley mudstones containing thin limestones. With regard to the geological structure, regionally the strata dip generally towards the north-west at relatively shallow angles (5 to 30 degrees), although locally steeper dips and variable dip directions do occur. As noted above there is very limited rock exposure throughout the study area due to the thickness of the overlying superficial deposits.

Route Option 1A & 1A (MV)

- 5.8.7 Moving from west to east, this route option alignment initially traverses a variety of different types of superficial deposits of varying composition, including Raised Shoreface and Beach deposits, Raised Glaciomarine deposits, Raised Tidal Flat deposits, Glaciofluvial ice contact deposits and Made Ground. The typical descriptions of these deposits are provided within Table 5.5, with the exception of the Made Ground.
- 5.8.8 The proposed Smithton Junction is underlain by a variety of soil types including an extensive area of Made Ground/fill centred on the junction, as identified on the Geotechnical Constraints plan in Drawing B1557601/GEO/0104 (Volume 2), with localised alluvium, in addition to Raised Shoreface and Beach deposits, Glaciomarine and Raised Tidal Flat deposits.
- 5.8.9 From approximately Lower Cullernie (ch4,600) the superficial deposits comprise mainly Glaciofluvial ice contact deposits (Alturlie Suite) with localised, sometimes quite extensive, areas of alluvium, in particular in the vicinity of Newton, Newton of Petty, Morayston, Tornagrain and Drumine as shown on the Geotechnical Constraints plans in Drawings B1557601/GEO/0105 and 0106 (Volume 2). The proposed Newton Junction is underlain by both Raised Tidal Flat deposits and Glaciofluvial ice contact deposits. Alluvial deposits underlie a number of the local roads, including the realignment of the existing A96 in the vicinity of the Norbord timber processing facility which are to be formed typically on embankment. These deposits also occur locally beneath the proposed Mid Coul Junction.
- 5.8.10 The proposed Brackley Junction is mainly underlain by Glaciofluvial ice contact deposits but there is an area of peat indicated to occur within the central area of the junction.
- 5.8.11 With regard to the Morayston Variant (Route Option 1A (MV)) this traverses the same superficial deposits noted above for Route Option 1A, in addition to the presence of Hummocky Glacial deposits (Smithton Suite) and Glacial Till deposits, with a short length of route option where rock is exposed at surface within the channel of a minor watercourse. The Morayston Variant avoids some of the areas of alluvium affecting Route Option 1A.

Route Option 1B & 1B (MV)

- 5.8.12 Moving from west to east, this route option alignment initially traverses a variety of different types of superficial deposits of varying composition, including Raised Shoreface and Beach deposits, Raised Glaciomarine deposits, Raised Tidal Flat deposits, Glaciofluvial ice contact deposits and Made Ground. The typical descriptions of these deposits are provided within Table 5.5, with the exception of the Made Ground.
- 5.8.13 The proposed Smithton Junction is underlain by a variety of soil types including an extensive area of Made Ground/fill centred on the junction, as identified on the Geotechnical Constraints plan in Drawing B1557601/GEO/0104 (Volume 2), with localised alluvium, in addition to Raised Shoreface and Beach deposits, Raised Glaciomarine and Raised Tidal Flat deposits.

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- 5.8.14 From approximately Lower Cullernie (ch4,600) the superficial deposits comprise mainly Glaciofluvial ice contact deposits (Alturlie Suite) with localised, sometimes quite extensive, areas of alluvium, in particular in the vicinity of Newton, Newton of Petty, Morayston, Tornagrain, Mid Coul and Drumine, as shown on the Geotechnical Constraints plans on Drawings B1557601/GEO/0105 and 0106 (Volume 2). The proposed Newton Junction is underlain by both Raised Tidal Flat deposits and Glaciofluvial ice contact deposits. Alluvial deposits underlie a number of the local roads, including the realignment of the exiting A96 in the vicinity of the Norbord timber processing facility which are to be formed typically on embankment. The mainline crosses an old pit/quarry, between approximately ch9,370 and ch9,560, and a short length of peat (approx. 70m) in the vicinity of Drumine.
- 5.8.15 Alluvium underlies parts of the proposed Mid Coul Junction, affecting mainly the northern section. The proposed Brackley Junction is mainly underlain by Glaciofluvial ice contact deposits but there is an area of peat indicated to occur within the central area of the junction.
- 5.8.16 With regard to the Morayston Variant (Route Option 1B (MV)), this traverses the same superficial deposits noted above for Route Option 1B, in addition to the presence of Hummocky Glacial deposits (Smithton Suite) and Glacial Till deposits, with a short length of route option where rock is exposed at surface within the channel of a minor watercourse. The Morayston Variant avoids some of the areas of alluvium affecting Route Option 1B.

Route Option 1C & 1C (MV)

- 5.8.17 Moving from west to east, this route option alignment initially traverses a variety of different types of superficial deposits of varying composition, including Raised Shoreface and Beach deposits, Glaciomarine deposits, Raised Tidal Flat deposits, Glaciofluvial ice contact deposits and Made Ground. The typical descriptions of these deposits are provided within Table 5.5, with the exception of the Made Ground.
- 5.8.18 The proposed Smithton Junction is underlain by a variety of soil types including an extensive area of Made Ground/fill centred on the junction, as identified on the Geotechnical Constraints plan in Drawing B1557601/GEO/0104 (Volume 2), with localised alluvium, in addition to Raised Shoreface and Beach deposits, Glaciomarine and Raised Tidal Flat deposits.
- 5.8.19 From approximately ch4,350 the superficial deposits comprise mainly Glaciofluvial ice contact deposits (Alturlie Suite) with localised, sometimes quite extensive areas of alluvium, in particular in the vicinity of Newton, Newton of Petty, Morayston, Kerrowaird, Tornagrain, and Drumine, as shown on the Geotechnical Constraints plans in Drawings B1557601/GEO/0105 and 0106 (Volume 2).
- 5.8.20 The proposed eastbound off ramp at Newton Junction is underlain by an area of Made Ground and an old pit/quarry while the remainder of the junction is underlain by mainly Glaciofluvial ice contact deposits (Alturlie Suite). Alluvial deposits occur locally beneath the proposed Mid Coul Junction. The proposed Brackley Junction is mainly underlain by Glaciofluvial ice contact deposits with an area of peat indicated to occur within the central area of the junction.
- 5.8.21 With regard to the Morayston Variant (Route Option 1C (MV)) this traverses the same superficial deposits noted above for Route Option 1C, in addition to the presence of Hummocky Glacial deposits (Smithton Suite) and Glacial Till deposits, with a short length of route option where rock is exposed at surface within the channel of a minor watercourse. The Morayston Variant avoids some of the areas of alluvium affecting Route Option 1C.

Route Option 1D & 1D (MV)

- 5.8.22 Moving from west to east, this route option alignment initially traverses a variety of different types of superficial deposits of varying composition, including Raised Shoreface and Beach

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deposits, Glaciomarine deposits, Raised Tidal Flat deposits, Glaciofluvial ice contact deposits and Made Ground. The typical descriptions of these deposits are provided within Table 5.5, with the exception of the Made Ground.

- 5.8.23 The proposed Smithton Junction is underlain by a variety of soil types including an extensive area of Made Ground/fill centred on the junction, as identified on the Geotechnical Constraints plan in Drawing B1557601/GEO/0104 (Volume 2), with localised alluvium, in addition to Raised Shoreface and Beach deposits, Glaciomarine and Raised Tidal Flat deposits.
- 5.8.24 From approximately ch4,350 the superficial deposits comprise mainly Glaciofluvial ice contact deposits (Alturlie Suite) with localised, sometimes quite extensive areas of alluvium, in particular in the vicinity of Newton, Newton of Petty, Morayston, Kerrowaird, Tornagrain, and Drumine, as shown on the Geotechnical Constraints plans in Drawings B1557601/GEO/0105 and 0106 (Volume 2).
- 5.8.25 The proposed eastbound off ramp at Newton Junction is underlain by an area of Made Ground and an old pit/quarry, while the remainder of the junction is underlain by mainly Glaciofluvial ice contact deposits (Alturlie Suite). Alluvial deposits underlie a number of the local roads, including the realignment of the existing A96 in the vicinity of the Norbord timber processing facility, which are to be formed typically on embankment. The mainline crosses an old pit/quarry, between approximately ch9,300 and ch9,490, and a short length of peat (approx. 70m) in the vicinity of Drumine. Alluvium underlies parts of the proposed Mid Coul Junction, affecting mainly the northern section.
- 5.8.26 The proposed Brackley Junction is mainly underlain by Glaciofluvial ice contact deposits but there is an area of peat indicated to occur within the central area of the junction.
- 5.8.27 With regard to the Morayston Variant (Route Option 1D (MV)) this traverses the same superficial deposits noted above for Route Option 1D, in addition to the presence of Hummocky Glacial deposits (Smithton Suite) and Glacial Till deposits, with a short length of route option where rock is exposed at surface within the channel of a minor watercourse. The Morayston Variant avoids some of the areas of alluvium affecting Route Option 1D.

Discussion

- 5.8.28 The main geotechnical constraints affecting the various route options between Inverness and Gollanfield is the presence of potentially compressible alluvial and glacial/late glacial deposits particularly where the road is to be constructed on embankment over these soils. Generally the mainline is to be constructed on low height embankments, typically less than 5m, in shallow cuttings (<5m) or at-grade. The exception to this is the proposed Smithton Junction where embankment heights of up to approximately 8m are required. Higher embankment heights are also required for some of the proposed local roads and junctions to allow grade separation with the proposed A96 and some of these are also affected locally by potentially compressible soils. The engineering issues associated with these conditions are discussed below and summarised on geotechnical constraints plans in Drawings B1557601/GEO/0104 to 0108 (Volume 2).
- 5.8.29 Peat is present only very locally, underlying the central area of the proposed junction at Brackley, affecting approximately 150m of the mainline, and part of the bridge abutment/approach embankment immediately to the north of the proposed A96. The same area of peat also underlies a connecting road from the proposed junction. Peat thicknesses are unknown in this area. Given the anticipated highly compressible nature of these deposits it is likely that these would require to be removed beneath the route option proposals and replaced with a suitable fill material.
- 5.8.30 Based on the geological maps, all the route options, including the proposed junctions and local roads, would appear to be underlain by areas of alluvium to varying degrees, although

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these deposits are only developed locally. Potentially, the alluvium can contain compressible silts and clays, and occasionally peat. Given that these areas are often low lying, the route options would generally be formed on embankment or at-grade in these areas which present a number of engineering constraints depending on the thickness and nature of the alluvium, as discussed below. Typically embankment heights of up to approximately 5m are required for the mainline route options although a number of the proposed local roads and junction roads would be constructed on greater embankment heights to allow crossing of the proposed A96 mainline, in particular the realignment of the existing A96 between Morayston and Kerrowaird and the C1020 Dalcross Station Road.

- 5.8.31 The potentially compressible nature of the alluvium can lead to unacceptable settlements beneath embankments in the longer term and can also lead to slope stability problems, particularly during the construction phase, unless appropriate treatment measures are applied, or the slopes designed accordingly. These can include such measures as staged construction, removal and replacement, accelerated settlement using band drains and/or surcharging with drainage layer(s), and the use of structurally supported load transfer platforms, particularly on the approaches to structures. The selection and design of these measures will depend largely on the thickness and nature of the alluvium which would be determined by means of a ground investigation, and potentially also programme constraints. Where the road is at-grade or on low height embankment it may be feasible to reinforce the subgrade with geogrids embedded within granular fill. The construction over areas of alluvium potentially involves greater cost and may have an adverse impact on programme to allow the necessary remedial works to be implemented.
- 5.8.32 With regard to other potentially compressible soils, including Glaciolacustrine, Raised Glaciomarine and Raised Tidal Flat deposits etc., these are recorded to occur beneath the western half of the study area and affect all of the route options to varying degrees, generally in areas of embankment, or where the route option proposals are at-grade. These deposits potentially affect Route Options 1C, 1C (MV), 1D and 1D (MV) to a greater extent, as these cross an extensive area underlain by Raised Tidal Flat deposits where embankment heights of typically between 3m to 5m are proposed. These deposits are also anticipated to underlie the proposed access to Redhill and Lower Cullernie where it crosses the proposed A96 mainline, and at Newton Junction (mainly Route Options 1A, 1A (MV), 1B and 1B (MV)). The thickness and nature of these deposits will require to be confirmed by means of ground investigation at the next stage. The potential engineering solutions for constructing roads over these deposits are essentially the same as for potentially compressible alluvial soils as discussed above.
- 5.8.33 A large area of Made Ground deposits are recorded within the area of the proposed Smithton Junction, and possible Made Ground deposits further to the east near Petty Church at Tornagrain, associated with an old pit or quarry. There are no further details of these and without further information it is uncertain if these would present a significant constraint to development or not. A ground investigation will be required to determine the nature and thickness of the backfill materials including any contamination that may be present. From desk study researches, it is considered unlikely that there would be any significant areas of contaminated land associated with historical industrial activity due to the largely rural setting for the study area. In-situ treatment of Made Ground deposits to improve their engineering properties or dig out and replace are possible options for dealing with Made Ground.
- 5.8.34 A comparison of the ground conditions affecting the various route options (mainline only) is provided in Table 5.6. This identifies lengths of the eight route options where less favourable ground conditions may be anticipated potentially requiring additional engineering measures (see above sections), including areas of alluvium, Made Ground, and potentially compressible glacial/late glacial deposits, as noted above.

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Table 5.6: Comparison of route options (mainline) based on anticipated unfavourable ground conditions

Route Option (Note 1)	Approx. length of route option underlain by superficial deposits identified				Total (m)
	Alluvium (m)	Peat (m)	Potentially Compressible Glacial/Late glacial deposits (m) (Note 2)	Made Ground / Worked Ground (m) (Note 3)	
1A	2060	130	1590	180	3960
1A (MV)	2020	130	1590	180	3920
1B	2570	230	1520	410	4730
1B (MV)	2330	230	1520	410	4490
1C	1920	130	1980	180	4210
1C (MV)	1320	130	1980	180	3610
1D	2420	210	1830	180	4640
1D (MV)	1720	210	1830	180	3940

Notes:

- (MV) – Morayston Variant for particular route option.
- Includes Glaciolacustrine, Raised Tidal Flat and Glaciomarine deposits.
- It has been assumed that where old pits/quarries are present then these have been backfilled with non-engineered fill of unknown origin, however a number of areas of worked ground have been included where no backfilling may have taken place.

5.8.35 An assessment and comparison of the anticipated ground conditions beneath the proposed junctions and local roads has also been undertaken for the route options as detailed in Table 5.7.

Table 5.7: Comparison of route options (junctions and local roads) based on anticipated unfavourable ground conditions

Route Option (Note 1)	Approx. length of route option underlain by superficial deposits identified				Total (m)
	Alluvium (m)	Peat (m)	Potentially Compressible Glacial/Late glacial deposits (m) (Note 2)	Made Ground / Worked Ground (m) (Note 3)	
1A	2920	160	1210	210	4500
1A (MV)	3020	160	570	210	3960
1B	2960	250	1210	250	4670
1B (MV)	3440	250	570	250	4510
1C	2420	160	620	410	3610
1C (MV)	1500	160	620	410	2690
1D	2460	250	620	450	3780
1D (MV)	1840	250	620	450	3160

Notes:

- Based on approximate lengths of local roads and roundabouts for comparison purposes.
- Includes Glaciolacustrine, Raised Marine Tidal Flat and Glaciomarine deposits.
- It has been assumed that where old pits/quarries are present then these have been backfilled with non-engineered fill of unknown origin, however a number of areas of worked ground have been included where no backfilling may have taken place.

5.8.36 The comparison of total lengths of potentially unfavourable ground conditions presents a number of limitations as summarised below:

- Worked ground may not present a constraint and will depend on the extent of any

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backfilling and ground disturbance;

- Old pits/quarries may be largely situated above general ground level and may therefore have not been backfilled;
- The nature of the potentially compressible glacial deposits is based on typical descriptions provided on the geological maps and may differ significantly from the actual nature of the materials; and
- The occurrence of the different types of superficial deposits is based on the geological mapping which records conjectural boundaries which will require to be confirmed by means of ground investigation.

5.8.37 There are lengths of potentially unfavourable ground conditions affecting the route options, including areas of alluvium and peat although the alluvium may not present a significant constraint to construction depending on its thickness and composition, and similarly the peat may be of only limited thickness. Based on the total route length affected by areas of peat and alluvium, Route Option 1C (MV) is the most favourable and Route Options 1A, 1B and 1B (MV) are the least favourable.

5.8.38 A brief discussion of the engineering constraints presented by these ground conditions is presented in the following sections.

Earthworks Balance

Excavated Material Acceptability

5.8.39 In general, where cuttings are to be formed, typically these lie within areas of predominantly granular materials of fluvioglacial origin, based on the available desk study information examined. It is estimated that of the order of 75% of these materials may be acceptable for reuse as general engineering fill. This figure would potentially also apply to the underlying glacial till deposits where present. Rock is generally not anticipated to occur within the proposed shallow cuttings, which are generally less than 5m in depth, although the possibility of localised shallow rock cannot be discounted.

5.8.40 The other deposits of glacial origin, and also the alluvium, may provide acceptable materials depending on their composition and nature. This can only be confirmed by a ground investigation to be carried out during the DMRB Stage 3 assessment once a preferred option has been selected. This also applies to confirming the percentage acceptable for the fluvioglacial and glacial till deposits.

Unacceptable material and Contaminated Land

5.8.41 Unacceptable materials which cannot be used in the main earthworks such as peat, soft clays and silts would require to be disposed of on or off-site. Much of this material would be unsuitable for the formation of bunds and in landscaping, although these volumes can be minimised through the use of various in-situ ground improvement techniques, particularly for the soft non organic soils, such as lime treatment, soil mixing, stone columns etc. This would not apply to the peat deposits. However, these are very localised in occurrence and may not be of a significant thickness.

5.8.42 Contaminated land is not anticipated to be a significant issue affecting any of the route options, largely due to the absence of any major industrial activity in the area. Localised areas of contaminated ground may, however, be present and investigation of these would be required to determine any special measures required to address any contaminants present. This could involve in-situ treatment or removal to a licensed disposal site depending on the nature of the contamination.

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Cut/fill Balance

- 5.8.43 Approximate earthworks volumes have been estimated to allow a reasonable comparison between route options. Following ground investigation and further earthworks design development the alignment of the identified preferred option may be developed to further optimise the cut/fill balance.
- 5.8.44 Table 5.8 summarises the total earthworks volumes as follows:
- Overall Fill Required – Overall earthworks fill volume required excluding capping, sub-base and top-soil volume. Includes allowance for stripping of existing top-soil and replacement of any excavated soft ground. The totals calculated include local road earthworks and allow for openings in major structures.
 - Total Excavated Volume – Overall volume of exacted material including unsuitable and excavated soft ground. Excludes top-soil strip.
 - Total Unsuitable Volume– The total volume of unsuitable material that will be required to be disposed of, either to landfill or for use in landscaping, noise bunds etc. No bulking factor has been applied to the gross unsuitable volume at this stage in the assessment.
 - Total Acceptable Available – Based on the above discussion regarding likely areas of suitable excavated material and potential percentage acceptability, a volume of site-won acceptable material has been determined.
 - Anticipated Cut/Fill Balance – The balance of the overall fill requirement, less the potential volume of available acceptable site won material. As expressed in this table a positive balance is indicative of an overall import requirement with the result that a volume of engineering fill will be required to be sourced and brought to site. Likewise a negative balance indicates that there will be an overall excess of engineering fill material generated by the work (in addition to the identified volume of unsuitable material).

Table 5.8: Cut Fill balance (Volumes expressed x 1000m³)

Route Option	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
Overall Fill Required	2537	2440	2616	2908	2256	2161	2329	2688
Total Excavated Volume	547	618	570	620	545	541	558	527
Total Unsuitable Volume	278	246	305	280	279	245	299	258
Total Acceptable Available	269	372	264	339	265	296	259	269
Anticipated Cut/Fill Balance	2268	2068	2352	2569	1990	1865	2070	2419

- 5.8.45 All route options require a significant volume of fill, while providing little acceptable material. Route Option 1B (MV) requires the most material and has the worst cut/fill balance, while Route Option 1C (MV) requires the least material and has the best cut/fill balance.

5.9 Hydrology

- 5.9.1 The effects of the route options on the water environment are considered fully in Part 3, Chapter 13 (Road Drainage and the Water Environment) of this report. This section provides a summary of the engineering issues related to watercourse crossings and road drainage.
- 5.9.2 A preliminary assessment of hydrology was made for each route option. Following the selection of a preferred option, a review of the drainage and flood risk strategy will be undertaken during the DMRB Stage 3 assessment.

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Watercourses

- 5.9.3 A number of watercourses located within the study area are affected by the proposed route options, including:

The Scretan Burn and its associated flood plain.

- 5.9.4 The Scretan Burn flows on the east side of Inverness Retail Park before continuing north through a culvert under the existing A96 and on to the Moray Firth.

The Cairnlaw Burn and its associated flood plain.

- 5.9.5 The Cairnlaw Burn flows close to the south-east side of the existing C1032 western junction, culverted first under C1032 Barn Church Road, followed by the existing A96 near Milton of Culloden and then the Aberdeen to Inverness Railway Line, before outfalling into the Moray Firth. North of the Aberdeen to Inverness Railway Line, the Cairnlaw Burn is joined by a tributary, Kenneth's Black Well, which has a wide floodplain in the vicinity of Milton of Culloden.

Fiddler's Burn

- 5.9.6 Fiddler's Burn is a small watercourse which starts south of the existing A96 near Balloch and follows field boundaries until it reaches the Moray Firth. Fiddler's burn flows underground for approximately 500m, including its crossing of the existing A96. This crossing is not listed within Part 1, Chapter 2 (Existing Conditions) of this report and it would appear that there may be no formal record of this culvert.

Rough Burn

- 5.9.7 The Rough Burn is a small watercourse which travels in a generally northern direction from High Wood. It is bridged under the existing A96 at Morayston and crosses the Aberdeen to Inverness Railway Line and the B9039 Newton – Castle Stuart – Ardersier Road before feeding into the Moray Firth.
- 5.9.8 There are also a number of unnamed watercourses / drainage ditch networks, which are culverted beneath the existing A96.
- 5.9.9 Table 5.9 indicates the watercourses affected by each route option and the proposed treatment.

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Table 5.9: Watercourse crossings

Route Option	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
Scretan Burn	C & EC	C & EC	C & EC	C & EC	C & EC	C & EC	C & EC	C & EC
Cairnlaw Burn and tributaries	3C	3C	3C	3C	3C	3C	3C	3C
Allanfearn field drain	-	-	-	-	C	C	C	C
Fiddler's Burn	2C	2C	2C	2C	C	C	C	C
Rough Burn and tributaries	B, 5C & 2EC	8C & EC	B, 5C & 2EC	9C & 2EC	B, 5C & EC	7C	B, 5C & 2EC	8C & EC
Ardersier Burn tributaries	2C & EC	2C & EC	2C & 2EC	2C & 2EC	2C & EC	2C & EC	2C & 2EC	2C & 2EC
Total	18	19	19	22	17	17	19	20

Key to Table:

EC – Extend/re-construct existing culvert– Number indicates no of crossings of watercourse or tributaries

C – Watercourse to be culverted – Number indicates no of crossings of watercourse or tributaries

B – Bridge – Refer to structures assessment

- 5.9.10 The route options have a broadly similar number of watercourse crossings. Route Option 1B (MV) has the largest number, with 22 watercourse crossings, and Route Options 1C and 1C (MV) has the least with only 17.

Drainage

- 5.9.11 A preliminary drainage design has been carried out to identify potential outfalls, catchment areas and treatment pond sizes to inform the engineering and environmental assessments of each route option. The design of drainage systems will be developed further as part of the DMRB Stage 3 assessment, once a preferred option has been identified.
- 5.9.12 The design will incorporate Sustainable Drainage Systems (SuDS) which will include the provision of measures such as swales, filter drains, and ponds or basins. The intention of such systems is to limit the rate of surface water discharging from the carriageway into existing watercourses in all but extreme weather situations and provide treatment to reduce the concentration of pollutants entering the watercourses. This will be achieved through the provision of detention basins at frequent intervals, containing the surface water runoff generated by the proposed scheme and allowing a controlled flow into the watercourse.
- 5.9.13 None of the route options are anticipated to result in significant problems with discharging runoff into watercourses. However, some of the outfall locations, particularly Fiddler's Burn and the easternmost tributary of Rough Burn, are very small watercourses. Using these watercourses may require greater levels of attenuation to avoid increasing flood risk. Furthermore, due to the relatively flat terrain, some of the preliminary drainage designs will require outfalls to discharge runoff within the floodplain at watercourses, and this will require careful consideration at the next stage of the design development.
- 5.9.14 On approach to the proposed Mid Coul Junction A, the proposed mainline for Route Options 1A and 1C cross a floodplain of the Unnamed burn at Mid Coul in a shallow cutting, which may cause problems for the new road in this area. At the next design stage, if alignments 1A, 1A (MV), 1C or 1C (MV) are to be used then the vertical alignment should be reconsidered at this point to help mitigate the risk of flooding in this area.
- 5.9.15 At this stage it has been assumed that most local roads will not require positive drainage systems, but water will simply flow over the carriageway edge as it does at present. However, some of the proposed local roads contribute to the dual carriageway drainage system.

5.10 Structures

Introduction

- 5.10.1 This section provides a general overview of the requirements for structures between Inverness and Gollanfield. Whilst there is a degree of repetition between the requirements for the various route options where they follow the same alignments, e.g. Route Options 1A, 1A (MV), 1B, and 1B (MV) between the proposed Smithton Junction and the proposed Newton A Junction, the requirements for each route option have been stated fully for ease of reading and to avoid confusion. However, where the Morayston Variant (MV) route options are described, e.g. Route Option 1A (MV), reference is made to Route Option 1A where identical structures are required.
- 5.10.2 Where individual structures are described, only outline details have been provided as further details will be developed and provided in the DMRB Stage 3 Report following development of the preferred option. All structure proposals described below comply with the DMRB and it is not envisaged that any Departures from Standard will be required at this stage of the scheme development in relation to the proposed structures.
- 5.10.3 The proposals are based on adopting concrete construction, either cast in-situ or precast, where span lengths permit as this is generally the most cost effective type of construction. However, where larger spans cannot be avoided, steel concrete composite construction is proposed.
- 5.10.4 In addition, wherever possible, integral construction has been proposed to minimise long term maintenance requirements and costs where the overall length of the structure does not exceed 60m and the skew does not exceed 30 degrees. In other cases, bearings and movement joints will be provided in conjunction with abutment inspection galleries where integral construction is not appropriate.
- 5.10.5 The proposed structure locations are shown on Drawings B1557601/SLP/1100 to 1450 (Volume 2).

Underbridges

- 5.10.6 The carriageway, hard shoulders and hard strips of the mainline will be continued over decks of underbridges. In addition, verges of the mainline carriageway shall be carried over underbridge decks with no reduction of width in accordance with Clause 5.6 of TD 27/05 of the DMRB.

Overbridges

- 5.10.7 The carriageway and, where provided, hard strips of local roads will be continued over the decks of overbridges. In addition, the verges of local roads carried by overbridges shall be continued across overbridges and verges of the mainline below overbridges shall be continued through the structure with no reduction of width in accordance with Clause 5.6 of TD 27/05 of the DMRB.
- 5.10.8 At certain locations, it may be necessary to widen bridge decks of both underbridges and overbridges and to lengthen overbridges and increase the spans of underbridges to cater for sightline requirements where road alignments are curved or where structures are located in the vicinity of junctions. In either case, widening would be accomplished by increasing the width of the verge(s) and central reserve as appropriate.

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Route Option 1A

- 5.10.9 Route Option 1A requires the provision of 9 bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east and these structures can be summarised as follows:

Smithton Junction Underbridge (1A)

- 5.10.10 This structure would carry the mainline over the proposed Smithton Junction link road between the north and south junction roundabouts and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate a 7.3m wide carriageway and 2 no 2.0m wide verges. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the roundabouts on each side of the structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

U1347 Overbridge (1A)

- 5.10.11 This structure would carry the U1347 Allanfeearn – Alturlie Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

U1347 Railway Overbridge (1A)

- 5.10.12 This structure would carry the U1347 Allanfeearn – Alturlie Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. An increase in the clear span may also be necessary to accommodate signal sighting on the curved track through this structure. The road cross section over the structure would accommodate a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure is proposed to be of cast in-situ concrete supported on spread footings whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway. Consultation with Network Rail will be required to confirm aspects such as vertical and horizontal clearances and parapet requirements along with requirements for working adjacent to and over the railway during construction.

Newton Junction A Overbridge (1A)

- 5.10.13 This structure would carry the proposed Newton Junction A link road between the north and south junction roundabouts over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for Non-Motorised User (NMU) provision.

Rough Burn Underbridge (1A)

- 5.10.14 This structure would carry the mainline over Rough Burn and is proposed to consist of a single span portal type structure with a minimum clear span of 4.5m between abutment walls to match the clear span of the existing A96 560 Morayston structure immediately north of the proposed structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to

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accommodate construction over the existing watercourse. In addition to carrying the mainline over Rough Burn this structure is widened to the south to carry the access road to Morayston House with an appropriate vehicle restraint system (VRS) and opaque barrier between the mainline and local road to prevent headlight glare between opposing traffic flows.

A96 Kerrowaird A Overbridge (1A)

- 5.10.15 This structure would carry the realigned existing A96 over the proposed mainline and consists of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

C1020 Overbridge (1A)

- 5.10.16 This structure would carry the C1020 Dalcross Station Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

Mid Coul Junction A Overbridge (1A)

- 5.10.17 This structure would carry the proposed Mid Coul Junction A link road between the north and south junction roundabouts over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Brackley Junction Overbridge (1A)

- 5.10.18 This structure would carry the proposed Brackley Junction link road between the north and south junction roundabouts over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Route Option 1A (MV)

- 5.10.19 Route Option 1A (MV) requires the provision of eight bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east. A number of structures at the western and eastern extremities of this route option are the same as for Route Option 1A above and therefore only those structures which differ from Route Option 1A are described in detail.

Smithton Junction Underbridge (1A (MV))

- 5.10.20 Refer to Route Option 1A above.

U1347 Overbridge (1A (MV))

- 5.10.21 Refer to Route Option 1A above.

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U1347 Railway Overbridge (1A (MV))

5.10.22 Refer to Route Option 1A above.

Newton Junction C Underbridge (1A (MV))

5.10.23 This structure would carry the proposed Newton Junction C link road between the north and south junction roundabouts below the mainline and is proposed to consist of a single span portal type structure with a minimum clear span of 12.8m between abutment walls to accommodate a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for NMU provision. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the roundabouts on each side of the structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

A96 Kerrowaird B Underbridge (1A (MV))

5.10.24 This structure would carry the mainline over the realigned existing A96 and is proposed to consist of a single span portal type structure with a minimum clear span of 14.3m between abutment walls to accommodate the former A96 comprising a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m minimum wide verges. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to accommodate construction over the existing A96.

C1020 Overbridge (1A (MV))

5.10.25 Refer to Route Option 1A above.

Mid Coul Junction A Overbridge (1A (MV))

5.10.26 Refer to Route Option 1A above.

Brackley Junction Overbridge (1A (MV))

5.10.27 Refer to Route Option 1A above.

Route Option 1B

5.10.28 Route Option 1B requires the provision of nine bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east and these structures can be summarised as follows:

Smithton Junction Underbridge (1B)

5.10.29 This structure would carry the mainline over the proposed Smithton Junction link road between the north and south junction roundabouts and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate a 7.3m wide carriageway and 2 no 2.0m wide verges. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the roundabouts on each side of the structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

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U1347 Overbridge (1B)

- 5.10.30 This structure would carry the U1347 Allanfeearn – Alturlie Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

U1347 Railway Overbridge (1B)

- 5.10.31 This structure would carry the U1347 Allanfeearn – Alturlie Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. An increase in the clear span may also be necessary to accommodate signal sighting on the curved track through this structure. The road cross section over the structure would accommodate a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure is proposed to be of cast in-situ concrete supported on spread footings whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway. Consultation with Network Rail will be required to confirm aspects such as vertical and horizontal clearances and parapet requirements along with requirements for working adjacent to and over the railway during construction.

Newton Junction A Overbridge (1B)

- 5.10.32 This structure would carry the proposed Newton Junction A link road between the north and south junction roundabouts over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for NMU provision.

Rough Burn Underbridge (1B)

- 5.10.33 This structure would carry the proposed mainline over Rough Burn and is proposed to consist of a single span portal type structure with a minimum clear span of 4.5m between abutment walls to match the clear span of the existing A96 560 Morayston structure immediately north of the proposed structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to accommodate construction over the existing watercourse. In addition to carrying the mainline over Rough Burn this structure would be widened to the south to carry the access road to Morayston House with an appropriate VRS and opaque barrier between the mainline and local road to prevent headlight glare between opposing traffic flows.

A96 Kerrowaird A Overbridge (1B)

- 5.10.34 This structure would carry the realigned exiting A96 over the proposed mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

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C1020 Overbridge (1B)

- 5.10.35 This structure would carry the C1020 Dalcross Station Road over the mainline and consists of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

Mid Coul Junction B Overbridge (1B)

- 5.10.36 This structure would carry the C1017 Kerrowgair – Croy Road over the mainline through Mid Coul Junction B and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 10.8m wide carriageway and 2 no 2.0m wide verges.

Brackley Junction Overbridge (1B)

- 5.10.37 This structure would carry the proposed Brackley Junction link road between the north and south junction roundabouts over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Route Option 1B (MV)

- 5.10.38 Route Option 1B (MV) requires the provision of eight bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east. A number of structures at the western and eastern extremities of this route option are the same as for Route Option 1B above and therefore only those structures which differ from Route Option 1B are described in detail.

Smithton Junction Underbridge (1B (MV))

- 5.10.39 Refer to Route Option 1B above.

U1347 Overbridge (1B (MV))

- 5.10.40 Refer to Route Option 1B above.

U1347 Railway Overbridge (1B (MV))

- 5.10.41 Refer to Route Option 1B above.

Newton Junction C Underbridge (1B (MV))

- 5.10.42 This structure would carry the proposed Newton Junction C link road between the north and south junction roundabouts below the mainline and is proposed to consist of a single span portal type structure with a minimum clear span of 12.8m between abutment walls to accommodate a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for NMU provision. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the junctions on each side of the structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

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A96 Kerrowaird C Overbridge (1B (MV))

- 5.10.43 This structure would carry the realigned existing A96 over the proposed mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

C1020 Overbridge (1B (MV))

- 5.10.44 Refer to Route Option 1B above.

Mid Coul B Junction Overbridge (1B (MV))

- 5.10.45 Refer to Route Option 1B above.

Brackley Junction Overbridge (1B (MV))

- 5.10.46 Refer to Route Option 1B above.

Route Option 1C

- 5.10.47 Route Option 1C requires the provision of seven bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east and these structures can be summarised as follows:

Smithton Junction Underbridge (1C)

- 5.10.48 This structure would carry the mainline over the proposed Smithton Junction link road between the north and south junction roundabouts and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate a 7.3m wide carriageway and 2 no 2.0m wide verges. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the roundabouts on each side of the structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

Newton Junction B Overbridge (1C)

- 5.10.49 This structure would carry the proposed Newton Junction B link road between the north and south junction roundabouts over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure is proposed to comprise a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for NMU provision.

Rough Burn Underbridge (1C)

- 5.10.50 This structure would carry the mainline over Rough Burn and is proposed to consist of a single span portal type structure with a minimum clear span of 4.5m between abutment walls to match the clear span of the existing A96 560 Morayston structure immediately north of the proposed structure. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to accommodate construction over the existing watercourse. In addition to carrying the mainline over Rough Burn this structure is widened to the south to carry the access road to

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Morayston House with an appropriate VRS and opaque barrier between the mainline and local road to prevent headlight glare between opposing traffic flows.

A96 Kerrowaird A Overbridge (1C)

- 5.10.51 This structure would carry the realigned existing A96 over the proposed mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

C1020 Overbridge (1C)

- 5.10.52 This structure would carry the C1020 Dalcross Station Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

Mid Coul Junction A Overbridge (1C)

- 5.10.53 This structure would carry the proposed Mid Coul Junction A link road between the north and south junction roundabouts over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Brackley Junction Overbridge (1C)

- 5.10.54 This structure would carry the proposed Brackley Junction link road between the north and south junction roundabouts over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Route Option 1C (MV)

- 5.10.55 Route Option 1C (MV) requires the provision of six bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east. A number of structures at the western and eastern extremities of this route option are the same as for Route Option 1C above and therefore only those structures which differ from Route Option 1C are described in detail:

Smithton Junction Underbridge (1C (MV))

- 5.10.56 Refer to Route Option 1C above.

Newton Junction B Overbridge (1C (MV))

- 5.10.57 Refer to Route Option 1C above.

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A96 Kerrowaird B Underbridge (1C (MV))

- 5.10.58 This structure would carry the mainline over the realigned existing A96 and is proposed to consist of a single span portal type structure with a minimum clear span of 13.3m between abutment walls to accommodate the former A96 comprising a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.5m minimum wide verges. The substructure is proposed to be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to accommodate construction over the existing A96.

C1020 Overbridge (1C (MV))

- 5.10.59 Refer to Route Option 1C above.

Mid Coul Junction A Overbridge (1C (MV))

- 5.10.60 Refer to Route Option 1C above.

Brackley Junction Overbridge (1C (MV))

- 5.10.61 Refer to Route Option 1C above.

Route Option 1D

- 5.10.62 Route Option 1D requires the provision of seven bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east and these structures can be summarised as follows:

Smithton Junction Underbridge (1D)

- 5.10.63 This structure would carry the mainline over the proposed Smithton Junction link road between the north and south junction roundabouts and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate a 7.3m wide carriageway and 2 no 2.0m wide verges. The verge widths through the structure may need to be increased depending on the particular sightline requirements in relation to the roundabouts on each side of the structure. The substructure will be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill.

Newton Junction B Overbridge (1D)

- 5.10.64 This structure would carry the proposed Newton Junction B link road between the north and south junction roundabouts over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 7.3m wide carriageway with 1 no 2.0m wide east verge and 1 no 3.5m wide west verge for NMU provision.

Rough Burn Underbridge (1D)

- 5.10.65 This structure would carry the mainline over Rough Burn and is proposed to consist of a single span portal type structure with a minimum clear span of 4.5m between abutment walls to match the clear span of the existing A96 560 Morayston structure immediately north of the proposed structure. The substructure will be of cast in-situ concrete although the deck may consist of either in-situ concrete or precast prestressed beams with solid infill to accommodate construction over the existing watercourse. In addition to carrying the mainline over Rough Burn this structure is widened to the south to carry the access road to

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Morayston House with an appropriate VRS and opaque barrier between the mainline and local road to prevent headlight glare between opposing traffic flows.

A96 Kerrowaird A Overbridge (1D)

- 5.10.66 This structure would carry the realigned exiting A96 over the proposed mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

C1020 Overbridge (1D)

- 5.10.67 This structure would carry the C1020 Dalcross Station Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

Mid Coul Junction B Overbridge (1D)

- 5.10.68 This structure would carry the C1017 Kerrowgair – Croy Road over the mainline through Mid Coul Junction B and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the abutments are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 10.8m wide carriageway and 2 no 2.0m wide verges.

Brackley Junction Overbridge (1D)

- 5.10.69 This structure would carry the proposed Brackley Junction link road between the north and south junction roundabouts over the mainline and consists of a four span structure comprising precast beam and slab type construction. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Route Option 1D (MV)

- 5.10.70 Route Option 1D (MV) requires the provision of six bridges between the proposed Smithton Junction in the west and the proposed Brackley Junction in the east. A number of structures at the western and eastern extremities of this route option are the same as for Route Option 1D above and therefore only those structures which differ from Route Option 1D are described in detail:

Smithton Junction Underbridge (1D (MV))

- 5.10.71 Refer to Route Option 1D above.

Newton Junction B Overbridge (1D (MV))

- 5.10.72 Refer to Route Option 1D above.

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A96 Kerrowaird C Overbridge (1D (MV))

- 5.10.73 This structure would carry the realigned existing A96 over the proposed mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction on a high skew of approximately 60 degrees. Intermediate supports are proposed to comprise circular columns or slab wall piers whilst the end supports are proposed to comprise galleried abutments on spread footings. The cross section over the structure will comprise a 7.3m wide carriageway with 2 no 1.0m wide hard strips and 2 no 2.5m wide verges.

C1020 Overbridge (1D (MV))

- 5.10.74 Refer to Route Option 1D above.

Mid Coul Junction B Overbridge (1D (MV))

- 5.10.75 Refer to Route Option 1D above.

Brackley Junction Overbridge (1D (MV))

- 5.10.76 Refer to Route Option 1D above.

Summary

- 5.10.77 Table 5.10 shows a summary of the number of structures required on the different route options. The table has been based on provision of bridge type structures. Requirements for the number and extent of any retaining walls have yet to be determined.

Table 5.10: Number of Structures required for each Route Option

Route Option	No. of Road Bridges	No. of River Bridges	No. of Rail Bridges	No. of Acc' Structures	No. of Culverts
1A	7	1	1	1	18
1A (MV)	7	0	1	2	17
1B	7	1	1	0	19
1B (MV)	7	0	1	1	20
1C	6	1	0	4	17
1C (MV)	6	0	0	4	15
1D	6	1	0	3	19
1D (MV)	6	0	0	3	18

Ancillary Structures

- 5.10.78 All Inverness to Gollanfield route options would require the provision of a number of ancillary structures such as culverts and may require farm accommodation underpasses and overbridges, which would have the following general structural arrangements. In addition, all structures would require the provision of vehicle parapets and pedestrian protection as described below.

Culverts

- 5.10.79 At present it has been assumed that all watercourses crossing the line of the route options will require a culvert which shall be sized to accommodate the required design flood flows. Culverts would generally consist of reinforced concrete pipes or either cast in-situ or precast concrete box construction thus minimising construction and maintenance costs. Wingwalls provided at each end of the culvert may consist of either precast or cast in-situ reinforced concrete. Where pipes of less than 2.0m diameter are provided, these are not classified as

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a structure but would form part of the drainage system, except that corrugated steel buried structures of span of 0.9m or greater are classified as structures in accordance with Clause 3 of BD 2/05 of the DMRB.

- 5.10.80 Where existing culverts require to be extended the extensions would generally be of the same cross section and materials as the existing culvert.
- 5.10.81 The proposed culvert locations for each route option are shown on Drawings B1557601/SLP/1100 to 1450 (Volume 2).

Farm Accommodation Underpasses

- 5.10.82 Farm accommodation underpasses would likely be of either cast in-situ construction or consist of precast reinforced concrete elements placed together with the internal carriageway and verge widths and vertical clearances determined to suit the particular agreement with the affected landowner.
- 5.10.83 Where precast concrete type structures are provided, these may be of a bespoke design prepared by manufacturers of proprietary type structures.
- 5.10.84 Initial consideration has been given to farm accommodation underpasses for each route option, and will be considered further in future design development for the preferred option in consultation with landowners. As such, the need for farm accommodation underpasses cannot be confirmed at this time.

Farm Accommodation Overbridges

- 5.10.85 Farm accommodation overbridges shall be of a similar type of construction as local road overbridges with the carriageway and verge widths determined to suit the particular agreement with the affected landowner.
- 5.10.86 Consideration has been given to farm accommodation overbridges for each route option, and will be considered further in future design development for the preferred option in consultation with landowners.

Vehicle Containment and Pedestrian Restraint over Structures

- 5.10.87 Generally, vehicle containment over structures would consist of 1.0m high N2 (Normal Containment Level) parapets of metal construction with mesh infill in accordance with Clause 4 of TD 19/06 of the DMRB. Where the structure would carry a cycleway, the parapet would be 1.4m high and where the structure would carry a bridleway, the parapet height would be increased to 1.8m. In the case of accommodation bridges, the parapet height would be 1.5m.
- 5.10.88 In the case of structures crossing over railway lines, containment would be H4a (Very High Containment Level) parapets of either metal construction with solid infill or concrete construction and be 1.5m high. Where concrete parapets are adopted, these may be of either cast in-situ or precast concrete construction. In the case of both metal and concrete parapets over railways, a steeple cope would be provided to prevent pedestrian access on top of the parapet. The final form and details of the parapets would be agreed with Network Rail.
- 5.10.89 In all cases, suitable transitions and connections will be made between parapets over structures and safety barriers on the approach and exit ends to each structure in accordance with Clause 6 of TD 19/06 of the DMRB.
- 5.10.90 Where underpasses and culverts are provided, pedestrian restraint systems would be provided at the top of headwalls and wingwalls in accordance with Clause 9 of TD 19/06 of

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the DMRB. In addition, pedestrian restraint systems would also be provided at the top of wingwalls to bridges where these are not protected by vehicle restraint systems.

5.11 Utilities

5.11.1 There are a significant number of buried and overhead public and private utility services within the study area including:

- Scottish and Southern Energy (SSE) sub-stations, High Voltage, Medium Voltage and Low Voltage overhead and buried services;
- Telecommunications – British Telecom overhead and buried services and THUS fibre optic network;
- Scottish water supply network;
- Scottish water sewer network;
- Scotia Gas – High, intermediate and medium pressure pipelines, including major above ground installations;
- Government Pipeline and Storage System – Supply pipeline to military facilities in the area; and
- Street lighting – there are areas of the existing road network that feature street lighting and will therefore include underground power cables in the vicinity of the lighting.

5.11.2 The key utilities are shown on Drawings B1557601/EXI/0005 and 0006 (Volume 2).

5.11.3 In accordance with the New Roads and Street Works Act (1991) C2 notices were issued to each of the utility providers to provide details of their networks within the study area to enable all potential clashes between route options and utility infrastructure to be clearly identified. Where possible the vertical and horizontal alignments have been developed to avoid or minimise clashes with key strategic elements of each provider's network.

5.11.4 Where it has not been possible to avoid a clash with key strategic parts of the utility providers network consultation has been undertaken with the relevant provider and C3 notices issued requesting an outline design and costing for resolution of key utility clashes.

5.11.5 Utilities diversion design for any utilities other than the key utilities has not been considered as a part of this DMRB Stage 2 assessment. A broad-based assessment has been undertaken for cost estimating purposes, at this stage of the scheme development.

Scottish and Southern Energy (SSE)

Network

5.11.6 SSE electricity supply infrastructure covers the majority of the study area. The key elements of the network include:

33kV (high voltage) power lines

5.11.7 This utility travels in a generally north-east direction through the study area, south of the existing A96. There is a branch off this line towards the airport.

Overhead and underground cables

5.11.8 These cables carry the 11kV (medium voltage) and low voltage power into homes and businesses in the study area. The network is concentrated mainly within more densely populated areas, but the majority of the study area is serviced to some extent.

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Impacts

5.11.9 Table 5.11 summaries the number of interfaces with the SSE network for each route option:

Table 5.11: Number of interfaces with SSE

Route Option	Impacts on 132kV Line	Impacts on 32kV Overhead Line	Impacts on 11kV Overhead Line	Impacts on 11kV Underground Line	Total
1A	0	2	22	7	31
1A (MV)	0	4	20	8	32
1B	0	3	22	6	31
1B (MV)	0	6	22	7	35
1C	0	2	17	7	26
1C (MV)	0	4	15	7	26
1D	0	3	14	6	23
1D (MV)	0	7	13	6	26

5.11.10 Route Option 1B (MV) impacts the SSE network on 35 occasions, the most of all route options. Route Option 1D impacts the SSE network on 23 occasions, the least of all route options. It should be noted that each impact varies in length, but this assessment considers the total number of impacts, and so the potential disruption to the network. The estimated overall length of diversions is considered in the cost estimate for each route option.

Telecommunications

Network

5.11.11 Telecommunications infrastructure covers the majority of the study area. The key elements of the network include:

British Telecom (BT) underground (U/G) supply network

5.11.12 This utility is located throughout the study area. There are cables adjacent to the existing A96 Aberdeen – Inverness Trunk Road and surrounding local roads, servicing homes and businesses.

BT overhead (O/H) supply network

5.11.13 This utility is not as prevalent as the underground supply network. Cables are adjacent to local roads, connecting to the underground cable adjacent to the existing A96.

THUS

5.11.14 This utility joins the existing A96 from the C1032 Barn Church Road east junction and follows the existing A96 to the eastern end of the scheme.

Impacts

5.11.15 Table 5.12 summarises the number of interfaces with the telecommunications network for each route option:

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Table 5.12: Number of interfaces with telecommunications

Route Option	Impacts on BT U/G network	Impacts on BT O/H network	Impacts on THUS Network	Total
1A	29	5	10	44
1A (MV)	25	5	10	40
1B	35	5	10	40
1B (MV)	27	5	10	42
1C	29	5	8	42
1C (MV)	23	5	8	35
1D	32	5	9	46
1D (MV)	30	5	9	44

5.11.16 There are significantly more impacts between all proposed route options and the BT underground network than any other element of the telecommunications utility network.

5.11.17 Route Option 1D impacts on the telecommunications network on 46 occasions, the most of all route options, compared with the 35 impacts on Route Option 1C (MV), the least of all route options. It should be noted that each impact varies in length, but this assessment considers the total number of impacts, and so the potential disruption to the network.

Scottish Water

Network

5.11.18 Scottish Water infrastructure covers the majority of the study area. The key elements of the network include:

Freshwater supply

5.11.19 In addition to the freshwater supply through water mains, there are a number of abandoned water mains in the study area. The network serves homes and businesses throughout the study area.

5.11.20 A number of private water supplies (PWS) have been identified within the study area and these are discussed in Part 3, Chapter 12 (Geology and Soils) of this report and shown on Figures 12.1 to 12.9 (Volume 3).

Wastewater infrastructure

5.11.21 The wastewater network comprises combined sewer outfalls, foul water sewers, and surface water sewers. The network services homes and businesses in the study area, with the majority of services concentrated in the more densely populated western end of the study area. Also, the local network feeds into a sewage works north of the existing A96 at Milton of Culloden.

Impacts

5.11.22 Table 5.13 summarises the number of interfaces with the freshwater network for each route option:

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Table 5.13: Number of interfaces with water utilities

Route Option	Impacts on Water Mains	Impacts on Abandoned Water Mains	Total Impacts
1A	30	10	40
1A (MV)	32	11	43
1B	26	11	37
1B (MV)	28	11	39
1C	28	11	39
1C (MV)	28	11	39
1D	22	12	36
1D (MV)	22	11	37

5.11.23 Route Option 1A (MV) impacts on the freshwater supply network on 32 occasions, the most of all route options. Route Option 1D impacts the active network 22 times, the least of all route options.

5.11.24 Table 5.14 summarises the number of interfaces with the foul water network for each route option:

Table 5.14: Number of interfaces with foul water utilities

Route Option	Impacts on Combined Sewer Outfall	Impacts on Foul Water Sewer	Impacts on Surface Water Sewer	Total Impacts
1A	5	2	1	8
1A (MV)	5	2	1	8
1B	5	2	1	8
1B (MV)	5	2	1	8
1C	5	2	1	8
1C (MV)	5	2	1	8
1D	5	2	1	8
1D (MV)	5	2	1	8

5.11.25 All proposed route options impact on the wastewater network in eight locations. This is significantly less than the number of impacts on freshwater network.

Scotia Gas

Network

5.11.26 Scotia Gas infrastructure covers the majority of the study area. Key elements of the network include:

Local high pressure mains

5.11.27 This utility is present throughout the study area; there is a pipeline to the south of the existing A96, which is the main gas transmission supplying Inverness.

Intermediate pressure mains

5.11.28 This utility is present throughout the study area and is generally located adjacent to the existing A96 and major local roads.

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Low pressure mains

5.11.29 This utility is not prevalent in the study area.

Impacts

5.11.30 Table 5.15 summarises the number of interfaces with the gas network for each route option:

Table 5.15: Number of interfaces with gas utilities

Route Option	Impacts on Local High Pressure Mains	Impacts on Intermediate Pressure Mains	Impacts on Low Pressure Mains	Total Impacts
1A	2	11	3	16
1A (MV)	5	10	2	17
1B	2	11	3	16
1B (MV)	5	10	2	17
1C	5	11	3	19
1C (MV)	6	9	2	17
1D	5	11	3	20
1D (MV)	6	9	2	17

5.11.31 Route Option 1D impacts the Scotia Gas infrastructure on 20 occasions, the most of all route options. Route Options 1A and 1B impact on the network on 16 occasions, the least of all route options. It should be noted that each impact varies in length, but this assessment considers the total number of impacts, and so the potential disruption to the network.

5.11.32 A C3 notice was issued to Scotland Gas Networks (SGN) in relation to the High Pressure Mains. The lead in time SGN require to complete any diversion is 24 to 30 months from the acceptance of the C4 notices. Additionally, the construction of SGNs diversionary work would only occur during a summer period of April to September.

Government Pipeline and Storage System (GPSS)

Network

5.11.33 The Inverness – Lossiemouth fuel pipeline travels through the study area, south of the existing A96 in a generally north-easterly direction, and interacts with the proposed alignment at numerous locations. This pipeline is covered under the Land Powers (Defence) Act 1958.

Impacts

5.11.34 Table 5.16 summarises the number of interfaces with the GPSS network for each route option:

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Table 5.16: Number of interfaces with GPSS

Route Option	Impacts on GPSS
1A	9
1A (MV)	9
1B	9
1B (MV)	9
1C	8
1C (MV)	8
1D	8
1D (MV)	8

5.11.35 From Table 5.16 it can be seen that there is little difference between the route options.

5.12 Constructability

5.12.1 All route options for Inverness to Gollanfield include lengths of both online and offline construction. Online construction generally involves using the existing single carriageway as one carriageway and constructing a central reserve and second carriageway parallel to it. Traffic can then be switched onto this new carriageway and the existing carriageway upgraded and widened as necessary. A continuous traffic management system would be required throughout construction to maintain one lane of traffic in each direction, and to reinforce that this is not yet a dual carriageway. The route options contain two online sections, one at Milton of Culloden for options 1A, 1A (MV), 1B and 1B (MV) and one at Mid Coul for options 1B, 1B (MV), 1D and 1D (MV). While some route options are close to the existing A96 Aberdeen – Inverness Trunk Road at Morayston, they are not online here; the existing A96 single carriageway is maintained to the north of the proposed A96 dual carriageway.

5.12.2 Offline construction, where the new road is constructed in a different corridor from the existing road, does not have the same traffic management issues as online construction. For offline construction, traffic management would only be required at junctions, where the proposed road crosses the existing road network, where the proposed road ties-in with the existing road, or at site accesses.

5.12.3 Within Inverness to Gollanfield there are several elements which may pose particular constructability issues. The construction of the proposed Mid Coul Junction will sever the access between the existing A96 and Inverness Airport requiring a diversion route. Inverness Airport can be accessed via the B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road from the east and the B9039 Newton – Castle Stuart – Ardersier Road from the west. However, there is a height restriction and narrowing of the road on the B9039, therefore any traffic travelling from the west which exceeds the height restriction will be required to access Inverness Airport via the B9006 to the east which will be a significant diversion. It should be noted that the rail crossing on the B9006 is single lane and carries an associated weight limit. Consideration must also be given to phasing during the construction of the proposed Mid Coul Junction to ensure that these diversion routes, and the mainline, remain open for the duration of the works. This will affect all route options.

5.12.4 The proposed arrangement of the proposed Smithton Junction will utilise an existing at-grade roundabout on the A96 to form the northern roundabout of the junction, but with the existing A96 single carriageway realigned on both sides. Due to the lack of available diversion routes, phasing of construction will be key to maintaining the flow of traffic on the A96 and maintaining access to C1032 Barn Church Road. This issue will affect all route options.

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- 5.12.5 The proposed arrangement of the proposed Newton Junction B for options 1C, 1C (MV), 1D and 1D (MV), requires the northern roundabout to be constructed above the existing A96, on a significant embankment. The overbridge connecting to the southern roundabout is proposed to be constructed above the C1032 Barn Church Road. Due to a lack of available diversion routes this would pose a significant constructability issue. Traffic management and phasing of the construction would be required to maintain the flow of traffic during the works. If taken forward to the next design stage, consideration should be given to modifying the proposed Newton Junction B to reduce or eliminate this constructability issue.
- 5.12.6 At the next stage of the scheme development, careful consideration of construction phasing and the maintaining of access between local and strategic roads during the construction period will be required.

Table 5.17: Constructability issues

Route Option	1A	1A (MV)	1B	1B (MV)	1C	1C (MV)	1D	1D (MV)
Online at Milton of Culloden	Y	Y	Y	Y	-	-	-	-
Newton Junction B	-	-	-	-	Y	Y	Y	Y
Online at Mid Coull	-	-	Y	Y	-	-	Y	Y

- 5.12.7 Table 5.17 shows which route options contain these constructability issues. Route Options 1B, 1B (MV), 1D, and 1D (MV) include two of these issues, while Route Options 1A, 1A (MV), 1C and 1C (MV) each include only one. If the constructability issue of the proposed Newton Junction B can be reduced or eliminated, then Route Options 1C and 1C (MV) will have no constructability issues.

5.13 Non-Motorised Users

- 5.13.1 For ease of reference, the term Non-Motorised Users (NMUs) is used to describe pedestrians, cyclists and equestrians.
- 5.13.2 The effects of the route options on all travellers, including NMUs, are considered in Part 3, Chapter 15 (Effects on All Travellers) of this report where the impacts of the route options are assessed.
- 5.13.3 The following objectives have been set in terms of NMU provision for the scheme:
- Improve safety for NMU traffic within the study area;
 - Enhance provision for NMUs in the A96 corridor with facilities to supplement the local Core Path Network, National Cycle Network and Green Networks;
 - Provide suitable facilities for NMUs to cross the proposed A96 dual carriageway;
 - Combine NMU crossings with junctions, accommodation works and local road/access crossings where possible;
 - Provide grade separated crossings solely for NMUs where site specific considerations can be demonstrated; and
 - Maintain connectivity of the path network between communities and to amenities.
- 5.13.4 In order to meet the objectives for NMUs and address the impacts identified in Part 3, Chapter 15 (Effect on All Travellers) of this report, NMU improvements will be considered during design development of the preferred option during DMRB Stage 3.

5.14 Engineering Assessment Summary

Road Geometric Design

- 5.14.1 Currently, there are no departures from road design standards in any of the route options proposed.

Local roads

- 5.14.2 Route Options 1A, 1A (MV), 1B and 1B (MV) affect the local road network to a greater extent than Route Options 1C, 1C (MV), 1D and 1D (MV).

Geotechnics and Earthworks

- 5.14.3 There are lengths of potentially unfavourable ground conditions affecting the route options, including areas of alluvium and peat. Based on the total route length affected by areas of peat and alluvium, Route Option 1C (MV) is the most favourable and route options 1A, 1B and 1B (MV) are the least favourable.
- 5.14.4 Route Option 1B (MV) requires the most imported material for earthworks construction and has the poorest earthworks balance, while Route Option 1C (MV) requires the least imported material and has the best earthworks balance.

Hydrology

- 5.14.5 The environmental issues associated with drainage and hydrology are discussed in Part 3, Chapter 13 (Road Drainage and the Water Environment) of this report.
- 5.14.6 Route Options 1A, 1A (MV), 1C and 1C (MV) cross a wide flood plain at Mid Coul. Should one of these route options be selected as the preferred option, the mainline may need to be raised at this location. There may also be a need for flood compensatory storage.

Structures

- 5.14.7 All route options require a similar number of road structures and culverts. The main differentiating factor between the route options is the requirement for a rail crossing for route options 1A, 1A (MV), 1B and 1B (MV) which will increase the engineering complexity of these options and as such they are less favourable.

Utilities

- 5.14.8 The utilities that pose the greatest constraint are a high pressure gas pipeline and the Inverness – Lossiemouth fuel pipeline. There is no significant difference between the number of impacts on the fuel pipeline for all route options. Route Options 1A and 1B have significantly fewer impacts on the high pressure gas main compared with all other route options. Therefore, Route Options 1A and 1B are more favourable with regard to utilities.

NMU

- 5.14.9 There are no significant engineering issues associated with the NMU's. NMU provision on the preferred option will be designed and developed during the DMRB Stage 3 assessment

Constructability

- 5.14.10 From the perspective of constructability, sections of offline construction are considered preferable to online construction. Route Options 1C and 1C (MV) includes the smallest length of online construction of all route options, and are therefore preferred with regard to constructability.

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5.15 References

Geological Maps:

Sheet NH64NE, Solid and Drift Edition, 1991, Inverness North, 1:10,000, BGS

Sheet NH74NW, Solid and Drift Edition, 1991, Smithton, 1:10,000, BGS

Sheet NH74NE, Solid and Drift Edition, 1991, Cantray, 1:10,000, BGS

Sheet NH75SE, Solid and Drift Edition, 1991, Ardersier, 1:10,000, BGS

Sheet NH85NE, Solid and Drift Edition, 1999, Nairn, 1:10,000, BGS

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6 Engineering Assessment – Nairn Bypass

6.1 Introduction

6.1.1 This section of the report describes the findings of the engineering assessment of the nine route options for the Nairn Bypass. This section includes a description the engineering features of each route option including mainline alignment, proposed junctions and structures. The potential effects of each route option are discussed including effects on the local road network, geotechnics, and utilities.

6.1.2 The route options are shown on drawings B1557601/MLA/2100 to 2915 (Volume 2).

6.1.3 References used in this section of the report are included in Section 6.15 of this chapter.

6.2 Engineering Constraints

6.2.1 Each of the nine route options for the Nairn Bypass have been designed to take into consideration the following physical engineering constraints:

- The topography of the area, which is generally flat, gently rising to the south on the western half of the study area. To the east of the River Nairn the topography becomes more undulating with small localised hills, particularly to the south and east of Auldearn;
- The existing A96 Aberdeen – Inverness Trunk Road corridor which is discussed in Part 1, Chapter 2 (Existing Conditions) of this report;
- 12 junctions, 24 access and 16 field accesses along the rural sections of the existing A96;
- The existing local road network, which consists primarily of roads running into and out of Nairn, generally perpendicular to the route options;
- The Aberdeen to Inverness Railway Line, which runs east to west through the study area, with a station at Nairn. This is currently a single track but Network Rail is investigating options to twin track some elements of the line. The railway is crossed by the existing A96 at Gollanfield;
- The town of Nairn is the main town in the area and has a population of approximately 9000;
- The village of Auldearn is located approximately 1km east of Nairn. It is a historic village with a population of less than 1000;
- Scattered residential development;
- Agricultural holdings which are the predominant land use in the area;
- Local businesses including quarrying, timber processing, and tourism;
- Gravel and quarry workings at Easter Glackton and Blackcastle and numerous historic abandoned workings, particularly to the south and east of Auldearn;
- Areas of peat bog at the western end of the study area including the Blar Nam Fiadh peat bog which straddles the Aberdeen to Inverness Railway Line;
- Areas of alluvium associated with local watercourses, in particular around the Alton Burn;
- The River Nairn, and its associated flood plain, which is the main watercourse in the area running south to north across the centre of the study area. The River Nairn is approximately 25-30m in width and continues north through the centre of Nairn before discharging into the Moray Firth;

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- The Alton Burn, and associated flood plain, which originates at the eastern end of the Blar nam Fiadh peat bog and runs in a deep open channel in a north-easterly direction, south of the Aberdeen to Inverness Railway line. In the vicinity of Balnaspirach, the channel becomes shallower and the Alton Burn has a wide flood plain. It enters the south-east corner of Nairn, turns northwards and then discharges into the Moray Firth;
- The Auldearn Burn, and associated flood plain, is located to the eastern half of the study area and is a tributary of the River Nairn. It runs in a generally north to south direction, south of Auldearn, but turns eastwards and has two significant flood plains west of Auldearn. It is culverted beneath the existing A96 at Auldearn and then curves north, then west, back beneath the A96 and joins the River Nairn to the south of Nairn;
- The Boath Burn is a tributary of the Auldearn Burn to the east of Auldearn;
- Environmentally significant areas (refer to Part 3 – Environmental Assessment) such as ancient woodlands and the Kildrummie Kames SSSI;
- Significant areas of cultural heritage (refer to Part 3 – Environmental Assessment) such as the Auldearn Battlefield, Listed Buildings and Scheduled Monuments; and
- Public Utilities.

6.3 Engineering Description of Mainline Alignments

6.3.1 The nine route option descriptions in this section commence at the western end of the Inverness to Gollanfield section and are described as running in an eastbound direction. All route options begin at ch20,000.

Route Option 2A

6.3.2 Route Option 2A is detailed in drawings B1557601/MLA/2100 to 2114 (Volume 2). This route option is 15.9km in length.

6.3.3 Over the first 4km of the route option the existing A96 is proposed to be widened online. It is proposed that the existing A96 will form the eastbound carriageway, with the westbound carriageway constructed to the south. All existing junctions with the local network, including private and field accesses, are proposed to be either be stopped up or diverted.

6.3.4 The route option diverges from the existing A96 at Delnies, turning in an easterly direction on a 1020m radius right hand curve, cutting across the northern part of Delnies Caravan Park.

6.3.5 A new grade separated junction is proposed in Delnies Wood, which is referenced as Nairn West Junction A, which crosses above the main carriageway. This connects to the existing A96 single carriageway, providing access into the west side of Nairn, and other local roads.

6.3.6 The route option passes through Delnies Wood gradually rising towards the C1170 Moss-Side – Mosshall – Broadley Road, which is realigned to pass over the mainline. At this point, the route option takes a second 1020m radius right hand curve, to a south-easterly direction. South of the C1170 the existing ground profile drops sharply from a level of approximately 28m to 19.5m, but the proposed alignment lowers gradually, to maintain the required clearance to cross over the Aberdeen to Inverness Railway Line on a bridge.

6.3.7 After crossing the railway, the route option turns left on a 1020m radius curve and runs downhill at a gradual gradient on a substantial embankment across the Alton Burn flood plain. The route option lowers to ground level by the crossing of the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be realigned to pass over the mainline.

6.3.8 After crossing the B9091, the alignment continues on a gentle downhill gradient entering a slight cutting at the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, which is

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also proposed to be realigned over the mainline. The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.

- 6.3.9 The route option passes across farmland and through the northern edge of Knocknagillan Wood on a 4-5m high embankment, severing the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but an NMU underpass may be proposed. The route option runs downhill from there towards an at-grade crossing of the existing A939 Tomintoul – Grantown on Spey – Nairn Road, which is proposed to be realigned to pass above the proposed A96 mainline. The route option continues on a straight alignment in a north-easterly direction, severing the U3010 Blackpark – Grigorhill – Newmill Road, which is proposed to be stopped up, and entering a shallow cutting through woodland east of Auldearn. At this point, the route option crosses the northern extent of the Auldearn Battlefield (1645) site to the north of Garlic Hill.
- 6.3.10 The existing A96 bypasses Auldearn to the north, and the B9111 Auchnacloch – Auldearn Road serves as the road into this village. Between Nairn and Auldearn the route option crosses these roads and connects with the existing A96, to both the north and south, and the B9111 to the south at the proposed grade separated Nairn East Junction A, which crosses under the main carriageway.
- 6.3.11 After the proposed junction, the route option runs downhill at a gentle gradient to a low point at the Auldearn Burn. The route option turns through a 1440m radius right hand curve to a south-westerly direction and runs uphill following the north slope of Gallows Hill with gradient of up to 3%. The route option crosses the C1172 Auldearn – Station – Drum Road at close to existing ground level and the C1172 is proposed to be realigned over the proposed dual carriageway.
- 6.3.12 The route option enters a deep cutting across the peak of Gallows Hill of up to 14m in depth. After the peak, the route option drops slowly to maintain sufficient clearance to pass over the existing A96, whilst turning further east via a 2880m radius left hand curve. The route option then continues west with the existing A96 running parallel with it on the north side. A new access is proposed on the south side of the proposed dual carriageway to replace accesses that are severed by the route option.
- 6.3.13 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2B

- 6.3.14 Route Option 2B is detailed in drawings B15576901/MLA/2200 to 2214 (Volume 2). This route option is 15.9km in length.
- 6.3.15 Over the first 4km of the route option the existing A96 is proposed to be widened online. It is proposed that the existing A96 will form the eastbound carriageway, with the westbound carriageway constructed to the south. All existing junctions with the local network, including private and field accesses, are proposed to be either be stopped up or diverted
- 6.3.16 The route option diverges from the existing A96 at Delnies, turning in an easterly direction on a 1020m radius right hand curve, cutting across the northern part of Delnies Caravan Park.
- 6.3.17 A new grade separated junction is proposed in Delnies Wood, which is referenced as Nairn West Junction A, which crosses above the main carriageway. This connects to the existing A96 single carriageway, providing access into the west side of Nairn, and other local roads.

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- 6.3.18 The route option passes through Delnies Wood gradually rising towards the C1170 Moss-Side – Mosshall – Broadley Road, which is realigned to pass over the mainline. At this point, the route option takes a second 1020m radius right hand curve, to a south-easterly direction. South of the C1170 the existing ground profile drops sharply from a level of approximately 28m to 19.5m, but the proposed alignment lowers gradually, to maintain the required clearance to cross over the Aberdeen to Inverness Railway Line on a bridge.
- 6.3.19 After crossing the railway, the route option turns left on a 1020m radius curve and runs downhill at a gradual gradient on a substantial embankment across the Alton Burn flood plain. The route option lowers to ground level by the crossing of the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be realigned to pass over the mainline.
- 6.3.20 After crossing the B9091, the alignment continues on a gentle downhill gradient entering a slight cutting at the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, which is also proposed to be realigned over the mainline. The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.
- 6.3.21 The route option passes across farmland and through the northern edge of Knocknagillan Wood on a 4-5m high embankment, severing the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but an NMU underpass may be proposed. The route option runs downhill from there towards an at-grade crossing of the existing A939 Tomintoul – Grantown on Spey – Nairn Road, which is proposed to be realigned to pass above the proposed A96 mainline. The route option continues on a straight alignment in a north-easterly direction, severing the U3010 Blackpark – Grigorhill – Newmill Road, which is proposed to be stopped up, and entering a shallow cutting through woodland east of Auldearn. At this point, the route option crosses the northern extent of the Auldearn Battlefield (1645) site to the north of Garlic Hill.
- 6.3.22 The existing A96 bypasses Auldearn to the north, and the B9111 Auchnacloich – Auldearn Road serves as the road into this village. Between Nairn and Auldearn the route option crosses these roads and connects with the existing A96 to the north and the B9111 to the south at the proposed grade separated Nairn East Junction B, which crosses under the main carriageway.
- 6.3.23 Beginning at this junction, the route option curves through a 1020m radius right hand curve to come online past Auldearn. East of Auldearn, the route option shifts offline again, to the south of the existing road. The local road network, including the existing A96 single carriageway is proposed to be maintained with a proposed set of new roads including bridge under the proposed dual carriageway.
- 6.3.24 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2C

- 6.3.25 Route Option 2C is detailed in drawings B1557601/MLA/2300 to 2314 (Volume 2). This route option is 15.6km in length.
- 6.3.26 Over the first 4km of the route option the existing A96 is proposed to be widened online. It is proposed that the existing A96 will form the eastbound carriageway, with the westbound carriageway constructed to the south. All existing junctions with the local network, including private and field accesses, are proposed to be either be stopped up or diverted

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- 6.3.27 The route option diverges from the existing A96 at Delnies, turning in an easterly direction on a 1020m radius right hand curve, cutting across the northern part of Delnies Caravan Park.
- 6.3.28 A new grade separated junction is proposed in Delnies Wood, which is referenced as Nairn West Junction A, which crosses above the main carriageway. This connects to the existing A96 single carriageway, providing access into the west side of Nairn, and other local roads.
- 6.3.29 The route option passes through Delnies Wood gradually rising towards the C1170 Moss-Side – Mosshall – Broadley Road, which is realigned to pass over the mainline. At this point, the route option takes a second 1020m radius right hand curve, to a south-easterly direction. South of the C1170 the existing ground profile drops sharply from a level of approximately 28m to 19.5m, but the proposed alignment lowers gradually, to maintain the required clearance to cross over the Aberdeen to Inverness Railway Line on a bridge.
- 6.3.30 After crossing the railway, the route option turns left on a 1020m radius curve and runs downhill at a gradual gradient on a substantial embankment across the Alton Burn flood plain. The route option lowers to ground level by the crossing of the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be realigned to pass over the mainline.
- 6.3.31 After crossing the B9091, the alignment continues on a gentle downhill gradient entering a slight cutting at the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, which is also proposed to be realigned over the mainline. The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.
- 6.3.32 The route option passes across farmland and through the northern edge of Knocknagillan Wood on an embankment running downhill towards the A939 Tomintoul – Grantown on Spey – Nairn Road. The route option crosses the existing A939 on a slight embankment and the local road is proposed to be realigned to pass over the mainline. Four-way slips are proposed to create the proposed grade separated A939 Junction A.
- 6.3.33 As the route option continues east, it crosses the B9101 Auldearn – Cawdor Road and U3010 Blackpark – Grigorhill – Newmill Road close to a crossroads of these roads. A single bridge is proposed on the B9101, and the U3010 is proposed to be realigned to join the B9101. Further east the route option crosses the C1167 Auldearn – Dalmore – Cotterton Road, which is also proposed to be realigned to join the B9101.
- 6.3.34 As the topography rises around Kinstearry House, the route option goes into deep cutting. Due to this cutting, the access to Kinstearry House is proposed to be maintained with an overbridge, but little realignment.
- 6.3.35 The route option then crosses the C1171 Auldearn – Moyness Road, which is proposed to be stopped up. A new grade separated junction is proposed, referenced as Nairn East Junction D, as the route option comes close to the existing A96 east of Auldearn. This proposed junction provides access to the existing A96 to the north, to the C1171 to the south, and to a proposed link that serves the properties along the south side of the existing A96 whose accesses are severed by the proposed dual carriageway. Due to the proximity of the A939 junction to the west, Nairn East Junction D is only proposed to have east-facing slips.
- 6.3.36 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

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Route Option 2D

- 6.3.37 Route Option 2D is detailed in drawings B1557601/MLA/2400 to 2414 (Volume 2). This route option is 16.2km in length.
- 6.3.38 Over the first 4km of the route option the existing A96 is proposed to be widened online. It is proposed that the existing A96 will form the eastbound carriageway, with the westbound carriageway constructed to the south. All existing junctions with the local network, including private and field accesses, are proposed to be either be stopped up or diverted.
- 6.3.39 The route option diverges from the existing A96 at Delnies, turning in an easterly direction on a 1020m radius right hand curve, cutting across the northern part of Delnies Caravan Park.
- 6.3.40 A new grade separated junction is proposed in Delnies Wood, which is referenced as Nairn West Junction A, which crosses above the main carriageway. This connects to the existing A96 single carriageway, providing access into the west side of Nairn, and other local roads.
- 6.3.41 The route option passes through Delnies Wood gradually rising towards the C1170 Moss-Side – Mosshall – Broadley Road, which is realigned to pass over the mainline. At this point, the route option takes a second 1020m radius right hand curve, to a south-easterly direction. South of the C1170 the existing ground profile drops sharply from a level of approximately 28m to 19.5m, but the proposed alignment lowers gradually, to maintain the required clearance to cross over the Aberdeen to Inverness Railway Line on a bridge.
- 6.3.42 After crossing the railway, the route option turns left on a 1020m radius curve and runs downhill at a gradual gradient on a substantial embankment across the Alton Burn flood plain. The route option lowers to ground level by the crossing of the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be realigned to pass over the mainline. A 1020m radius right hand curve brings the route option direction from southward to south-east.
- 6.3.43 The route option is in cutting for approximately 400m between the B9091 and B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, but changes from cut to fill at the crossing of the B9090. To keep the B9090 open, and maintain acceptable road standards, a link is proposed between the B9090 and the B9091, and the B9090 is proposed to be realigned to cross the proposed dual carriageway and join this link where the proposed dual carriageway is in cut. The mainline and local road alignments do not conflict with the extra-high voltage power lines, which they cross at this point.
- 6.3.44 After crossing the River Nairn, a 1440m radius left-hand curve brings the route option to an easterly direction. The route option enters an area of undulating existing topography and is on a slight embankment and a local high point as it severs the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but a pedestrian underpass may be proposed. The route option then follows the existing topography, climbing with a gradient of over 3%. The route option crosses the A939 Tomintoul – Grantown on Spey – Nairn Road close to the staggered junction of the A939 and the B9101 Auldearn – Cawdor Road at ground level. The proposed grade separated A939 Junction B is used to connect the proposed dual carriageway with both of these roads. East of this proposed junction, the topography peaks and the route option then falls with a gradient of 1.5%.
- 6.3.45 The route option reaches a local low point near the C1167 Auldearn – Dalmore – Cotterton Road, which is proposed to be realigned over the proposed dual carriageway. The route option then slowly climbs again past Kinstearry House, to remain at ground level to avoid severing a high pressure gas main. A significant realignment is proposed for the access to Kinstearry House to pass over the proposed dual carriageway.

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- 6.3.46 The route option then crosses the C1171 Auldearn – Moyness Road, which is proposed to be stopped up. A new grade separated junction is proposed, referenced as Nairn East Junction D, as the route option comes close to the existing A96 east of Auldearn. This proposed junction provides access to the existing A96 to the north, to the C1171 to the south, and to a proposed link that serves the properties along the south side of the existing A96 whose accesses are severed by the proposed dual carriageway. Due to the proximity of the A939 junction to the west, Nairn East Junction D is only proposed to have east-facing slips.
- 6.3.47 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2E

- 6.3.48 Route Option 2E is detailed in drawings B1557601/MLA/2500 to 2514 (Volume 2). This route option is 15.4km in length.
- 6.3.49 Over the first 2km of the route option the existing is proposed to be widened online. It is proposed that the existing A96 corridor will form the eastbound carriageway with new westbound carriageway construction to the south. All existing private and field accesses are proposed to be stopped up.
- 6.3.50 The route option diverges from the existing A96 near Blackcastle and enters a significant cutting. The Cockhill private access road is proposed to be maintained by realigning it over the proposed dual carriageway. The route option continues on a slight downhill gradient through a depleted area of Blackcastle Quarry. A new grade separated junction, which is referenced as Nairn West Junction B, is proposed to connect to the existing A96 north-east into Nairn, the U2218 McDermotts Road to access the Port of Ardersier, and the existing A96 south-west for local access. This junction crosses above the main carriageway.
- 6.3.51 The route option then turns right on a 1440m radius curve and raises on an embankment to cross over the Aberdeen to Inverness Railway Line and the Alton Burn on bridges, but it severs the C1163 Delnies – Kildrummie – Howford Road, which is proposed to be stopped up. The route option then continues east, approximately following ground level, severing the U3226 Balnaspirach – Nairn Moss Lands Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be stopped up. The existing C1163 joins the existing B9091 south of the proposed route option, forming a local road connection between the south side of Nairn and the trunk road to the west of Nairn. This connection is proposed to be maintained by a proposed single carriageway link parallel to the proposed dual carriageway on the north side. This link is also proposed to connect to Balnaspirach.
- 6.3.52 The route option crosses the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road in slight cutting and this local road is proposed to be realigned on slight embankment over the proposed dual carriageway. A new link is proposed connecting the B9090 to the severed B9091, south of the proposed dual carriageway.
- 6.3.53 The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.
- 6.3.54 The route option passes across farmland and through the northern edge of Knocknagillan Wood on a 4-5m high embankment, severing the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but an NMU underpass may be proposed. The route option runs downhill from there towards an at-grade crossing of the existing A939 Tomintoul – Grantown on Spey – Nairn Road, which is proposed to be realigned to pass

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above the proposed A96 mainline. The route option continues on a straight alignment in a north-easterly direction, severing the U3010 Blackpark – Grigorhill – Newmill Road, which is proposed to be stopped up, and entering a shallow cutting through woodland east of Auldearn. At this point, the route option crosses the northern extent of the Auldearn Battlefield (1645) site to the north of Garlic Hill.

- 6.3.55 The existing A96 bypasses Auldearn to the north, and the B9111 Auchnacloch – Auldearn Road serves as the road into this village. Between Nairn and Auldearn the route option crosses these roads and connects with the existing A96, to both the north and south, and the B9111 to the south at the proposed grade separated Nairn East Junction A, which crosses under the main carriageway.
- 6.3.56 After the proposed junction, the route option runs downhill at a gentle gradient to a low point at the Auldearn Burn. The route option turns through a 1440m radius right hand curve to a south-westerly direction and runs uphill following the north slope of Gallows Hill with gradient of up to 3%. The route option crosses the C1172 Auldearn – Station – Drum Road at close to existing ground level and the C1172 is proposed to be realigned over the proposed dual carriageway.
- 6.3.57 The route option enters a deep cutting across the peak of Gallows Hill of up to 14m in depth. After the peak, the route option drops slowly to maintain sufficient clearance to pass over the existing A96, whilst turning further east via a 2880m radius left hand curve. The route option then continues west with the existing A96 running parallel with it on the north side. A new access is proposed on the south side of the proposed dual carriageway to replace accesses that are severed by the route option.
- 6.3.58 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2F

- 6.3.59 Route Option 2F is detailed in drawings B1557601/MLA/2600 to 2614 (Volume 2). This route option is 15.4km in length.
- 6.3.60 Over the first 2km of the route option the existing is proposed to be widened online. It is proposed that the existing A96 corridor will form the eastbound carriageway with new westbound carriageway construction to the south. All existing private and field accesses are proposed to be stopped up.
- 6.3.61 The route option diverges from the existing A96 near Blackcastle and enters a significant cutting. The Cockhill private access road is proposed to be maintained by realigning it over the proposed dual carriageway. The route option continues on a slight downhill gradient through a depleted area of Blackcastle Quarry. A new grade separated junction, which is referenced as Nairn West Junction B, is proposed to connect to the existing A96 north-east into Nairn, the U2218 McDermotts Road to access the Port of Ardersier, and the existing A96 south-west for local access.
- 6.3.62 The route option then turns right on a 1440m radius curve and raises on an embankment to cross over the Aberdeen to Inverness Railway Line and the Alton Burn on bridges, but it severs the C1163 Delnies – Kildrummie – Howford Road, which is proposed to be stopped up. The route option then continues east, approximately following ground level, severing the U3226 Balnaspirach – Nairn Moss Lands Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be stopped up. The existing C1163 joins the existing B9091 south of the proposed route option, forming a local road connection between the south side of Nairn and the trunk road to the west of Nairn. This connection is proposed

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- to be maintained by a proposed single carriageway link parallel to the proposed dual carriageway on the north side. This link is also proposed to connect to Balnaspirach.
- 6.3.63 The route option crosses the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road in slight cutting and this local road is proposed to be realigned on slight embankment over the proposed dual carriageway. A new link is proposed connecting the B9090 to the severed B9091, south of the proposed dual carriageway.
- 6.3.64 The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.
- 6.3.65 The route option passes across farmland and through the northern edge of Knocknagillan Wood on a 4-5m high embankment, severing the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but an NMU underpass may be proposed. The route option runs downhill from there towards an at-grade crossing of the existing A939 Tomintoul – Grantown on Spey – Nairn Road, which is proposed to be realigned to pass above the proposed A96 mainline. The route option continues on a straight alignment in a north-easterly direction, severing the U3010 Blackpark – Grigorhill – Newmill Road, which is proposed to be stopped up, and entering a shallow cutting through woodland east of Auldearn. At this point, the route option crosses the northern extent of the Auldearn Battlefield (1645) site to the north of Garlic Hill.
- 6.3.66 The existing A96 bypasses Auldearn to the north, and the B9111 Auchnacloich – Auldearn Road serves as the road into this village. Between Nairn and Auldearn the route option crosses these roads and connects with the existing A96 to the north and the B9111 to the south at the proposed grade separated Nairn East Junction B, which crosses under the main carriageway.
- 6.3.67 Beginning at this junction, the route option curves through a 1020m radius right hand curve to come online past Auldearn. East of Auldearn, the route option shifts offline again, to the south of the existing road. The local road network, including the existing A96 single carriageway is proposed to be maintained with a proposed set of new roads including bridge under the proposed dual carriageway.
- 6.3.68 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2G

- 6.3.69 Route Option 2G is detailed in drawings B1557601/MLA/2700 to 2714 (Volume 2). This route option is 15.2km in length.
- 6.3.70 Over the first 2km of the route option the existing is proposed to be widened online. It is proposed that the existing A96 corridor will form the eastbound carriageway with new westbound carriageway construction to the south. All existing private and field accesses are proposed to be stopped up.
- 6.3.71 The route option diverges from the existing A96 near Blackcastle and enters a significant cutting. The Cockhill private access road is proposed to be maintained by realigning it over the proposed dual carriageway. The route option continues on a slight downhill gradient through a depleted area of Blackcastle Quarry. A new grade separated junction, which is referenced as Nairn West Junction B, is proposed to connect to the existing A96 north-east into Nairn, the U2218 McDermotts Road to access the Port of Ardersier, and the existing A96 south-west for local access.

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- 6.3.72 The route option then turns right on a 1440m radius curve and raises on an embankment to cross over the Aberdeen to Inverness Railway Line and the Alton Burn on bridges, but it severs the C1163 Delnies – Kildrummie – Howford Road, which is proposed to be stopped up. The route option then continues east, approximately following ground level, severing the U3226 Balnaspirach – Nairn Moss Lands Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be stopped up. The existing C1163 joins the existing B9091 south of the proposed route option, forming a local road connection between the south side of Nairn and the trunk road to the west of Nairn. This connection is proposed to be maintained by a proposed single carriageway link parallel to the proposed dual carriageway on the north side. This link is also proposed to connect to Balnaspirach.
- 6.3.73 The route option crosses the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road in slight cutting and this local road is proposed to be realigned on slight embankment over the proposed dual carriageway. A new link is proposed connecting the B9090 to the severed B9091, south of the proposed dual carriageway.
- 6.3.74 The route option rises again on the approach to the River Nairn crossing. After the river crossing the route option conflicts with extra-high voltage power lines, which are proposed to be diverted.
- 6.3.75 The route option passes across farmland and through the northern edge of Knocknagillan Wood on an embankment running downhill towards the A939 Tomintoul – Granttown on Spey – Nairn Road. The route option crosses the existing A939 on a slight embankment and the local road is proposed to be realigned to pass over the mainline. Four-way slips are proposed to create the proposed grade separated A939 Junction A.
- 6.3.76 As the route option continues east, it crosses the B9101 Auldearn – Cawdor Road and U3010 Blackpark – Grigorhill – Newmill Road close to a crossroads of these roads. A single bridge is proposed on the B9101, and the U3010 is proposed to be realigned to join the B9101. Further east the route option crosses the C1167 Auldearn – Dalmore – Cotterton Road, which is also proposed to be realigned to join the B9101.
- 6.3.77 As the topography rises around Kinstearry House, the route option goes into deep cutting. Due to this cutting, the access to Kinstearry House is proposed to be maintained with an overbridge, but little realignment.
- 6.3.78 The route option then crosses the C1171 Auldearn – Moyness Road, which is proposed to be stopped up. A new grade separated junction is proposed, referenced as Nairn East Junction D, as the route option comes close to the existing A96 east of Auldearn. This proposed junction provides access to the existing A96 to the north, to the C1171 to the south, and to a proposed link that serves the properties along the south side of the existing A96 whose accesses are severed by the proposed dual carriageway. Due to the proximity of the A939 junction to the west, Nairn East Junction D is only proposed to have east-facing slips.
- 6.3.79 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2H

- 6.3.80 Route Option 2H is detailed in drawings B1557601/MLA/2800 to 2814 (Volume 2). This route option is 16.0km in length.
- 6.3.81 Over the first 2km of the route option the existing is proposed to be widened online. It is proposed that the existing A96 corridor will form the eastbound carriageway with new

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- westbound carriageway construction to the south. All existing private and field accesses are proposed to be stopped up.
- 6.3.82 The route option diverges from the existing A96 near Blackcastle and enters a significant cutting. The Cockhill private access road is proposed to be maintained by realigning it over the proposed dual carriageway. The route option continues on a slight downhill gradient through a depleted area of Blackcastle Quarry. A new grade separated junction, which is referenced as Nairn West Junction B, is proposed to connect to the existing A96 north-east into Nairn, the U2218 McDermotts Road to access the Port of Ardersier, and the existing A96 south-west for local access.
- 6.3.83 The route option then turns right on a 1440m radius curve and raises on an embankment to cross over the Aberdeen to Inverness Railway Line and the Alton Burn on bridges, but it severs the C1163 Delnies – Kildrummie – Howford Road, which is proposed to be stopped up. The route option then continues east, approximately following ground level, severing the U3226 Balnaspirach – Nairn Moss Lands Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be stopped up. The existing C1163 joins the existing B9091 south of the proposed route option, forming a local road connection between the south side of Nairn and the trunk road to the west of Nairn. This connection is proposed to be maintained by a proposed single carriageway link parallel to the proposed dual carriageway on the north side. This link is also proposed to connect to Balnaspirach
- 6.3.84 The route option is in cutting for approximately 400m between the B9091 and B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, but changes from cut to fill at the crossing of the B9090. To keep the B9090 open, and maintain acceptable road standards, a link is proposed between the B9090 and the B9091, and the B9090 is proposed to be realigned to cross the proposed dual carriageway and join this link where the proposed dual carriageway is in cut. The mainline and local road alignments do not conflict with the extra-high voltage power lines, which they cross at this point.
- 6.3.85 After crossing the River Nairn, a 1440m radius left-hand curve brings the route option to a north-easterly direction. The route option enters an area of undulating existing topography and is on a slight embankment and a local high point as it severs the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but a pedestrian underpass may be proposed. The route option crosses the A939 Tomintoul – Grantown on Spey – Nairn Road on a slight embankment and the A939 is proposed to be realigned over the proposed dual carriageway. The route option continues on a straight alignment in a north-easterly direction, severing U3010 Blackpark – Grigorhill – Newmill Road, which is proposed to be stopped up, and entering a shallow cutting through woodland east of Auldearn. At this point, the route option crosses the northern extent of the Auldearn Battlefield (1645) site to the north of Garlic Hill.
- 6.3.86 The existing A96 bypasses Auldearn to the north, and the B9111 Auchnacloch – Auldearn Road serves as the road into this village. Between Nairn and Auldearn the route option crosses these roads and connects with the existing A96, to both the north and south, and the B9111 to the south at the proposed grade separated Nairn East Junction A, which crosses under the main carriageway.
- 6.3.87 After the proposed junction, the route option runs downhill at a gentle gradient to a low point at the Auldearn Burn. The route option turns through a 1440m radius right hand curve to a south-westerly direction and runs uphill following the north slope of Gallows Hill with gradient of up to 3%. The route option crosses the C1172 Auldearn – Station – Drum Road at close to existing ground level and the C1172 is proposed to be realigned over the proposed dual carriageway.
- 6.3.88 The route option enters a deep cutting across the peak of Gallows Hill of up to 14m in depth. After the peak, the route option drops slowly to maintain sufficient clearance to pass over the

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existing A96, whilst turning further east via a 2880m radius left hand curve. The route option then continues west with the existing A96 running parallel with it on the north side. A new access is proposed on the south side of the proposed dual carriageway to replace accesses that are severed by the route option.

- 6.3.89 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

Route Option 2I

- 6.3.90 Route Option 2I is detailed in drawings B1557601/MLA/2900 to 2914 (Volume 2). This route option is 15.4km in length.
- 6.3.91 Over the first 2km of the route option the existing is proposed to be widened online. It is proposed that the existing A96 corridor will form the eastbound carriageway with new westbound carriageway construction to the south. All existing private and field accesses are proposed to be stopped up.
- 6.3.92 The route option diverges from the existing A96 near Blackcastle and enters a significant cutting. The Cockhill private access road is proposed to be maintained by realigning it over the proposed dual carriageway. The route option continues on a slight downhill gradient through a depleted area of Blackcastle Quarry. A new grade separated junction, which is referenced as Nairn West Junction B, is proposed to connect to the existing A96 north-east into Nairn, the U2218 McDermotts Road to access the Port of Ardersier, and the existing A96 south-west for local access.
- 6.3.93 The route option then turns right on a 1440m radius curve and raises on an embankment to cross over the Aberdeen to Inverness Railway Line and the Alton Burn on bridges, but it severs the C1163 Delnies – Kildrummie – Howford Road, which is proposed to be stopped up. The route option then continues east, approximately following ground level, severing the U3226 Balnaspirach – Nairn Moss Lands Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road, which is proposed to be stopped up. The existing C1163 joins the existing B9091 south of the proposed route option, forming a local road connection between the south side of Nairn and the trunk road to the west of Nairn. This connection is proposed to be maintained by a proposed single carriageway link parallel to the proposed dual carriageway on the north side. This link is also proposed to connect to Balnaspirach
- 6.3.94 The route option is in cutting for approximately 400m between the B9091 and B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road, but changes from cut to fill at the crossing of the B9090. To keep the B9090 open, and maintain acceptable road standards, a link is proposed between the B9090 and the B9091, and the B9090 is proposed to be realigned to cross the proposed dual carriageway and join this link where the proposed dual carriageway is in cut. The mainline and local road alignments do not conflict with the extra-high voltage power lines, which they cross at this point.
- 6.3.95 After crossing the River Nairn, a 1440m radius left-hand curve brings the route option to an easterly direction. The route option enters an area of undulating existing topography and is on a slight embankment and a local high point as it severs the C1175 Househill – Raitloan – Howford Road, which also serves as National Cycle Route 1 Dover – Shetland. The C1175 is proposed to be closed to vehicular traffic, but a pedestrian underpass may be proposed. The route option then follows the existing topography, climbing with a gradient of over 3%. The route option crosses the A939 Tomintoul – Granttown on Spey – Nairn Road close to the staggered junction of the A939 and the B9101 Auldearn – Cawdor Road at ground level. The proposed grade separated A939 Junction B is used to connect the proposed dual carriageway with both of these roads. East of this proposed junction, the topography peaks and the route option then falls with a gradient of 1.5%.

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- 6.3.96 The route option reaches a local low point near the C1167 Auldearn – Dalmore – Cotterton Road, which is proposed to be realigned over the proposed dual carriageway. The route option then slowly climbs again past Kinstearry House, to remain at ground level to avoid severing a high pressure gas main. A significant realignment is proposed for the access to Kinstearry House to pass over the proposed dual carriageway.
- 6.3.97 The route option then crosses the C1171 Auldearn – Moyness Road, which is proposed to be stopped up. A new grade separated junction is proposed, referenced as Nairn East Junction D, as the route option comes close to the existing A96 east of Auldearn. This proposed junction provides access to the existing A96 to the north, to the C1171 to the south, and to a proposed link that serves the properties along the south side of the existing A96 whose accesses are severed by the proposed dual carriageway. Due to the proximity of the A939 junction to the west, Nairn East Junction D is only proposed to have east-facing slips.
- 6.3.98 The route option ties in with the existing A96 at Hardmuir, and a new link is proposed between the existing A96 single carriageway west of the tie-in and the U3036 Ellands – Hardmuir – Boghole Road, a local road east of the tie-in. This link provides a connection between Auldearn and the existing A96 to the east of the proposed dual carriageway.

6.4 Junction Layouts

- 6.4.1 Preliminary junction layout designs have been prepared for each junction location. The junction layout designs for the preferred option will be developed further during the DMRB Stage 3 assessment. Each route option has a junction with the existing A96 Aberdeen – Inverness Trunk Road to the west of Nairn. Route options that pass to the north of Auldearn have a junction with the existing A96 between Nairn and Auldearn. Route options that pass to the south of Auldearn have a junction with the A939 Tomintoul – Granttown on Spey – Nairn Road as well as with the existing A96 to the east of Auldearn. Table 6.1 details which junction each route option utilises.

Table 6.1: Junction and Route Option Matrix

Junction	2A	2B	2C	2D	2E	2F	2G	2H	2I
Nairn West A	X	X	X	X					
Nairn West B					X	X	X	X	X
Nairn East A	X				X				
Nairn East B		X				X			
Nairn East C								X	
A939 A			X				X		
A939 B				X					X
Nairn East D			X	X			X		X

- 6.4.2 A description of the layout and design assumptions made in the development of the outline design of each junction layout is provided below.

Nairn West Junction A

- 6.4.3 The proposed Nairn West Junction A applies to Route Options 2A, 2B, 2C and 2D. It is located in Delnies Wood, approximately 4km to the west of Nairn town centre, as the route options diverge from the existing A96.
- 6.4.4 The proposed dual carriageway is at existing ground level through the junction, and the junction is built on embankments with an overbridge. The junction includes a roundabout on the north side and link over the proposed dual carriageway to the C1163 Delnies – Kildrummie – Howford Road, which is stopped up at its existing junction with the A96. The westbound merge and diverge form a hook and loop and meet this link road at a priority junction.

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- 6.4.5 The roundabout would be a four arm roundabout connecting to:
- the existing A96 to the east into Nairn;
 - the B9092 Ardersier – Nairn Road to Ardersier and the Port of Ardersier;
 - the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
 - the link over the proposed dual carriageway.

6.4.6 This form of junction was chosen so the hook and loop slip roads on the north-west corner would minimise impacts on the properties at Delnies, and the hoop and loop slip roads on the south-east corner would minimise impacts on the caravan park.

Nairn West Junction B

6.4.7 The proposed Nairn West Junction B applies to Route Options 2E, 2F, 2G, 2H and 2I. It is located in the depleted section of Blackcastle Quarry, approximately 5km to the west of Nairn town centre.

6.4.8 The proposed dual carriageway is at existing ground level through the junction, and the junction is proposed to be built on embankments with an overbridge. The junction includes a four arm roundabout on the north side connecting to:

- the existing A96 to the east into Nairn;
- the proposed A96 westbound merge and diverge in a hook and loop arrangement with a bridge over the proposed dual carriageway;
- the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
- the U2218 McDermotts Road to the Port of Ardersier.

6.4.9 A link off the U2218 connects to the existing A96 to the west for local access and to connect to the network of U-class roads to the north of the existing A96.

6.4.10 This form of junction was chosen because it fits well with the proposed local road arrangement to the north and it is expected to have a lower construction cost than a conventional diamond grade separated junction.

Nairn East Junction A

6.4.11 The proposed Nairn East Junction A applies to Route Options 2A and 2E. It is located between Nairn and Auldearn, approximately 2.5km east of Nairn town centre. The existing A96 runs to the north of Auldearn and the B9111 Auchnacloch – Auldearn Road runs through Auldearn, connecting to the trunk road on both sides of the village. Nairn East Junction A is located at the B9111 western junction.

6.4.12 The proposed dual carriageway is at existing ground level, and because the topography is falling to the north, the junction is in cutting with an underbridge. The junction includes a roundabout on the south side and link under the proposed dual carriageway to the existing A96 west into Nairn. The eastbound merge and diverge form a hook and loop and meet this link road at a priority junction.

- 6.4.13 The roundabout would be a four arm roundabout connecting to:
- the existing A96 to the north of Auldearn;
 - the B9111 Auchnacloch – Auldearn Road to the south into Auldearn;
 - the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
 - the link under the proposed dual carriageway.

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6.4.14 This form of junction was chosen because it fits well with the proposed local road arrangement and minimises impacts on Russell's Wood, the Auldearn Burn and the Auldearn Battlefield. It is also expected to have a lower construction cost than a conventional diamond grade separated junction.

Nairn East Junction B

6.4.15 The proposed Nairn East Junction B applies to Route Options 2B and 2F. It is located between Nairn and Auldearn, approximately 2.5km east of Nairn town centre, at the B9111 western junction.

6.4.16 The proposed dual carriageway is on a slight embankment and the junction is in cutting with an underbridge. The junction consists of a link between the existing A96 west into Nairn and the B9111 Auchnacloch – Auldearn Road east into Auldearn. The proposed dual carriageway would follow the line of the existing A96 single carriageway to the north of Auldearn. Hook and loop slip roads on both sides of the proposed dual carriageway connect to the A96/B9111 link at T-junctions.

6.4.17 This form of junction was chosen because it minimises impacts on Russell's Wood, the setting of Boath House and the Auldearn Battlefield. It is also expected to have a lower construction cost than a conventional diamond grade separated junction.

Nairn East Junction C

6.4.18 The proposed Nairn East Junction C applies to Route Option 2H. It is located between Nairn and Auldearn, approximately 2.5km east of Nairn town centre, at the B9111 western junction.

6.4.19 The proposed dual carriageway is at existing ground level, and the junction is in cutting with an underbridge. The junction includes a roundabout on the south side and link under the proposed dual carriageway to the existing A96 west into Nairn. The eastbound merge and diverge form a hook and loop and meet this link road at a T-junction.

6.4.20 The roundabout would be a four arm roundabout connecting to:

- the existing A96 to the north of Auldearn;
- the B9111 Auchnacloch – Auldearn Road to the south into Auldearn;
- the proposed A96 eastbound merge and diverge in a hook and loop arrangement; and
- the link under the proposed dual carriageway.

6.4.21 This form of junction was chosen because it fits well with the proposed local road arrangement and minimises impacts on Russell's Wood, the Auldearn Burn and the Auldearn Battlefield. It is also expected to have a lower construction cost than a conventional diamond grade separated junction.

A939 Junction A

6.4.22 The proposed A939 Junction A applies to Route Options 2C and 2G. It is located approximately 2km south of Nairn town centre, where the proposed dual carriageway crosses the existing A939 Tomintoul – Grantown on Spey – Nairn Road.

6.4.23 The proposed dual carriageway is on slight embankment, and the junction is on embankment with an overbridge. The junction consists of hook and loop slip roads on both sides of the proposed dual carriageway connecting to the realigned A939 at T-junctions. Links have been added for local access.

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6.4.24 This form of junction was chosen because it is expected to have a lower construction cost than a conventional diamond grade separated junction.

A939 Junction B

6.4.25 The proposed A939 Junction B applies to Route Options 2D and 2I. It is located approximately 3km south of Nairn town centre, at the location of the existing staggered junction of the A939 Tomintoul – Grantown on Spey – Nairn Road and the B9101 Auldearn – Cawdor Road.

6.4.26 The proposed dual carriageway is at existing ground level, and because the topography is falling to the north, the junction is in cutting with an underbridge. The junction consists of hook and loop slip roads on both sides of the proposed dual carriageway connecting to the realigned A939. The proposed A96 eastbound hook and loop and the B9101 east form a staggered junction with the A939 on the north side. The proposed A96 westbound hook and loop and the B9101 west form two, separate T-junctions on the south side. Links have been added for local access.

6.4.27 This form of junction was chosen because it fits well with the proposed local road arrangement and it is expected to have a lower construction cost than a conventional diamond grade separated junction.

Nairn East Junction D

6.4.28 The proposed Nairn East Junction D applies to Route Options 2C, 2D, 2G and 2I. It is located approximately 1.5km east of Auldearn and approximately 5km east of Nairn town centre, where these route options run parallel to, and to the south of, the existing A96.

6.4.29 The proposed dual carriageway is close to ground level through this junction, and the junction is on embankment with an overbridge. The junction includes a roundabout on the south side, with a link over the proposed dual carriageway to connect to the existing A96 west to Nairn and Auldearn. A link off this connects to the existing A96 east for local access.

6.4.30 The roundabout would be a four arm roundabout connecting to:

- the proposed A96 westbound diverge;
- a link to the C1171 Auldearn – Moyness Road , which is severed by the proposed dual carriageway;
- an access link to local properties south of the existing A96, whose accesses are severed by the proposed dual carriageway; and
- the link over the proposed dual carriageway.

6.4.31 Only east-facing slips are provided, as traffic to and from the west can use the proposed A939 junction. The eastbound merge connects to the link over the proposed dual carriageway to the existing A96 at a T-junction.

6.4.32 This form of junction was chosen because it fits well with the proposed local road arrangement.

6.5 Local Roads and Private Accesses

6.5.1 This section of the report discusses the existing local road network and accesses and the diversion strategy proposed with regard to each route option.

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Existing Local Road Network and Private Accesses

- 6.5.2 In addition to the A96 Aberdeen – Inverness Trunk Road, there is one other A class road and there are a number of B class, C class and unclassified local roads along with numerous private accesses that are directly affected by the route options. These are described below. Local roads and private accesses within Nairn have been excluded and private accesses that are not directly affected by any of the route option are excluded. The existing road network is shown on Drawings B155701/EXI/0001 to 0002 (Volume 2).

U1017 Wester Glackton – Balcroy – Kilvarrock – Cawdor Road

- 6.5.3 This is a local road that commences at a staggered junction with the C1013 Gollanfield Road on the existing A96 to the south providing access to the settlement of Lockside, and continuing to the B9091 Croy – Clephanton – Kildrummie – Nairn Road.

C1013 Gollanfield Road

- 6.5.4 This is a local road that commences at a staggered junction with the U1017 on the existing A96 to the north, and links with the B9092 Ardersier – Nairn Road near Ardersier.

U1029 Tomhommie – Ballinreich – Balnagowan Road

- 6.5.5 This is a local road that provides access to a number of farms and connects the B9092 Ardersier – Nairn Road with the existing A96 approximately 4km west of Nairn.

Blackcastle Farm accesses

- 6.5.6 These are two direct private accesses from the north side of the existing A96 approximately 3km west of Nairn.

Cockhill access

- 6.5.7 This is a private access road from the south side of the existing A96 approximately 3km west of Nairn.

U2218 McDermotts Road

- 6.5.8 This is a local road that connects to the existing A96 approximately 3km west of Nairn and the B9092 Ardersier – Nairn Road. At the B9092 it forms a cross roads with the access to the Port of Ardersier so the U2218 is used as a route from the trunk road to the port.

C1163 Delnies – Kildrummie – Howford Road

- 6.5.9 This is a local road that connects the B9092 Ardersier – Nairn Road approximately 2km west of Nairn with the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road at Howford, with a crossroads on the existing A96 and a bridge over the Aberdeen to Inverness Railway Line. It connects to the C1170 Moss-Side – Mosshall – Broadley Road and the B9091 Croy – Clephanton – Kildrummie – Nairn Road and provides access to Delnies Caravan Park and the Blackcastle Quarry.

Ashley access

- 6.5.10 This is a direct private access on the A96 next to Woodside Cottages access.

Woodside Cottages access

- 6.5.11 This is a private access road approximately 200m east of the C1163 Delnies – Kildrummie – Howford Road connecting to both the existing A96 and the B9092 Ardersier – Nairn Road.

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B9092 Ardersier – Nairn Road

- 6.5.12 This is a local road that commences at the B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road in Ardersier, approximately 8km east of Nairn. It connects to the existing A96 approximately 1.2km east of Nairn

Direct accesses at Delnies

- 5.1.1 Seven private properties take direct access off the south side of the existing A96 at Delnies, between 60m west and 450m east of the B9092 junction.

Easter Delnies Farm access

- 6.5.13 This is a private access road approximately 400m east of the B9092 junction providing access to Easter Delnies Farm on the north side of the existing A96.

Newlands of Delnies access

- 6.5.14 This is a private access road approximately 700m east of the B9092 junction providing access to Newlands of Delnies on the south side of the existing A96.

Ruthven Cottage access

- 6.5.15 This is a private access road approximately 950m east of the B9092 junction providing access to Ruthven Cottage on the north side of the existing A96.

C1170 Moss-Side – Mosshall – Broadley Road

- 6.5.16 This is a local road that commences at the C1163 Delnies – Kildrummie – Howford Road, and connects to the urban areas of Moss-side and Tradespark at the western limits of Nairn, before turning south-east over the Aberdeen to Inverness Railway Line. It connects with the B9091 Croy – Clephanton – Kildrummie – Nairn Road at a crossroads and ends at the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road at Bradley, forming a link between these B class roads.

U3226 Balnaspirach – Nairn Moss Lands Road

- 6.5.17 This is a local road from the B9091 Croy – Clephanton – Kildrummie – Nairn Road to a group of residential properties at Balnaspirach.

B9091 Croy – Clephanton – Kildrummie – Nairn Road

- 6.5.18 This is a local road that runs south-west out of Nairn, beginning at the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road directly south of its crossing under the Aberdeen to Inverness Railway Line. It diverges from the B9090 until the B9090 turns at Cawdor, then crosses this local road before joining the B9006 Millburn Roundabout – Culcabock – Castle Hill – Culloden Moor – Croy – Gollanfield – Fort George Road at Croy.

B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road

- 6.5.19 This is a local road that runs south from the centre of Nairn, beneath the Aberdeen to Inverness Railway Line (via a single span width and height restricted bridge) parallel to and west of the River Nairn. It crosses the River Nairn on a historic bridge at Howford and continues south-west to Cawdor. It continues west out of Cawdor, crosses the River Nairn again, and turns north-west to meet the existing A96 at Brackley.

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C1175 Househill – Raitloan – Howford Road

- 6.5.20 This is a local road that is parallel and approximately 300m to the east of the River Nairn. It joins the A939 Tomintoul – Grantown on Spey – Nairn Road at Househill and the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road just to the east of the Howford Bridge crossing. This road forms part of National Cycle Route 1 Dover – Shetland.

A939 Tomintoul – Grantown on Spey – Nairn Road

- 6.5.21 This is a 96km local road that runs south out of the east side of Nairn. The A939 serves as a tourist route into the Highlands to Granton-On-Spey where it crosses the A95 Granish – Keith Trunk Road before continuing south to join the A93 Perth – Braemar – Ballater – Banchory – Aberdeen Road. It also serves the whisky and timber industries.

Knocknagillan Farm access

- 6.5.22 This is a private access road on the west of the A939 Tomintoul – Grantown on Spey – Nairn Road approximately 250m north of the B9101 Auldearn – Cawdor Road.

U3010 Blackpark – Grigorhill – Newmill Road

- 6.5.23 This is a local road that commences at the A939 Tomintoul – Grantown on Spey – Nairn Road at the south-eastern edge of Nairn and proceeds south-east to a crossroads with the B9101 Auldearn – Cawdor Road. Several industrial units are located along the U3010 between the A939 and the B9101, including a timber yard, a helicopter charter company and a major SSE substation. The local road continues south-east of the B9101 and curves east, passing through the community of Newmill and joining the C1167 Auldearn – Dalmore – Cotterton Road.

Blackpark Farm access

- 6.5.24 This is a private access road on the west side of the U3010 Blackpark – Grigorhill – Newmill Road approximately 1.3km south of the A939 Tomintoul – Grantown on Spey – Nairn Road.

B9101 Auldearn – Cawdor Road

- 6.5.25 This is a local road that runs south-east of out Auldearn. It crosses the A939 Tomintoul – Grantown on Spey – Nairn Road at a staggered junction, and meets the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road south of Howford.

Kinnudie Farm access

- 6.5.26 This is a private access road on the north side of the B9101 Auldearn – Cawdor Road approximately 500m east of the U3010 Blackpark – Grigorhill – Newmill Road. The private access road continues through Kinnudie Farm and connects to the B9111 Auchnacloch – Auldearn Road 400m west of the B9101.

C1167 Auldearn – Dalmore – Cotterton Road

- 6.5.27 This is a local road that commences in Auldearn and proceeds south, past the community of Newmill, to connect to a network of C class roads.

Craggie Farm access

- 6.5.28 This is a private access road on the B9101 Auldearn – Cawdor Road to the south approximately 850m east of the A939 Tomintoul – Grantown on Spey – Nairn Road. The private access road continues through Craggie Farm and connects to the U3010 Blackpark – Grigorhill – Newmill Road approximately 200m south of the B9101.

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Kinstearry House access

- 6.5.29 This is a private access road from the B9111 Auchnacloch – Auldearn Road in Auldearn running approximately 1km in a southerly direction.

C1171 Auldearn – Moyness Road

- 6.5.30 This is a local road that commences at the B9111 Auchnacloch – Auldearn Road near its eastern junction with the existing A96 in Auldearn. It proceeds south-east providing access to a significant number of houses and farms.

Auchnacloch access

- 6.5.31 This is a private access road from the existing A96 approximately 550m east of Nairn, through Auchnacloch and connecting to the U2297 Waterloo – Eastertown – Inshoch Road.

B9111 Auchnacloch – Auldearn Road

- 6.5.32 This is a local road that runs in an east-west direction through Auldearn and has a T junction with the existing A96 on both sides of Auldearn approximately 1km and 3km east of Nairn.

U2997 Waterloo – Eastertown – Inshoch Road

- 6.5.33 This is a local road that commences at the existing A96 forming a staggered junction with the B9111 Auchnacloch – Auldearn Road and connects to the C1172 Auldearn – Station – Drum Road to the north of Boath house.

Bogside of Boath Farm access

- 6.5.34 This is a private access road on the U2997 Waterloo – Eastertown – Inshoch Road approximately 1.6km east of the existing A96. The private access road continues through Bogside of Boath Farm and connects to the C1172 Auldearn – Station – Drum Road 950m north of the existing A96.

C1172 Auldearn – Station – Drum Road

- 6.5.35 This is a local road that proceeds in a north-easterly direction from its junction with the existing A96 adjacent to Boath House, and connects to a number of minor roads both north and south of the Aberdeen to Inverness Railway Line.

U2959 Broombank Road

- 6.5.36 This is a local road to Broombank, a group of houses opposite the existing B9111 eastern junction.

U3164 Penick Road

- 6.5.37 This is a local road that connects with the C1172 Auldearn – Station – Drum Road 800m to the north of the existing A96 and proceeds in a generally easterly direction to the existing A96 approximately 2km east of Auldearn.

Broombank Cottage access

- 6.5.38 This is a direct private access 300m east of the B9111 eastern junction on the north side of the existing A96.

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Gallows View access

- 6.5.39 This is a direct private access 850m east of the B9111 eastern junction on the north side of the existing A96.

Courage Cottage accesses

- 6.5.40 These are two direct private accesses 900m east of the B9111 eastern junction on the south side of the existing A96.

Courage Steading access

- 6.5.41 This is a private access road from the south side of the existing A96 approximately 1.3km east of the B9111 eastern junction.

Muirend Farm access

- 6.5.42 This is a private access road from the north side of the existing A96 approximately 1.9km east of the B9111 eastern junction.

Wester Hardmuir Farm access

- 6.5.43 This is a direct private access approximately 2.3km east of the B9111 eastern junction on the north side of the existing A96.

Hardmuir of Boath access

- 6.5.44 This is a private access road from the south side of the existing A96 approximately 2.4km east of the B9111 eastern junction.

U3036 Ellands – Hardmuir – Boghole Road

- 6.5.45 This is a local road that connects with the existing A96 at the eastern limit of the study area. The road extends north-east to connect with a network of local roads.

Local Road and Private Access Strategy

- 5.1.2 All route options cross or affect the local road network and individual private accesses to a differing extent. To minimise severance, a preliminary local road strategy has been developed for each route option in consultation with The Highland Council. The local road strategy for the preferred option will be refined and developed further in consultation with The Highland Council and affected landowners at DMRB Stage 3. The existing road network is shown on Drawings B155701/EXI/0001 and 0002 (Volume 2).

- 6.5.46 The strategy being adopted for individual local roads generally fits into one of the following five categories:

- Local road is maintained with a structure to allow the road to pass over or under the proposed A96 dual carriageway. The local road may be realignment to suit the appropriate structural solution;
- A grade separate junction with the proposed A96 is provided;
- Local road is stopped up at the interface with proposed dual carriageway as alternative routes are available;
- Local road is stopped up, but a local road diversion is provided to connect road back into local road network; or
- Local road is maintained with a realignment.

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- 6.5.47 The extent of interfaces with the local road network differs for each route option but, a consistent approach has been adopted for each instance that a route option crosses a local road. The existing A96 through Nairn would connect with the bypass at both the west and east ends via a grade separated junction.
- 6.5.48 The A939 links Nairn to Grantown-on-Spey to the south and provides a gateway to the Highlands. There are no alternative routes that follow a similar path without a long diversion; therefore this road would remain open for all route options.
- 6.5.49 The B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road and B9091 Croy – Clephanton – Kildrummie – Nairn Road run roughly parallel to each other approximately 600m apart through the study area and join in Nairn, immediately south of the Aberdeen to Inverness Railway Line. Both these local roads remain open via an overbridge for Route Options 2A, 2B, 2C, and 2D. For the remaining route options, the B9091 is stopped up at the proposed dual carriageway, and the link between the B9091 and the C1163 Delnies – Kildrummie – Howford Road is maintained to the north of the proposed A96. To the south of the proposed A96, the B9091 is realigned to join the B9090, which is maintained via an overbridge.
- 6.5.50 The B9111 Auchnacloch – Auldearn Road would remain open to the west of Auldearn for all relevant route options and is proposed to be incorporated into the proposed Nairn East Junction for Route Options 2A, 2B, 2E, 2F and 2H. The B9111 eastern junction is only affected by Route Options 2B and 2F and is maintained with an underbridge for these.
- 6.5.51 While the C1175 Househill – Raitloan – Howford Road, which is part of National Cycle Route 1 Dover – Shetland, is stopped up for all route options, it is proposed to maintain the cycle route with a NMU underpass.
- 6.5.52 Table 6.2 describes the proposed local road strategy for each route option. Local roads and private accesses that are not affected by any of the route options have been omitted from this table.

Table 6.2: Local Road and Private Access Strategy

Local Road / Private Access	2A	2B	2C	2D	2E	2F	2G	2H	2I
U1017	SU								
C1013	SU								
U1029	SU	SU	SU	SU	-	-	-	-	-
Blackcastle Farm accesses	SU*	SU*	SU*	SU*	-	-	-	-	-
Cockhill access	SU*	SU*	SU*	SU*	B	B	B	B	B
U2218	SU	SU	SU	SU	J	J	J	J	J
C1163	SU*	SU*	SU*	SU*	R	R	R	R	R
Ashley access	SU*	SU*	SU*	SU*	-	-	-	-	-
Woodside Cottages access	SU	SU	SU	SU	-	-	-	-	-
C1170	B	B	B	B	-	-	-	-	-
U3226	-	-	-	-	R	R	R	R	R
B9091	B	B	B	B	SU*	SU*	SU*	SU*	SU*
B9090	B	B	B	B	B	B	B	B	B
C1175	SU								
A939	B	B	J	J	B	B	J	B	J
Knocknagillan Farm access	-	-	R	R	-	-	R	R	R
U3010	SU	SU	R	R	SU	SU	R	SU	R
Blackpark Farm access	R	R	-	-	R	R	-	-	-
B9101	-	-	B	J	-	-	B	-	J
Kinnudie Farm access	-	-	R	-	-	-	R	-	-

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Local Road / Private Access	2A	2B	2C	2D	2E	2F	2G	2H	2I
C1167	-	-	SU*	B	-	-	SU*	-	B
Craggie Farm access	-	-	-	SU	-	-	-	-	SU
Kinsteary House access	-	-	B	B	-	-	B	-	B
C1171	-	-	SU*	SU*	-	-	SU*	-	SU*
B9111 – West of Auldearn	J	J	-	-	J	J	-	J	-
U2997	SU	-	-	-	SU	-	-	SU	-
Bogside of Boath access	SU	-	-	-	SU	-	-	SU	-
C1172	B	SU*	-	-	B	SU*	-	B	-
B9111 – East of Auldearn	-	B	-	-	-	B	-	-	-
U2959	-	SU*	-	-	-	SU*	-	-	-
U3164	R	-	-	-	R	-	-	R	-
Courage Steading access	SU*								
Hardmuir of Boath access	SU*								

Key to Table:

B – Bridge to be provided over or under A96 allowing continuation of road.

J – Road to be diverted to / connected with A96 junction allowing continuity of road and connectivity to the proposed A96 dual carriageway.

SU – Road / access to be stopped up. Diversion via existing road network.

SU* – Road / access to be stopped up. Alternate access to be provided onto different road.

R – Road / access realigned to continue onto same road.

- Road / access not affected by route option.

6.5.53 Table 6.3 below summarises the potential effect of each route option on the local road network and private accesses.

Table 6.3: Local Road and Private Access Strategy Summary

Route Option	2A	2B	2C	2D	2E	2F	2G	2H	2I
B – Bridge	5	5	5	5	4	4	4	4	4
J – Connect to Junction	1	1	1	2	2	2	2	2	3
SU – Stopped Up with diversion on existing road	9	7	6	7	6	4	3	6	4
SU* – Stopped Up with alternate access provided	6	8	8	7	3	5	5	3	4
R – Realigned	2	1	3	2	4	3	5	4	4
Total No of Local Roads affected	23	22	23	23	19	18	19	19	19

6.5.54 Where local roads and accesses are bridged, connected to a junction, or realigned onto the same road, there is a potential effect during construction, but the operation effects are negligible. Only local roads and accesses that are stopped up, forcing traffic to use a different, longer route, have a significant long-term effect.

6.5.55 The strategy for Route Options 2A and 2B proposes that 15 local roads and accesses are stopped up, the most of all route options. The strategy for Route Options 2G and 2I proposes that 8 local roads and accesses are stopped up, the least of all route options.

6.6 Departures from Standard

6.6.1 All of the route options have a common departure for the vertical curve over the Aberdeen to Inverness Railway Line. The vertical geometry over the existing structure features a 10,000m radius curve, which is acceptable for a single carriageway, but 1 step below desirable minimum standard for 120kph design speed dual carriageway. This affects the

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stopping sight distance, bring it one step below desirable minimum standard, resulting in a departure from standard. The existing alignment has been mimicked so that the existing A96 Aberdeen – Inverness Trunk Road can be used as the westbound carriageway of the proposed A96.

- 6.6.2 Currently, there are no other Departures from Standard for any of the proposed mainlines, junctions or local roads for the Nairn Bypass. However, departures or relaxations may be introduced during future design development to reduce environmental impacts, or improve value for money, if appropriate.

6.7 Topography and Land Use

- 6.7.1 The topography is primarily flat, low-lying, open ground to the west of the River Nairn, and becomes increasing rolling and hilly to the east.

- 6.7.2 All options would introduce changes to the existing topography through the introduction of new road embankments and cuttings, grade separated junctions, local road re-alignments and structures including a viaduct over the River Nairn.

- 6.7.3 The landscape surrounding the A96 Aberdeen – Inverness Trunk Road south of Nairn, is a mixture of pastoral and arable farmland, with pockets of woodlands spread across the study area. Landscape and visual impacts are assessed in greater detail in Part 3, Chapter 10 (Landscape and Visual) and Land Use is assessed in greater detail in Part 3, Chapter 16 (Community and Private Assets) of this report.

6.8 Geotechnics and Earthworks

Existing ground conditions

- 6.8.1 An assessment of the likely ground conditions affecting the various route options for the Nairn Bypass has been determined largely from the 1:10,000 and 1:50,000 British Geological Survey maps for the area and the memoir for the 1:50,000 British Geological Survey map for the area. There is very limited ground investigation information available for the study area as a whole, to confirm actual conditions along the route options. The exceptions to this are: at the western end of the study area where a ground investigation was undertaken by Inverness County Council in 1972 for the Gollanfield Overbridge; and around Auldearn for the Auldearn Bypass by Highland Regional Council in 1973 & 1980.

- 6.8.2 Unlike the section between Inverness and Gollanfield, geological mapping of the majority of the area to the south and east of Nairn was carried out in the late nineteenth century and consequently the superficial deposits have not been mapped in the same detail. The more recent mapping benefitting from developments in the recognition and interpretation of glacial/post glacial landforms and soils allowing a more detailed assessment of the different soil types present to be made. The western part of the study area, between Gollanfield and Delnies was mapped in the 1980's and contains a similar level of detail as for Inverness to Gollanfield. Reference has been made during the study to the Preliminary Sources Study Report (PSSR) prepared by Atkins in March 2010.

- 6.8.3 The geological setting for the Nairn Bypass is essentially the same as the section to the west described earlier, the study area generally occupying the coastal lowland backing the southern shores of the Inverness and Moray Firths, with extensive coverage of superficial deposits (See Chapter 5 of this report). The superficial deposits covering the majority of the area, except from Gollanfield to around Delnies to the west of Nairn, are broadly described as 'glacial sand and gravel and morainic gravels' (see Drawings B1557601/GEO/0101 to 0103). Localised areas of peat and alluvium are also recorded to occur. Geological features of particular significance within the general study area include the Blar nam Fiadh peat bog, an extensive area of basin peat bog, and the Flemington Eskers next to Loch Flemington, reported to be 'probably the best preserved braided esker system in Britain since it remains

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untouched by large scale quarrying' (memoir for 1:50,000 British Geological Survey Sheet 84W, Chapter 8 Quaternary, Glaciofluvial Ice-contact Deposits, Esker Systems, Page 79). The latter is not affected by any of the route options. Inshoch Moss, an extensive area of peat, lies at the eastern end of the study area.

- 6.8.4 In summary, the route options under consideration, going from west to east, cross the western extension of the Blar nam Fiadh peat bog before crossing mainly glacial sands and gravels and morainic gravels, with more localised areas of alluvium associated with the watercourses of the area, including the Alton Burn, the River Nairn and the Auldearn Burn. A private access road at the eastern end of the study area encroaches on the western edge of Inshoch Moss for Route Options 2A, 2E and 2H.
- 6.8.5 The solid geology of the area comprises mainly Middle and Upper Old Red Sandstone strata of Devonian (345 to 395 million years ago) age comprising mainly sandstones and conglomerates. More recent geological mapping within the western (Gollanfield to Delnies) area and to the north of the study area has assigned the strata in these areas to the Inverness Sandstone Group and the Hillhead Sandstone Formation (HSa) of Middle Devonian age. The latter is indicated to comprise red coarse grained sandstones, flaggy siltstones, calcareous mudstones and thin shaley mudstones. There is little information relating to the geological structure of the area on the geological maps and in the memoir due to the very limited rock exposure, however, the strata would generally appear to be dipping at relatively shallow angles towards the north and north-west. Granite occurs locally near surface, and underlies the southern part of the study area in the vicinity of Bognafeuran Wood.

Route Option 2A

- 6.8.6 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.7 The route option then crosses a variety of different types of glacial deposits, followed by an area of worked ground where sands and gravels were formerly extracted between Moss-side and Tradespark. The route option continues across an extensive area of alluvium associated with the Alton Burn. The road would be constructed on embankment within this area to allow crossing of the Aberdeen to Inverness Railway Line, with embankment heights of up to 10m required. The route option is then underlain by sand and gravel and morainic gravels as far as the River Nairn crossing where a narrow strip (approximately 100m) of alluvium is present associated with the river. The proposed structure at this location is likely to span the majority or full extent of these deposits.
- 6.8.8 Similar glacial deposits are then anticipated to be present as far east as Mill of Boath, where alluvium associated with the Auldearn Burn is present. These alluvial deposits are also present locally beneath some of the connecting roads associated with the proposed Nairn East Junction A.
- 6.8.9 A relatively deep cutting, up to 14m in depth, is proposed within an area of high ground to the east of Mill of Boath. A trial pit located at the west end of the cutting, excavated as part of the Auldearn Bypass, encountered rock at a depth of only 0.85m and a borehole located on lower lying ground to the north of the cutting encountered weathered rock at 3.6m, suggesting the cutting would largely be formed in rock.
- 6.8.10 An extensive area of alluvium is present at Penick near the eastern end of the scheme where the mainline is on embankment.

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Route Option 2B

- 6.8.11 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.12 The route option then crosses a variety of different types of glacial deposits, followed by an area of worked ground where sands and gravels were formerly extracted between Moss-side and Tradespark. The route option continues across an extensive area of alluvium associated with the Alton Burn. The road is proposed to be constructed on embankment within this area to allow crossing of the Aberdeen to Inverness Railway Line, with embankment heights of up to 10m required.
- 6.8.13 The route option is then underlain by sand and gravel and morainic gravels as far as the River Nairn crossing where a narrow strip (approximately 100m) of alluvium is present associated with the river. The proposed structure at this location is likely to span the majority or full extent of these deposits.
- 6.8.14 Similar glacial deposits are then anticipated to be present beneath much of the remainder of the route option with the exception of localised occurrences of alluvium, for example in the vicinity of the Auldearn Burn, beneath some of the connecting roads associated with the proposed Nairn East Junction B, and beneath a section of the mainline between Courage and Wester Hardmuir. Three old pits/quarries potentially affect the route option proposals at the eastern end of the scheme but these would appear to only affect local roads and private accesses. The nature and thickness of any infill material within these, if present, is unknown.

Route Option 2C

- 6.8.15 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.16 The route option then crosses a variety of different types of glacial deposits, followed by an area of worked ground where sands and gravels were formerly extracted between Moss-side and Tradespark. The route option then crosses an extensive area of alluvium associated with the Alton Burn. The road is proposed to be constructed on embankment within this area to allow crossing of the Aberdeen to Inverness Railway Line, with embankment heights of up to 10m required.
- 6.8.17 The route option is then underlain by sand and gravel and morainic gravels as far as the River Nairn crossing where a narrow strip (approximately 100m) of alluvium is present associated with the river. The proposed structure at this location is likely to span the majority or full extent of these deposits.
- 6.8.18 After crossing the River Nairn, the mainline is underlain mainly by sand and gravel and morainic gravels with the exception of a number of localised areas of alluvium at Crooks, Garblies, and between Courage and Hardmuir. There are also a few localised areas of alluvium affecting local roads and junctions.

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6.8.19 There is a relatively deep cutting to the east of Newmill (approximately ch31,000 to ch33,000) reaching a maximum depth of approximately 10m. There is very limited ground investigation covering this area, however it is assumed that the majority of the cut would be formed in sands and gravels on account of the topography of the area, with gravel mounds, kames and ridges identified on the geological map.

6.8.20 The mainline crosses an old pit/quarry between approximately ch32,450 and the C1171 Auldearn – Moyness Road to the east of Auldearn at approximately ch32,760. The ground here appears level from aerial photographs and it may be that sand and gravel was worked above this level, or alternatively this feature was backfilled. Another old pit/quarry is present to the north of the proposed Nairn East Junction D where it underlies the northern connecting road to the existing A96, beneath an approximately 100m section length. Two very minor old pits/quarries are also recorded to occur at the east end of the scheme where the mainline is parallel to the existing A96.

Route Option 2D

6.8.21 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield overbridge, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.

6.8.22 The route option then crosses a variety of different types of glacial deposits, followed by an area of worked ground where sands and gravels were formerly extracted between Moss-side and Tradespark. The route option then continues across an extensive area of alluvium associated with the Alton Burn. The road is proposed to be constructed on embankment within this area to allow crossing of the Aberdeen to Inverness Railway Line, with embankment heights of up to 10m required. After crossing the area of alluvium, the mainline traverses an area underlain by sand and gravel and morainic gravels before reaching the floodplain of the River Nairn, where alluvial deposits are present to the west of the river beneath an approximately 200m length of the route option (approximately ch27,500 to ch27,700). An approach embankment up to approximately 6m in height is required here for the proposed bridge structure.

6.8.23 Beyond the River Nairn, the route option is underlain by sand and gravel and morainic gravels with the exception of several localised areas of alluvium around Newmill, Garblies and between Courage and Hardmuir, and beneath localised areas along the proposed local roads associated with the proposed Nairn East Junction D.

6.8.24 The mainline crosses an old pit/quarry between approximately ch33,050 and the C1171 Auldearn – Moyness Road to the east of Auldearn at approximately ch33,360. Whilst no records of this feature have been obtained, the ground here appears level from aerial photographs and it may be that sand and gravel was worked above this level, or alternatively this feature was backfilled before being reinstated. Another old pit/quarry is present to the north of the proposed Nairn East Junction D where it underlies the northern connecting road to the existing A96 beneath an approximately 100m length. Two very minor old pits/quarries are also recorded at the east end of the scheme where the mainline is parallel to the existing A96.

Route Option 2E

6.8.25 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness

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Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.

- 6.8.26 The route option then crosses areas of worked ground associated with the Blackcastle sand and gravel workings before rising on embankment (up to approximately 10m in height) to cross the Aberdeen to Inverness Railway Line. The route option crosses an area of alluvium a short distance before the railway. The proposed Nairn West Junction B and associated local roads in the vicinity of the Blackcastle workings are affected by a variety of ground conditions, including peat, worked ground and Made Ground deposits.
- 6.8.27 The route option crosses an extensive area of sand and gravel and morainic gravels between the railway and the River Nairn, where there is a cutting of up to approximately 4.7m, before crossing the river where there is an approximately 100m wide strip of alluvium. The proposed structure would largely span across the alluvium, although the western approach embankment may be partly underlain by alluvium to the west of the river.
- 6.8.28 The route option is then underlain by mainly sand and gravel with morainic gravels with localised areas of alluvium at Crook, Mill of Boath and to the east of Penick. These alluvial deposits are also present locally beneath some of the connecting roads associated with Nairn East Junction A.
- 6.8.29 A relatively deep cutting, up to 14m in depth, is proposed within an area of high ground to the east of Mill of Boath. A trial pit located at the west end of the cutting, excavated as part of the Auldearn Bypass encountered rock at a depth of only 0.85m and a borehole located on lower lying ground to the north of the cutting encountered weathered rock at 3.6m, suggesting the cutting would largely be formed in rock.
- 6.8.30 An extensive area of alluvium is present at Penick near the eastern end of the scheme where the mainline is on embankment.

Route Option 2F

- 6.8.31 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.32 The route option then crosses areas of worked ground associated with the Blackcastle sand and gravel workings before rising on embankment (up to approximately 10m in height) to cross the Aberdeen to Inverness Railway Line. The route option crosses an area of alluvium a short distance before the railway. The proposed Nairn West Junction B and associated local roads in the vicinity of the Blackcastle workings are affected by a variety of ground conditions including peat, worked ground and Made Ground deposits.
- 6.8.33 The route option crosses an extensive area of sand and gravel and morainic gravels between the railway and the River Nairn, where there is a cutting of up to approximately 4.7m, before crossing the river where there is an approximately 100m wide strip of alluvium. The proposed structure would largely span across the alluvium although the western approach embankment may be partly underlain by alluvium to the west of the river.
- 6.8.34 The route option is then underlain by mainly sand and gravel with morainic gravels and localised areas of alluvium at Crook, Boath House, Broombank and between Courage and Hardmuir. Localised occurrences of alluvium also affect the connecting roads associated with the proposed Nairn East Junction B and some of the access roads further east. Three

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old pits/quarries potentially affect the route option proposals at the eastern end of the scheme but these would appear to only affect local roads and private accesses. The nature and thickness of any infill material within these, if present, is unknown.

Route Option 2G

- 6.8.35 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.36 The route option then crosses areas of worked ground associated with the Blackcastle sand and gravel workings before rising on embankment (up to approximately 10m in height) to cross the Aberdeen to Inverness Railway Line. The route option crosses an area of alluvium a short distance before the railway. The proposed Nairn West Junction B and associated local roads in the vicinity of the Blackcastle workings are affected by a variety of ground conditions including peat, worked ground and Made Ground deposits.
- 6.8.37 The route option crosses an extensive area of sand and gravel and morainic gravels between the railway and the River Nairn, where there is a cutting of up to approximately 4.7m, before crossing the river where there is an approximately 100m wide strip of alluvium. The proposed structure would largely span across the alluvium although the western approach embankment may be partly underlain by alluvium to the west of the river.
- 6.8.38 The route option is then underlain by mainly sand and gravel with morainic gravels with localised areas of alluvium at Crook, Newmill, Garblies and between Courage and Hardmuir. There is a relatively deep cutting to the east of Newmill (approx. ch30,800 to ch33,000) reaching a maximum depth of approximately 10m. There is very limited ground investigation covering this area, however it is assumed that the majority of the cut would be formed in sands and gravels on account of the topography of the area, with gravel mounds, kames and ridges identified on the geological map.
- 6.8.39 The mainline crosses an old pit/quarry between approximately ch32,120 and the C1171 Auldearn – Moyness Road to the east of Auldearn at approximately ch32,450. The ground here appears level from aerial photographs and it may be that sand and gravel was worked above this level, or alternatively this feature was backfilled. Another old pit/quarry is present to the north of Nairn East Junction D where it underlies the northern connecting road to the existing A96, beneath an approximately 100m section length. Two very minor old pits/quarries are also recorded to occur at the east end of the scheme where the mainline is parallel to the existing A96.

Route Option 2H

- 6.8.40 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.41 The route option then crosses areas of worked ground associated with the Blackcastle sand and gravel workings before rising on embankment (up to approximately 10m in height) to cross the Aberdeen to Inverness Railway Line. The route crosses an area of alluvium a short distance before the railway. The proposed Nairn West Junction B and associated local

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roads in the vicinity of the Blackcastle workings are affected by a variety of ground conditions including peat, worked ground and Made Ground deposits.

- 6.8.42 The route option then crosses an extensive area of sand and gravel and morainic gravels and includes a cutting of up to approximately 7m in depth (approximately ch25,900 to ch26,600). It is unknown what materials this would be formed in due to the absence of any ground investigation information for this area.
- 6.8.43 Alluvial deposits associated with the River Nairn are present within the floodplain area to the west of the river, over a distance of approximately 200m. Current proposals are for part of the floodplain to be crossed by means of a bridge, the remaining section (approximately 100m) would require an approach embankment on the west side of the river up to approximately 6m in height.
- 6.8.44 The remainder of the mainline is predominantly underlain by sand and gravel and morainic gravels, with localised areas of alluvium around Mill of Boath and between Penick and Wester Hardmuir. A relatively deep cutting, up to 14m in depth, is proposed within an area of high ground to the east of Mill of Boath. A trial pit located at the west end of the cutting, excavated as part of the Auldearn Bypass encountered rock at a depth of only 0.85m and a borehole located on lower lying ground to the north of the cutting encountered weathered rock at 3.6m, suggesting the cutting would largely be formed in rock.
- 6.8.45 Extensive areas of alluvium are also present to the east of the proposed Nairn East Junction C where the mainline is on embankment.

Route Option 2I

- 6.8.46 Moving from west to east, the route option, in common with all the other route options, traverses the western extension of the Blar nam Fiadh peat bog between Gollanfield and Blackcastle. Peat thicknesses of up to approximately 4m were recorded here during the ground investigation for the Gollanfield Rail structure, over the Aberdeen to Inverness Railway Line. To the east of this route option, a recent investigation of the Blar nam Fiadh peat bog, as part of this study, encountered greater thicknesses, with a maximum thickness of 6.9m of peat recorded.
- 6.8.47 The route option then crosses areas of worked ground associated with the Blackcastle sand and gravel workings before rising on embankment (up to approximately 10m in height) to cross the Aberdeen to Inverness Railway Line. The route option crosses an area of alluvium a short distance before the railway. The proposed Nairn West Junction B and associated local roads in the vicinity of the Blackcastle workings are affected by a variety of ground conditions including peat, worked ground and Made Ground deposits.
- 6.8.48 The route option then crosses an extensive area of sand and gravel and morainic gravels and includes a cutting of up to approximately 7m in depth (approximately ch26,000 to ch26,800). It is unknown what materials this would be formed in due to the absence of any ground investigation information for this area.
- 6.8.49 Alluvial deposits associated with the River Nairn are present within the floodplain area to the west of the river, over a distance of approximately 200m. Current proposals are for part of the floodplain to be crossed by means of a bridge, the remaining section (approximately 100m) would require an approach embankment on the west side of the river up to approximately 6m in height.
- 6.8.50 Beyond the River Nairn, the route option is underlain by sand and gravel and morainic gravels with the exception of several localised areas of alluvium around Newmill, Garblies, between Courage and Hardmuir, and beneath localised areas along the proposed local roads associated with the proposed Nairn East Junction D.

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6.8.51 The mainline crosses an old pit/quarry between approximately ch32,420 and the C1171 to the east of Auldearn at approximately ch32,740. Whilst no records of this feature have been obtained, the ground here appears level from aerial photographs and it may be that sand and gravel was worked above this level, or alternatively this feature was backfilled before being reinstated. Another old pit/quarry is present to the north of the proposed Nairn East Junction D where it underlies the northern connecting road to the existing A96 beneath an approximately 100m length. Two very minor old pits/quarries are also recorded at the east end of the scheme where the mainline is parallel to the existing A96.

Discussion

6.8.52 A comparison of the ground condition affecting the various route options (mainline) for the Nairn Bypass is provided in Table 6.4. This identifies lengths of the nine route options (2A to 2I) where less favourable ground conditions may be anticipated, including areas of peat, alluvium, Made Ground and potentially compressible glacial deposits. These areas, with the exception of the potentially compressible glacial deposits which are not shown for clarity and given the uncertainties relating to the nature of these deposits, are shown on the geotechnical constraints plans in Drawings B1557601/GEO/0108 to 0113 (Volume 2).

Table 6.4: Comparison of route options (mainline) based on anticipated unfavourable ground conditions

Route Option	Approx. length of route option underlain by superficial deposits identified				Total (m)
	Alluvium (m)	Peat (m)	Potentially Compressible Glacial/Late Glacial deposits (m) (Note 1)	Made Ground / Worked Ground (m) (Note 2)	
2A	1490	1080	100	200	2870
2B	1370	1080	100	200	2750
2C	1170	1080	100	510	2860
2D	1160	1080	100	510	2850
2E	720	1400	170	1050	3340
2F	960	1400	170	1050	3580
2G	660	1400	80	1360	3500
2H	480	1400	80	1050	3010
2I	620	1400	80	1370	3470

Notes:

1. Includes Glaciolacustrine, Raised Marine Tidal Flat and Glaciomarine deposits.
2. It has been assumed that where old pits/quarries are present then these have been backfilled with non-engineered fill of unknown origin, however a number of areas of worked ground are present where no backfilling may have taken place.

6.8.53 A comparison of the various route options with regard to the ground conditions affecting the local roads and junctions for each of the route options has also been undertaken and is presented in Table 6.5.

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Table 6.5: Comparison of route options (Junctions and local roads) based on anticipated unfavourable ground conditions

Route Option	Approx. length of route option underlain by superficial deposits identified				Total (m)
	Alluvium (m)	Peat (m)	Potentially Compressible Glacial/Late glacial deposits (m) (Note 1)	Made Ground / Worked Ground (m) (Note 2)	
2A	250	0	300	240	790
2B	250	0	300	120	670
2C	400	0	150	140	690
2D	650	0	0	140	790
2E	290	75	300	850	1515
2F	260	75	300	960	1595
2G	510	75	150	950	1685
2H	450	75	300	850	1675
2I	630	75	0	950	1655

Notes:

1. Includes Glaciolacustrine, Raised Marine Tidal Flat and Glaciomarine deposits.
2. It has been assumed that where old pits/quarries are present then these have been backfilled with non-engineered fill of unknown origin, however a number of areas of worked ground are present where no backfilling may have taken place.

6.8.54 The comparison of total lengths of potentially unfavourable ground conditions can only be used as a crude means of comparing the different route options due to a number of limitations as summarised below:

- Worked ground may not present a constraint and would depend on the extent of any backfilling and ground disturbance;
- Old pits/quarries may be largely situated above general ground level and may therefore have not been backfilled;
- The nature of the potentially compressible glacial deposits is based on typical descriptions provided on the geological maps and may differ significantly from the actual nature of the materials; and
- The occurrence of the different types of superficial deposits is based on the geological mapping which records conjectural boundaries which would require to be confirmed by means of ground investigation.

6.8.55 There are lengths of potentially unfavourable ground conditions affecting the route options, including areas of alluvium and peat although the alluvium may not present a significant constraint to route option construction depending on its thickness and composition, and similarly the peat may be of limited thickness, not presenting a significant constraint.

6.8.56 Based on the total route length affected by areas of peat and alluvium, Route Option 2A is the most favourable and Route Option 2D is the least favourable. A brief discussion of the engineering constraints presented by these ground conditions is presented in the following sections.

6.8.57 Based on the desk study researches and findings, discussed above, a number of potential geotechnical constraints have been identified affecting all the route options to varying degrees. These relate mainly to the presence of potentially soft compressible soils, but also possible infilled quarries and pits where contaminated materials may be present and non-engineered fill used as backfill. These constraints are discussed further below.

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- 6.8.58 Peat is present mainly in the area around Gollanfield to the west of Nairn and affects all of the route options equally, as the initial section of the Nairn Bypass is common to all route options. It is proposed to widen the existing A96 in this area where it is carried on embankment. Peat thicknesses of up to approximately 4m have previously been identified in this area but greater thicknesses of up to approximately 7m have been proved further to the east. Peat is also anticipated to occur locally in the vicinity of Blackcastle Quarry. Given the anticipated highly compressible nature of these deposits it is likely that these would require to be removed beneath the widened embankments and replaced with a suitable fill material. Alternative design solutions however should be considered and may prove to be cost effective where the peat is thickest, such as a piled concrete raft or load transfer platform. Particular care would be required when excavating peat in the immediate vicinity of the railway to prevent possible settlement as a result of dewatering the peat locally. It is unknown to what extent peat has been removed beneath the existing road and similarly with regard to the railway. With regard to local roads and junctions, peat is anticipated to underlie part of the proposed Nairn West Junction B. Excavation and replacement with suitable fill is also likely to be the preferred option in this area.
- 6.8.59 Based on the geological maps, all the route options would appear to be underlain by areas of alluvium to varying degrees. Potentially, the alluvium can contain compressible silts and clays, and occasionally peat. Given that these areas are often low lying within flood plains or at the base of valleys, the route options would normally be formed on embankment or at-grade in these areas based on the route options under consideration here. In particular, a relatively high embankment is required for the crossing of the Aberdeen to Inverness Railway Line over an extensive area of alluvium associated with the Alton Burn. More localised occurrences of alluvium are associated with the Auldearn Burn, the River Nairn and some minor watercourses. With regard to the River Nairn, approach embankment heights of up to approximately 10m are required for the proposed river crossing.
- 6.8.60 With regard to local roads and junctions, these are only affected very locally by these deposits.
- 6.8.61 The potentially compressible nature of the alluvium can lead to unacceptable settlements beneath embankments in the longer term and can also lead to slope stability problems, particularly during the construction phase unless appropriate treatment measures are applied, or the slopes designed accordingly. These can include such measures as staged construction, removal and replacement of the soft soils, accelerated settlement using band drains and/or surcharging with drainage layer(s), and the use of structurally supported load transfer platforms, particularly on the approaches to structures. The selection and design of these measures would depend largely on the thickness and nature of the alluvium which would be determined by means of a ground investigation, and potentially construction programme constraints. Where the road is at-grade or on low height embankment it may be feasible to reinforce the subgrade with geogrids embedded within a layer of granular fill. The construction over areas of alluvium potentially involves greater cost and may have an potential adverse effect on programme to allow the necessary remedial works to be implemented.
- 6.8.62 With regard to other potentially compressible soils, including Glaciolacustrine, Glaciomarine and Raised Beach deposits etc., which may be present, these are not anticipated to be widespread and may affect the route options locally. Again, the thickness and nature of these deposits would require to be confirmed by means of ground investigation at the next stage.
- 6.8.63 All of the route options traverse areas of Made Ground or worked ground, mainly associated with historic or recent sand and gravel extraction. At the west end of the study area a number of the route options cross areas of worked ground associated with Blackcastle Quarry at Delnies Wood while the remainder cross several old gravel pits between Moss-side and Tradespark on the west side of Nairn. At the east end of the study area there are a number of old pits/quarries to the east of Auldearn, affecting most of the route options.

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Without further information it is uncertain if these would present a significant constraint to development or not. Sand and gravel extraction may have taken place largely above ground level or to relatively shallow depths below general ground level in these areas, and provided no backfilling has taken place, there may only be a requirement for some up-filling. The older pits and quarries identified may however have been backfilled with unknown materials and a ground investigation would be required to determine the nature and thickness of the backfill materials including any contamination that may be present. From desk study researches it is considered unlikely that there would be any significant areas of contaminated land associated with historical industrial activity due to the largely rural setting for the study area. In-situ treatment of Made Ground deposits to improve their engineering properties or dig out and replace are possible options for dealing with Made Ground.

- 6.8.64 Other geotechnical issues to be addressed include several relatively deep (up to approximately 14m in depth – Gallows Hill) cuttings where rock may be encountered at shallow depths, requiring more demanding excavation techniques such as hard ripping or blasting, and potentially shallow groundwater existing in cuttings, affecting slope stability and ease of construction.

Earthworks Balance

Excavated Material Acceptability

- 6.8.65 In general, where cuttings are to be formed, typically these lie within areas of predominantly granular materials of fluvioglacial origin, based on the available desk study information examined. It is estimated that of the order of 75% of these materials may be acceptable for reuse as general fill. This figure would potentially also apply to the underlying glacial till deposits where present. Rock is generally not anticipated to occur within the proposed shallow cuttings, which are generally less than 5m in depth, although the possibility of localised shallow rock cannot be discounted. There are several deeper cuttings, however, up to 14m in depth where some rock excavation is anticipated. It is anticipated that a significant proportion of the rock would be acceptable for reuse as a general fill material.
- 6.8.66 The other deposits of glacial origin, and also the alluvium, may provide acceptable materials depending on their composition and nature. This can only be confirmed by means of a ground investigation to be carried out during the DMRB Stage 3 assessment once a preferred option has been selected. This also applies to confirming the percentage acceptable for the fluvioglacial and glacial till deposits.

Unacceptable Material and Contaminated Land

- 6.8.67 Unacceptable materials which cannot be used in the main earthworks such as peat, soft clays and silts will require to be disposed of on or off-site. Much of this material will be unsuitable for the formation of bunds and in landscaping, although these volumes can be minimised through the use of various in-situ ground improvement techniques, particularly for the soft non-organic soils, such as lime treatment, soil mixing, stone columns etc. This would not apply to the peat deposits. However, these are very localised in occurrence and are unlikely to be of a significant thickness.
- 6.8.68 Contaminated land is not anticipated to be a significant issue affecting any of the route options, largely due to the absence of any major industrial activity in the area. Localised areas of contaminated ground may, however, be present and investigation of these will be required to determine any special measures required to address any contaminants present. This could involve in-situ treatment or removal to a licensed disposal site depending on the nature of the contamination.

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Cut/fill Balance

6.8.69 Approximate earthworks volumes have been estimated to allow a reasonable comparison between route options. Following a ground investigation and further earthworks design development the alignment of the preferred option will be developed to further optimise the cut/fill balance.

6.8.70 Table 6.6 below summarises the total earthworks volumes as follows:

- Overall Fill Required – Overall earthworks fill volume required excluding capping, sub-base and top-soil volume. Includes allowance for stripping of existing top-soil and replacement of any excavated soft ground. The totals calculated include local road earthworks and allow for openings in major structures.
- Total Excavated Volume – Overall volume of excavated material including unsuitable and excavated soft ground. Excludes top-soil strip.
- Total Unsuitable Volume – The total volume of unsuitable material that will be required to be disposed of, either to landfill or for use in landscaping, noise bunds etc. No bulking factor has been applied to the gross unsuitable volume at this stage in the assessment.
- Total Acceptable Available – Based on the above discussion regarding likely areas of suitable excavated material and potential percentage acceptability a volume of site-won acceptable material has been determined.
- Anticipate Cut/Fill Balance – The balance of the overall fill requirement, less the potential volume of available acceptable site won material. As expressed in this table a positive balance is indicative of an overall import requirement with the result that a volume of engineering fill will be required to be sourced and brought to site. Likewise a negative balance indicates that there will be an overall excess of engineering fill material generated by the work (in addition to the identified volume of unsuitable material).

Table 6.6: Section 2 Cut/Fill balance (Volumes expressed x 1000m³)

Route Option	2A	2B	2C	2D	2E	2F	2G	2H	2I
Overall Fill Required	2279	2232	2528	2415	1845	1766	2004	2628	2128
Total Excavated Volume	1166	553	887	1113	1367	729	1056	1462	1296
Total Unsuitable Volume	464	275	411	486	416	213	343	534	467
Total Acceptable Available	702	278	476	627	951	516	712	928	829
Anticipated Cut/Fill Balance	1577	1954	2053	1788	894	1250	1292	1700	1299

6.8.71 All route options require a significant volume of import of fill material. Route Option 2H requires the most material but generates one of the greatest volumes of acceptable material. Route Option 2B generates the least acceptable material, and is close to average in terms of fill required. Route Option 2C has the worst cut/fill balance, as it requires the second greatest volume of fill material and generates the second least volume of acceptable material.

6.8.72 Route Option 2E has the best cut/fill balance, with the second lowest fill requirement, and the highest acceptable material generated.

6.9 Hydrology

6.9.1 The effects of the route options on the water environment are considered fully in Part 3, Chapter 13 (Road Drainage and the Water Environment) of this report. This section provides a summary of the engineering issues related to watercourse crossings and road drainage.

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- 6.9.2 A preliminary assessment of hydrology was made for each route option. Following the selection of a preferred option, a review of the drainage and flood risk strategy will be undertaken during the DMRB Stage 3 assessment.

Watercourses

- 6.9.3 A number of watercourses, located within the study area, are affected by the proposed route options, including:

River Nairn

- 6.9.4 The River Nairn is the main watercourse in the area running south to north through the study area. It is approximately 25-30m in width and flows through the centre of Nairn before discharging into the Moray Firth. Several tributaries also flow into the River Nairn in the study area.

Alton Burn

- 6.9.5 The Alton Burn originates at the eastern end of the Blar nam Fiadh peat bog and runs in a north-easterly direction, south of the railway line before entering the south-east corner of Nairn, turning northwards, and discharging into the Moray Firth. The Alton Burn runs in a deep open channel for most of its length but has a wide flood plain in the vicinity of Balnarspirach.

Auldearn Burn

- 6.9.6 The Auldearn Burn is located in the east of the study area and is a tributary of the River Nairn. It runs in a generally northerly direction, south of Auldearn and is culverted beneath the existing A96 Aberdeen – Inverness Trunk Road at Auldearn. It then turns west, back beneath the existing A96 and joins the River Nairn to the south of Nairn. Several tributaries also flow into the Auldearn Burn in the study area.

- 6.9.7 There are also a number of unnamed watercourses / drainage ditch networks which are culverted beneath the existing A96 in the west of the study area at Blackcastle and Delnies.

- 6.9.8 Table 6.7 indicates the watercourses affected by each route option and the proposed treatment.

Table 6.7: Watercourse crossings

Route Option	2A	2B	2C	2D	2E	2F	2G	2H	2I
Blackcastle Stream	EC	EC	EC	EC	EC	EC	EC	EC	EC
Delnies Stream	EC	EC	EC	EC	EC	EC	EC	EC	EC
Alton Burn	C	C	C	C	C	C	C	C	C
Alton Burn Flood Plain	F	F	F	F	-	-	-	-	-
River Nairn and Tributaries	V+C	V+C	V+C	V	V+C	V+C	V+C	V+C	V
Auldearn Burn and Tributaries	4C	3C	4C	4C	3C	3C	4C	3C	4C
Total	9	8	9	7	8	8	9	8	8

Key to Table:

EC – Extend/re-construct existing culvert

C – Watercourse to be culverted – Number indicates no of crossings of watercourse or tributaries

F – Flood Plain crossed by route option

V – Viaduct – Ref to structures assessment

- 6.9.9 It can be seen that the route options all require a similar number of interventions. Route Option 2D requires seven interventions, the least of all route options, while Route Options

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2A, 2C and 2G require nine interventions, the most of all route options. The remaining route options all require eight interventions.

6.9.10 Route Options 2A, 2B, 2C and 2D cross Alton Burn flood plain on a significant embankment. Engineering works such as a culverted embankment or a viaduct would be required to avoid significantly affecting the water flow through this flood plain.

6.9.11 Each route option would cross the River Nairn on a structure at one of two proposed crossing points.

Drainage

5.1.3 A preliminary drainage design has been carried out to identify potential outfalls, catchment areas and treatment pond sizes to inform the engineering and environmental assessments of each route option. The design of drainage systems will be developed further as part of the DMRB Stage 3 assessment, when a preferred option has been identified.

5.1.4 The design will incorporate Sustainable Drainage Systems (SuDS) which will include the provision of measures such as swales, filter drains, and ponds or basins. The intention of such systems is to limit the rate of surface water discharging from the carriageway into existing watercourses in all but extreme weather situations and provide treatment to reduce the concentration of pollutants entering the watercourses. This will be achieved through the provision of detention basins at frequent intervals, containing the surface water runoff generated by the proposed scheme and allowing a controlled flow into the watercourse.

6.9.12 In the western part of the study area, there are few watercourses suitable for receiving runoff from roads. The proposed route options all mimic the existing road at the start of the Nairn Bypass section, which has a low point to the south of the railway. While there appears to be an existing drainage system, there does not appear to be a watercourse in the area, and the outfall of this drainage system is unknown. A drainage survey should be carried out as part of the DMRB Stage 3 assessment to determine if the existing system is appropriate for current drainage design standards.

6.9.13 The proposed Nairn East Junctions A, B and C, incorporated into Route Options 2A, 2B, 2E, 2F and 2H, are in cut within the floodplain of Auldearn Burn. Should one of these route options be carried forward to the next design stage, consideration should be given to redesigning or relocating this junction.

6.10 Structures

Introduction

6.10.1 This section provides a general overview of the requirements for structures over the length of the Nairn Bypass between Gollanfield and the eastern tie-in to the existing A96. Whilst there is a degree of repetition between the requirements for the various route options where they follow the same alignments, e.g. Route Options 2A, 2B, 2C and 2D between Gollanfield and the proposed Nairn West Junction A, the requirements for each route option have been stated fully for ease of reading and to avoid confusion.

6.10.2 With the exception of the River Nairn Bridge which is described in greater detail below, individual structures are described in outline detail only, as further details will be developed and provided in the DMRB Stage 3 Report following development of the preferred option. All structure proposals described below comply with the DMRB and it is not envisaged that any Departures from Standard will be required at this stage of the scheme development in relation to the proposed structures.

6.10.3 The proposals are based on adopting concrete construction, either cast in-situ or precast, where span lengths permit as this is generally the most cost effective type of construction.

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However, where larger spans cannot be avoided, steel concrete composite construction is proposed.

6.10.4 In addition, wherever possible, integral construction has been proposed to minimise long term maintenance requirements and costs where the overall length of the structure does not exceed 60m and the skew does not exceed 30 degrees. In other cases, bearings and movement joints will be provided in conjunction with abutment inspection galleries where integral construction is not appropriate.

6.10.5 The proposed structure locations are shown on Drawings B1557601/SLP/2100 to 2900 (Volume 2).

River Nairn Bridge

6.10.6 The crossing of the River Nairn has been given particular consideration and the findings are detailed below.

6.10.7 Two locations have been identified for crossing the River Nairn depending on the particular route option considered and each route option adopts one of three alignments at these two locations as follows:

- North Alignment 1 – Route Options 2A, 2B and 2C;
- North Alignment 2 – Route Options 2E, 2F and 2G; and
- South Alignment – Route Options 2D, 2H and 2I.

6.10.8 A number of outline bridge arrangement options have been developed for each of the three alignments where they cross the River Nairn and these are described below and shown on Drawings B1557601/0101 to 0302 (Volume 2).

6.10.9 In developing these options, a number of constraints have been considered as follows:

- For the northern alignments 1 and 2, it has been assumed that the design 1 in 100 year flood level of the river is 18.0m AOD, this is based on interpretation of available SEPA flood maps;
- For the southern alignment, it has been assumed that the design 1 in 100 year flood level of the river is 19.0m AOD, again based on interpretation of available SEPA flood maps for the River Nairn;
- It has been assumed that a minimum freeboard of 1.0m will be provided between the flood level and the bridge deck soffit; and
- It has been assumed that a minimum clearance of 2.5m will be provided between the bridge deck soffit and finished ground level below the bridge, in particular above the core path that runs along the eastern bank of the river.

6.10.10 In addition, a 132kV overhead power line crosses the River Nairn in the vicinity of North Alignment 1 and North Alignment 2 and a minimum vertical clearance of 9.65m is required to be provided, i.e. high load clearance of 6.45m + additional 3.2m clearance to the overhead lines. The existing cables do not accommodate this clearance relative to the mainline alignment and would require to be raised. Alternatively, the lines could be ducted and buried where they cross the line of the proposed A96.

6.10.11 At this stage, it has been assumed that all foundations for the proposed River Nairn Bridge would require to be supported on piles installed to a suitable founding stratum. However, this will be reviewed when more geotechnical information becomes available and it may be possible to adopt spread foundations for some or all foundations depending on the results of these investigations.

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North Alignment 1

- 6.10.12 Three of the nine route options cross the River Nairn at a point approximately one kilometre south of the limits of Nairn and immediately south of Broadley Farm to the east of the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road.
- 6.10.13 At this location, the river is approximately 18m wide with a steep slope on the east bank and gently rising ground towards the existing B9090 some 200m to the west.
- 6.10.14 The route options which cross at this location are Route Options 2A, 2B and 2C and three different structural span arrangements have been developed and are shown in Drawings B1557601/STR/0101, 0102 and 0103 (Volume 2) as North Alignment 1 Option 1, Option 2 and Option 3.
- 6.10.15 It should be noted that for this alignment the width of the proposed A96 is generally constant over the western half of the bridge but widens over the eastern half to accommodate sightline widening on the approach to a left hand horizontal curve.

Option 1

- 6.10.16 Option 1 is proposed to comprise a three span arrangement with the span over the river and the eastern span being of variable depth and the western span of constant depth. The span lengths from the west are 40.0m, 57.5m and 57.5m.
- 6.10.17 It is assumed that the deck would comprise steel concrete composite construction as the spans are too long for precast concrete beam construction. The span lengths are suitable for cast in-situ or precast concrete box type construction. However, constructing such a deck over the river would have greater environmental constraints and construction difficulties and is therefore discounted at this stage.
- 6.10.18 The intermediate piers are assumed to comprise piled foundations with suitably sized circular columns or leaf piers supporting the deck on bearings. End supports would also comprise piled foundations with in-situ concrete abutments incorporating inspection galleries, bearings and movement joints at road surface level.

Option 2

- 6.10.19 Option 2 is proposed to comprise a five span arrangement with all spans being of constant depth. The span lengths from the west are 22.5m, 35.0m, 45.0m, 45.0m and 30.0m.
- 6.10.20 Again, it is assumed that the deck would comprise steel concrete composite construction as the spans are generally too long for precast concrete beam construction.
- 6.10.21 The intermediate piers and abutments are assumed to be similar to those described above for Option 1.

Option 3

- 6.10.22 Option 3 is proposed to comprise a six span arrangement with all spans being of constant depth. The span lengths from the west are 18.0m, 30.0m, 30.0m, 30.0m, 33.0m and 20.0m.
- 6.10.23 In this case, it is assumed that the deck would comprise precast concrete beam and slab construction as the spans are of a suitable length and that the intermediate piers and abutments are similar to those described above for Option 1.
- 6.10.24 In all three options described above, the piers adjacent to the river are kept beyond the main river channel although appropriate measures would need to be taken to avoid any pollution of the river from construction activities. However, in Option 3, the piers are located

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immediately adjacent to the river bank and thus may require particular attention in this regard.

North Alignment 2

6.10.25 A further three of the nine route options cross the River Nairn at the same location as North Alignment 1 described above but on a slightly different bearing, thus crossing the river at a skew of approximately 30 degrees.

6.10.26 The topography is therefore similar to that described above for North Alignment 1.

6.10.27 The route options which cross at this location are Route Options 2E, 2F and 2G and three different structural span arrangements have been developed and are shown in Drawings B1557601/STR/0201, 0202 and 0203 (Volume 2) as North Alignment 2 Option 1, Option 2 and Option 3.

6.10.28 The A96 is of constant width on these alignments over the River Nairn.

Option 1

6.10.29 Option 1 is proposed to comprise a three span arrangement with all spans being of variable depth. The span lengths from the west are 45.0m, 67.5m and 57.5m.

6.10.30 It is assumed that the deck would comprise steel concrete composite construction as the spans are too long for precast concrete beam construction. The span lengths are suitable for cast in-situ or precast concrete box type construction. However, constructing such a deck over the river would have greater environmental constraints and construction difficulties and is therefore discounted at this stage.

6.10.31 The intermediate piers are assumed to comprise piled foundations with suitably sized circular columns or leaf piers supporting the deck on bearings. End supports would also comprise piled foundations with in-situ concrete abutments incorporating inspection galleries, bearings and movement joints at road surface level.

6.10.32 All supports are aligned on a skew of approximately 30 degrees to the A96 to run parallel to the alignment of the River Nairn.

Option 2

6.10.33 Option 2 is proposed to comprise a five span arrangement with all spans being of constant depth. The span lengths from the west are 32.5m, 40.0m, 40.0m, 47.5m and 30.0m.

6.10.34 Again, it is assumed that the deck would comprise steel concrete composite construction as the main span over the river, at 47.5m, is above the span length for precast concrete beam construction.

6.10.35 The intermediate piers and abutments are assumed to be similar to those described above for Option 1.

Option 3

6.10.36 Option 3 is proposed to comprise a six span arrangement with all spans being of constant depth. The span lengths from the west are 22.0m, 32.0m, 32.0m, 32.0m, 34.0m and 20.0m.

6.10.37 In this case it is assumed that the deck would comprise precast concrete beam and slab construction as the spans are of a suitable length and that the intermediate piers and abutments are similar to those described above for Option 1.

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6.10.38 In all three options described above, the piers adjacent to the river are kept beyond the main river channel although appropriate measures would need to be taken to avoid any pollution of the river from construction activities. However, in Option 3, the piers are located immediately adjacent to the river bank and thus may require particular attention in this regard.

South Alignment

6.10.39 The remaining three of the nine route options cross the River Nairn at a point approximately two kilometres south of the limits of Nairn and immediately north of the existing Howford Bridge on a skew to the river of approximately 15 degrees. The existing bridge carries the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the River Nairn and is situated approximately 75m to the south of the proposed A96 on this alignment.

6.10.40 At this location, the river is approximately 30m wide with a steep slope on the east bank and gently rising ground towards the existing B9090 some 150m to the west.

6.10.41 The route options which cross at this location are Route Options 2D, 2H and 2I and two different structural span arrangements have been developed and are shown in Drawings B1557601/STR/0301 and 0302 (Volume 2) as Option 1 and Option 2.

6.10.42 It should be noted that for this alignment the width of the proposed A96 is generally constant over the western half of the bridge but widens over the eastern half to accommodate sightline widening on the approach to a left hand horizontal curve.

Option 1

6.10.43 Option 1 is proposed to comprise a five span arrangement with the three eastern spans being of variable depth. The span lengths from the west are 35.0m, 45.0m, 45.0m, 70.0m and 45.0m.

6.10.44 It is assumed that the deck would comprise steel concrete composite construction as the spans are too long for precast concrete beam construction. The span lengths are suitable for cast in-situ or precast concrete box type construction. However, constructing such a deck over the river would have greater environmental constraints and construction difficulties and is therefore discounted at this stage.

6.10.45 The intermediate piers are assumed to comprise piled foundations with suitably sized circular columns or leaf piers supporting the deck on bearings. End supports would also comprise piled foundations with in-situ concrete abutments incorporating inspection galleries, bearings and movement joints at road surface level.

6.10.46 All supports are aligned on a skew of approximately 15 degrees to the A96 to run parallel to the alignment of the River Nairn.

Option 2

6.10.47 Option 2 is proposed to comprise a six span arrangement with all spans being of constant depth. The span lengths from the west are 25.0m, 35.0m, 35.0m, 35.0m, 50.0m and 35.0m.

6.10.48 Again, it is assumed that the deck would comprise steel concrete composite construction as the main span over the river, at 50.0m, is above the span length for precast concrete beam construction.

6.10.49 The intermediate piers and abutments are assumed to be similar to those described above for Option 1.

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A96 Gollanfield Rail Bridge

- 6.10.50 All nine route options discussed below require the proposed dualling of the A96 to cross the Aberdeen to Inverness Railway Line in the vicinity of the existing A96 550 Gollanfield Rail Bridge. This structure currently carries the existing A96 Aberdeen – Inverness Trunk Road over the single track railway on a clear span of 6.79m between abutment walls.
- 6.10.51 The options in relation to providing a proposed dual carriageway A96 over the railway at this location are as follows:
- (1) construct a completely new structure with a clear span to accommodate **future doubling** of the existing single track and to carry the **full width** of the proposed dual carriageway with the existing structure demolished;
 - (2) construct a completely new structure with a clear span to accommodate the existing **single track** and to carry the **full width** of the proposed dual carriageway with the existing structure demolished;
 - (3) construct a completely new structure with a clear span to accommodate **future doubling** of the existing single track and to carry a **single carriageway** of the proposed dual carriageway with the existing structure carrying the remaining carriageway; or
 - (4) construct a completely new structure with a clear span to accommodate the existing **single track** and to carry a **single carriageway** of the proposed dual carriageway with the existing structure carrying the remaining carriageway.
- 6.10.52 For the purposes of this Stage 2 study, it has been assumed that option (1) above, i.e. providing a structure which will accommodate the doubling of the existing track and the full width of the proposed A96 dual carriageway, is preferred. Options (2), (3) and (4) would require further works to be carried out in the future should the existing single track railway be improved to double track which is understood to be an aspiration of Network Rail. It will be necessary to carry out further assessment of each potential option during DMRB Stage 3 assessment in consultation with Network Rail.
- 6.10.53 If on the other hand, there is little likelihood of the railway being improved in the near future from single to double track, consideration should be given to proceeding with option (3) as there would be benefits in relation to cost and traffic disruption compared to options (2) and (4) should doubling of the track proceed at a later date.

Other Structures

- 6.10.54 A general discussion on the other structures required for the Nairn Bypass is provided below.

Underbridges

- 6.10.55 The carriageway, hard shoulders and hard strips of the mainline will be continued over decks of underbridges. In addition, verges of the mainline carriageway shall be carried over underbridge decks with no reduction of width in accordance with Clause 5.6 of TD 27/05 of the DMRB.

Overbridges

- 6.10.56 The carriageway and, where provided, hard strips of local roads will be continued over the decks of overbridges. In addition, the verges of local roads carried by overbridges shall be continued across overbridges and verges to the mainline below overbridges shall be continued through the structure with no reduction of width in accordance with Clause 5.6 of TD 27/05 of the DMRB.
- 6.10.57 At certain locations, it may be necessary to widen bridge decks of both underbridges and overbridges and to lengthen overbridges and increase the spans of underbridges to cater for

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sightline requirements where road alignments are curved or where structures are located in the vicinity of junctions. In either case, widening would be accomplished by increasing the width of the verge(s) and central reserve as appropriate.

Route Option 2A

- 6.10.58 Excluding the River Nairn Bridge, Route Option 2A requires the provision of 10 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2A)

- 6.10.59 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.60 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.
- 6.10.61 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Nairn West Junction A Overbridge (2A)

- 6.10.62 This structure would carry the proposed Nairn West Junction A link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, a 2m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision.

C1170 Overbridge (2A)

- 6.10.63 This structure would carry the C1170 Moss-side – Mosshall – Broadley Road over the mainline and is proposed to consist of a four span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 3.3m wide carriageway, a 2m wide footpath on the north side and a 2.0m wide verge on the south side.

Moss-side Rail Underbridge (2A)

- 6.10.64 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of

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cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9091 Overbridge (2A)

- 6.10.65 This structure would carry the B9091 Croy – Clephanton – Kildrummie – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

B9090 Overbridge (2A)

- 6.10.66 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Overbridge (2A)

- 6.10.67 This structure would carry the A939 Tomintoul – Grantown on Spey – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction A Underbridge (2A)

- 6.10.68 This structure would carry the mainline over the proposed Nairn East Junction A link road and is proposed to consist of a single span portal type structure with a minimum clear span of 14.8m between abutment walls to accommodate a 7.3m wide carriageway, 2 no 1.0m wide hard strips, a 2.0m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the varying width eastbound facing slips to the junction. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

C1172 Overbridge (2A)

- 6.10.69 This structure would carry the C1172 Auldearn – Station – Drum Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Existing A96 Underbridge (2A)

- 6.10.70 This structure would carry the mainline over the existing A96 and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate the 7.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m

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wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Route Option 2B

- 6.10.71 Excluding the River Nairn Bridge, Route Option 2B requires the provision of nine bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2B)

- 6.10.72 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.73 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.
- 6.10.74 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Nairn West Junction A Overbridge (2B)

- 6.10.75 This structure would carry the proposed Nairn West Junction A link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, a 2m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision.

C1170 Overbridge (2B)

- 6.10.76 This structure would carry the C1170 Moss-side – Mosshall – Broadley Road over the mainline and is proposed to consist of a four span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 3.3m wide carriageway, a 2m wide footpath on north side and a 2.0m wide verge on the south side.

Moss-side Rail Underbridge (2B)

- 6.10.77 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum

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wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9091 Overbridge (2B)

- 6.10.78 This structure would carry the B9091 Croy – Clephanton – Kildrummie – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

B9090 Overbridge (2B)

- 6.10.79 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Overbridge (2B)

- 6.10.80 This structure would carry the A939 Tomintoul – Grantown on Spey – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction B Underbridge (2B)

- 6.10.81 This structure would carry the mainline over the proposed Nairn East Junction B link road and is proposed to consist of a single span portal type structure with a minimum clear span of 20.3m between abutment walls to accommodate a 10.8m wide carriageway, 2 no 1.0m wide hard strips, a 2.0m wide verge on the east side and a 5.5m wide verge on the west side for sightline and NMU provision. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the varying width eastbound facing slips to the junction. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of precast beam and slab type construction.

Realigned A96 single carriageway Underbridge (2B)

- 6.10.82 This structure would carry the mainline over the realigned A96 single carriageway and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate the 7.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

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Route Option 2C

- 6.10.83 Excluding the River Nairn Bridge, Route Option 2C requires the provision of 10 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2C)

- 6.10.84 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.85 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.
- 6.10.86 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Nairn West Junction A Overbridge (2C)

- 6.10.87 This structure would carry the proposed Nairn West Junction A link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, a 2m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision.

C1170 Overbridge (2C)

- 6.10.88 This structure would carry the C1170 Moss-side – Mosshall – Bradley Road over the mainline and is proposed to consist of a four span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 3.3m wide carriageway, a 2m wide footpath on the north side and a 2.0m wide verge on the south side.

Moss-side Rail Underbridge (2C)

- 6.10.89 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

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B9091 Overbridge (2C)

- 6.10.90 This structure would carry the B9091 Croy – Clephanton – Kildrummie – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

B9090 Overbridge (2C)

- 6.10.91 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Junction A Overbridge (2C)

- 6.10.92 This structure would carry the proposed A939 Junction A link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 10.8m wide carriageway and 2 no 2.0m wide verges.

B9101 Overbridge (2C)

- 6.10.93 This structure would carry the B9101 Auldearn – Cawdor Road over the mainline and is proposed to consist of a three span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0 m wide carriageway and 2 no 2.0m wide verges.

Kinsteary House Overbridge (2C)

- 6.10.94 This structure would carry the private access road to Kinsteary House over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction D Overbridge (2C)

- 6.10.95 This structure would carry the proposed Nairn East Junction D link road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Route Option 2D

- 6.10.96 Excluding the River Nairn Bridge, Route Option 2D requires the provision of 10 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

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Gollanfield Rail Underbridge (2D)

- 6.10.97 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.98 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.
- 6.10.99 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Nairn West Junction A Overbridge (2D)

- 6.10.100 This structure would carry the proposed Nairn West Junction A link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, a 2m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision.

C1170 Overbridge (2D)

- 6.10.101 This structure would carry the C1170 Moss-side – Mosshall – Broadley Road over the mainline and is proposed to consist of a four span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 3.3m wide carriageway, a 2m wide footpath on north side and a 2.0m wide verge on the south side.

Moss-side Rail Underbridge (2D)

- 6.10.102 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9091 Overbridge (2D)

- 6.10.103 This structure would carry the B9091 Croy – Clephanton – Kildrummie – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried

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abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

B9090 Overbridge (2D)

6.10.104 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Junction B Underbridge (2D)

6.10.105 This structure would carry the mainline over the A939 Junction B link road and is proposed to consist of a single span portal type structure with a minimum clear span of 21.8m between abutment walls to accommodate a 10.8m wide carriageway and 2 no 5.5m wide verges including sightline widening on both sides. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the eastbound facing northern and the westbound facing southern slips to the junction. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of precast beam and slab type construction.

C1167 Overbridge (2D)

6.10.106 This structure would carry the C1167 Auldearn – Dalmore – Cotterton Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

Kinstearry House Overbridge (2D)

6.10.107 This structure would carry the private access road to Kinstearry House over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction D Overbridge (2D)

6.10.108 This structure would carry the proposed Nairn East Junction D link road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Route Option 2E

6.10.109 Excluding the River Nairn Bridge, Route Option 2E requires the provision of 11 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

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Gollanfield Rail Underbridge (2E)

- 6.10.110 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.111 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.
- 6.10.112 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Cockhill Access No. 1 Overbridge (2E)

- 6.10.113 This structure would carry the proposed private access road to Cockhill over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn West Junction B Overbridge (2E)

- 6.10.114 This structure would carry the proposed Nairn West Junction B link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Cockhill Access No. 2 Underbridge (2E)

- 6.10.115 This structure would carry the mainline over a private access road to Cockhill and is proposed to consist of a single span portal type structure with a minimum clear span of 7.3m between abutment walls to accommodate a 3.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Moss-side Rail Underbridge (2E)

- 6.10.116 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum

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wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

- 6.10.117 Whilst the mainline crosses the railway at a skew of approximately 50 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

C1163 Rail Underbridge (2E)

- 6.10.118 This structure would carry the C1163 Delnies – Kildrummie – Howford Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure comprise a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9090 Overbridge (2E)

- 6.10.119 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Overbridge (2E)

- 6.10.120 This structure would carry the A939 Tomintoul – Grantown on Spey – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction A Underbridge (2E)

- 6.10.121 This structure would carry the mainline over the proposed Nairn East Junction A link road and is proposed to consist of a single span portal type structure with a minimum clear span of 14.8m between abutment walls to accommodate a 7.3m wide carriageway, 2 no 1.0m wide hard strips, a 2.0m wide verge on the east side and a 3.5m wide verge on the west side for NMU provision. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the varying width eastbound facing slips to the junction. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

C1172 Overbridge (2E)

- 6.10.122 This structure would carry the C1172 Auldearn – Station – Drum Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried

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abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Existing A96 Underbridge (2E)

6.10.123 This structure would carry the mainline over the existing A96 and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate the 7.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Route Option 2F

6.10.124 Excluding the River Nairn Bridge, Route Option 2F requires the provision of 10 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2F)

6.10.125 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.126 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

6.10.127 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Cockhill Access No. 1 Overbridge (2F)

6.10.128 This structure would carry the proposed private access road to Cockhill over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn West Junction B Overbridge (2F)

6.10.129 This structure would carry the proposed Nairn West Junction B link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

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Cockhill Access No. 2 Underbridge (2F)

6.10.130 This structure would carry the mainline over a private access road to Cockhill and is proposed to consist of a single span portal type structure with a minimum clear span of 7.3m between abutment walls to accommodate a 3.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Moss-side Rail Underbridge (2F)

6.10.131 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.132 Whilst the mainline crosses the railway at a skew of approximately 50 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

C1163 Rail Underbridge (2E)

6.10.133 This structure would carry the C1163 Delnies – Kildrummie – Howford Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure comprise a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9090 Overbridge (2F)

6.10.134 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Overbridge (2F)

6.10.135 This structure would carry the A939 Tomintoul – Grantown on Spey – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

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Nairn East Junction B Underbridge (2F)

6.10.136 This structure would carry the mainline over the proposed Nairn East Junction B link road and is proposed to consist of a single span portal type structure with a minimum clear span of 20.3m between abutment walls to accommodate a 10.8m wide carriageway, 2 no 1.0m wide hard strips, a 2.0m wide verge on the east side and a 5.5m wide verge on the west side for sightline and NMU provision. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the varying width eastbound facing slips to the junction. The substructure would be of cast in-situ concrete whilst the deck would consist of precast prestressed beam and slab type construction.

Realigned A96 single carriageway Underbridge (2F)

6.10.137 This structure would carry the mainline over the realigned A96 single carriageway and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate the 7.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Route Option 2G

6.10.138 Excluding the River Nairn Bridge, Route Option 2G requires the provision of 11 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2G)

6.10.139 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.140 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

6.10.141 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Cockhill Access No. 1 Overbridge (2G)

6.10.142 This structure would carry the proposed private access road to Cockhill over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

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Nairn West Junction B Overbridge (2G)

6.10.143 This structure would carry the proposed Nairn West Junction B link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Cockhill Access No. 2 Underbridge (2G)

6.10.144 This structure would carry the mainline over a private access road to Cockhill and is proposed to consist of a single span portal type structure with a minimum clear span of 7.3m between abutment walls to accommodate a 3.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Moss-side Rail Underbridge (2G)

6.10.145 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.146 Whilst the mainline crosses the railway at a skew of approximately 50 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

C1163 Rail Underbridge (2G)

6.10.147 This structure would carry the C1163 Delnies – Kildrummie – Howford Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure comprise a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9090 Overbridge (2G)

6.10.148 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

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A939 Junction A Overbridge (2G)

6.10.149 This structure would carry the A939 Junction A link road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 10.8m wide carriageway and 2 no 2.0m wide verges.

B9101 Overbridge (2G)

6.10.150 This structure would carry the B9101 Auldearn – Cawdor Road over the mainline and is proposed to consist of a three span structure comprising steel concrete composite construction due to the high skew, long span plan arrangement. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0 m wide carriageway and 2 no 2.0m wide verges.

Kinsteary House Overbridge (2G)

6.10.151 This structure would carry the private access road to Kinsteary House over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction D Overbridge (2G)

6.10.152 This structure would carry the Nairn East Junction D link road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Route Option 2H

6.10.153 Excluding the River Nairn Bridge, Route Option 2H requires the provision of 11 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2H)

6.10.154 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.155 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

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- 6.10.156 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Cockhill Access No. 1 Overbridge (2H)

- 6.10.157 This structure would carry the proposed private access road to Cockhill over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn West Junction B Overbridge (2H)

- 6.10.158 This structure would carry the Nairn West Junction B link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verge.

Cockhill Access No. 2 Underbridge (2H)

- 6.10.159 This structure would carry the mainline over a private access road to Cockhill and is proposed to consist of a single span portal type structure with a minimum clear span of 7.3m between abutment walls to accommodate a 5.5m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

Moss-side Rail Underbridge (2H)

- 6.10.160 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

- 6.10.161 Whilst the mainline crosses the railway at a skew of approximately 50 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

C1163 Rail Underbridge (2H)

- 6.10.162 This structure would carry the C1163 Delnies – Kildrummie – Howford Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure comprise a

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5.5m wide carriageway and 2 no 2.0m wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9090 Overbridge (2H)

6.10.163 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Overbridge (2H)

6.10.164 This structure would carry the A939 Tomintoul – Granttown on Spey – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction C Underbridge (2H)

6.10.165 This structure would carry the mainline over the proposed Nairn East Junction C link road and is proposed to consist of a single span portal type structure with a minimum clear span of 16.55m between abutment walls to accommodate a 7.3m wide carriageway, 2 no 1.0m wide hard strips, a 2.0m wide verge on the east side and a 5.25m wide verge on the west side for sightline and NMU provision. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the varying width eastbound facing slips to the junction. The substructure would be of cast in-situ concrete whilst the deck would consist of precast beam and slab type construction.

C1172 Overbridge (2H)

6.10.166 This structure would carry the C1172 Auldearn – Station – Drum Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Existing A96 Underbridge (2H)

6.10.167 This structure would carry the mainline over the existing A96 and is proposed to consist of a single span portal type structure with a minimum clear span of 11.3m between abutment walls to accommodate the 7.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

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Route Option 2I

6.10.168 Excluding the River Nairn Bridge, Route Option 2I requires the provision of 11 bridges over the extent of the Nairn Bypass and these structures can be summarised as follows:

Gollanfield Rail Underbridge (2I)

6.10.169 This structure would carry the mainline over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5m minimum wide central reserve and 2 no 2.5m minimum wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

6.10.170 Whilst the mainline crosses the railway at a high skew of approximately 70 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

6.10.171 The location of the new structure relative to the existing and the construction phasing would be developed further at the DMRB Stage 3 assessment.

Cockhill Access No. 1 Overbridge (2I)

6.10.172 This structure would carry the proposed private access road to Cockhill over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn West Junction B Overbridge (2I)

6.10.173 This structure would carry the proposed Nairn West Junction B link road over the mainline and is proposed to consist of a four span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges and in the central reserve would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments, all on piled foundations. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Cockhill Access No. 2 Underbridge (2I)

6.10.174 This structure would carry the mainline over a private access road to Cockhill and is proposed to consist of a single span portal type structure with a minimum clear span of 7.3m between abutment walls to accommodate a 3.3m wide carriageway and 2 no 2.0m wide verges. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of cast in-situ concrete or precast prestressed beams with solid infill.

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Moss-side Rail Underbridge (2I)

- 6.10.175 This structure would carry the mainline over the Aberdeen to Inverness Railway Line near Moss-side and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.
- 6.10.176 Whilst the mainline crosses the railway at a skew of approximately 50 degrees, the new structure would span across the railway at a maximum skew of 20 degrees to minimise the span length and hence construction depth.

C1163 Rail Bridge (2I)

- 6.10.177 This structure would carry the C1163 Delnies – Kildrummie – Howford Road over the Aberdeen to Inverness Railway Line and is proposed to consist of a single span portal type structure with a minimum clear span of 14.0m between abutment walls to accommodate a future doubling of the existing single line track and 4.5m minimum clearance from the outer rails to the adjacent abutment walls. The road cross section over the structure comprise a 5.5m wide carriageway and 2 no 2.0m wide verges. The substructure would be of cast in-situ concrete supported on piled foundations whilst the deck would consist of precast prestressed beams with solid infill in order to minimise works over the railway.

B9090 Overbridge (2I)

- 6.10.178 This structure would carry the B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 6.0m wide carriageway and 2 no 2.0m wide verges.

A939 Junction B Underbridge (2I)

- 6.10.179 This structure would carry the mainline over the proposed A939 Junction B link road and is proposed to consist of a single span portal type structure with a minimum clear span of 21.8m between abutment walls to accommodate a 10.8m wide carriageway and 2 no 5.5m wide verges including sightline widening on both sides. The road cross section over the structure would accommodate the mainline consisting of dual 7.3m wide carriageways with 2 no 1.0m wide hard strips, a 2.5 m minimum wide central reserve and 2 no 2.5m minimum wide verges in addition to the eastbound facing northern and the westbound facing southern slips to the junction. The verges and central reserve are widened to accommodate sightlines on the mainline. The substructure would be of cast in-situ concrete whilst the deck would consist of precast beam and slab type construction.

C1167 Overbridge (2I)

- 6.10.180 This structure would carry the C1167 Auldearn – Dalmore – Cotterton Road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 5.5m wide carriageway and 2 no 2.0m wide verges.

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Kinsteary House Overbridge (2I)

6.10.181 This structure would carry the private access road to Kinsteary House over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 3.3m wide carriageway and 2 no 2.0m wide verges.

Nairn East Junction D Overbridge (2I)

6.10.182 This structure would carry the proposed Nairn East Junction D link road over the mainline and is proposed to consist of a three span structure comprising precast beam and slab type construction. Intermediate supports located at the back of the verges would comprise circular columns or slab wall piers whilst the end supports would comprise galleried abutments on spread footings. The cross section over the structure would comprise a 7.3m wide carriageway, 2 no 1.0m wide hard strips and 2 no 2.0m wide verges.

Summary

6.10.183 Table 6.8 shows a summary of the number of structures required on the different route options. The table has been based on provision of bridge type structures. Requirements for the number and extent of any retaining walls have yet to be determined.

Table 6.8: Number of Structures required for each Route Option

Route Option	No. of Road Bridges	No. of River Bridges	No. of Rail Bridges	No. of Acc' Structures	No. of Culverts
2A	7	1	2	3	5
2B	6	1	2	2	6
2C	7	1	2	2	11
2D	7	1	2	2	9
2E	7	1	3	2	5
2F	6	1	3	1	6
2G	7	1	3	1	11
2H	7	1	3	1	4
2I	7	1	3	1	9

Ancillary Structures

6.10.184 All Nairn Bypass route options would require the provision of a number of ancillary structures such as culverts and may require farm accommodation underpasses and overbridges which would have the following general structural arrangements. In addition, all structures would require the provision of vehicle parapets and pedestrian protection as described below.

Culverts

6.10.185 At present, it has been assumed that all watercourses crossing the line of the route option will require a culvert, which shall be sized to accommodate the required design flood flows. Culverts would generally consist of reinforced concrete pipes or either cast in-situ or precast concrete box construction thus minimising construction and maintenance costs. Wingwalls provided at each end of the culvert may consist of either precast or cast in-situ reinforced concrete. Where pipes of less than 2.0m diameter are provided, these are not classified as a structure but would form part of the drainage system except that corrugated steel buried structures of span of 0.9m or greater are classified as structures in accordance with Clause 3 of BD 2/05 of the DMRB.

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6.10.186 In a number of instances existing culverts require to be extended and the extensions would generally be of the same cross section and materials as the existing culvert.

6.10.187 The proposed culvert locations for each route option are shown on Drawings B1557601/SLP/2100 to 2900 (Volume 2).

Farm Accommodation Underpasses

6.10.188 Farm accommodation underpasses would likely be of either cast in-situ construction or consist of precast reinforced concrete elements placed together with the internal carriageway and verge widths and vertical clearances determined to suit the particular agreement with the affected landowner.

5.1.5 Where precast concrete type structures are provided, these may be of a bespoke design prepared by manufacturers of proprietary type structures.

5.1.6 Initial consideration has been given to farm accommodation underpasses for each route option, and will be considered further in future design development for the preferred option under consultation with landowners. As such, the need for farm accommodation underpasses cannot be confirmed at this time.

Farm Accommodation Overbridges

6.10.189 Farm accommodation overbridges shall be of a similar type of construction as local road overbridges with the carriageway and verge widths determined to suit the particular agreement with the affected landowner.

6.10.190 Consideration has been given to farm accommodation overbridges for each route option, and will be considered further in future design development for the preferred option under consultation with landowners.

Vehicle Containment and Pedestrian Restraint over Structures

6.10.191 Generally, vehicle containment over structures would consist of 1.0m high N2 (Normal Containment Level) parapets of metal construction with mesh infill in accordance with Clause 4 of TD 19/06 of the DMRB. Where the structure carries a cycleway, the parapet would be 1.4m high and where the structure carries a bridleway, the parapet height would be increased to 1.8m. In the case of accommodation bridges, the parapet height would be 1.5m.

6.10.192 In the case of structures crossing over railway lines, containment would be H4a (Very High Containment Level) parapets of either metal construction with solid infill or concrete construction and be 1.5m high. Where concrete parapets are adopted, these may be of either cast in-situ or precast concrete construction. In the case of both metal and concrete parapets over railways, a steeple cope would be provided to prevent pedestrian access on top of the parapet. The final form and details of the parapets would be agreed with Network Rail.

6.10.193 In all cases, suitable transitions and connections will be made between parapets over structures and safety barriers on the approach and exit ends to each structure in accordance with Clause 6 of TD 19/06 of the DMRB.

6.10.194 Where underpasses and culverts are provided, pedestrian restraint systems would be provided at the top of headwalls and wingwalls in accordance with Clause 9 of TD 19/06 of the DMRB. In addition, pedestrian restraint systems would also be provided at the top of wingwalls to bridges where these are not protected by vehicle restraint systems.

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6.11 Utilities

Introduction

- 6.11.1 There are a significant number of buried and overhead public and private utility services within the study area including:
- Scottish and Southern Energy (SSE) – sub-stations, extra-high voltage, high voltage, medium voltage and low voltage overhead and buried services;
 - Telecommunications – British Telecom overhead and buried services and THUS fibre optic network;
 - Scottish Water supply network;
 - Scottish Water sewer network;
 - Scotia Gas – High, intermediate and medium pressure pipelines, including major above ground installations;
 - Government Pipeline and Storage System – Supply pipeline to military facilities in area; and
 - Street lighting – there are areas of the existing road network that feature street lighting and will therefore include underground power cables in the vicinity of the lighting.
- 6.11.2 The key utilities are shown on Drawings B1557601/EXI/0005 and 0006 (Volume 2).
- 6.11.3 In accordance with the New Roads and Street Works Act (1991) C2 notices were issued to each of the utility providers to provide details of their networks within the study area to enable all potential clashes between route options and utility infrastructure to be clearly identified. Where possible the vertical and horizontal alignments have been developed to avoid or minimise clashes with key strategic elements of each provider's network.
- 6.11.4 Where it has not been possible to avoid a clash with key strategic parts of the utility providers network consultation has been undertaken with the relevant provider and C3 notices issued requesting an outline design and costing for resolution of key utility clashes.
- 6.11.5 The provision of a utilities diversion design for all identified utility interfaces with the secondary network has not been considered as a part of this DMRB Stage 2 assessment. A broad based assessment having been undertaken for cost estimate purposes only based on prior engineering experience. The provision of such details will be considered as part of the DMRB Stage 3 assessment process with a utilities diversion design prepared for each utility provider once a preferred option for each section has been identified.

Scottish and Southern Energy (SSE)

Network

- 6.11.6 SSE electricity supply infrastructure covers the majority of the study area. The key elements of the network include:
- 132kV (extra-high voltage) power lines*
- 6.11.7 This line travels from north of Auldearn in a generally south-westerly direction. There is a sub-station located adjacent to the U3010 Blackpark – Grigorhill – Newmill Road. The transmission line is carried by transmission towers which cross the River Nairn near to where the route options also cross the river.

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33kV (high voltage) power lines

- 6.11.8 There are two main lines which pass to the south of Nairn in a similar fashion to that of the route options linking into the sub-station mentioned above.

Overhead and underground cables

- 6.11.9 These cables carry the 11kV (medium voltage) and low voltage power into homes and businesses in the study area. The network is concentrated mainly within more densely populated areas, but the majority of the study area is serviced to some extent.

Impacts

- 6.11.10 Table 6.9 summaries the number of interfaces with the SSE network for each route option:

Table 6.9: Number of interfaces with SSE

Route Option	Impacts on 132kV Line	Impacts on 32kV Overhead Cable	Impacts on Overhead Cable	Impacts on Underground Cable	Total
2A	3	8	13	4	27
2B	3	7	18	1	29
2C	2	7	15	3	27
2D	2	6	16	2	26
2E	3	10	9	2	24
2F	3	9	16	5	33
2G	1	8	9	3	21
2H	4	7	9	2	22
2I	2	7	13	3	25

- 6.11.11 It is evident from Table 6.9 that the majority of the impacts with the SSE infrastructure are with the low voltage overhead cables. Route Option 2F impacts the SSE network on 33 occasions, the most of all the route options and Route Option 2G impacts the SSE network on 21 occasions, the least, of all the route options.
- 6.11.12 It is likely that the impact and cost of a diversion to the 132kV would, in itself, outweigh the remaining SSE impacts combined, for each of the route options. It should be noted that each impact varies in length; therefore the estimated length of diversions will vary between route options and may not correlate with the total number of impacts identified.
- 6.11.13 A C3 notice was issued to SSE in relation to the extra-high voltage power lines. The lead in time SSE require to complete an extra-high voltage power diversion is 100 weeks from the start of the design, including a 16 month advance notice for the power outage.

Telecommunications

Network

- 6.11.14 Telecommunications infrastructure covers the majority of the study area. The key elements of the network include:

British Telecom (BT) underground (U/G) supply network

- 6.11.15 This utility is located throughout the study area. Cables travel adjacent to the existing A96 Aberdeen – Inverness Trunk Road and surrounding local roads, servicing homes and businesses.

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BT overhead (O/H) supply network

6.11.16 This utility is not as prevalent as the underground supply network. Cables travel adjacent to local roads, connecting to the underground cable which runs adjacent to the existing A96.

THUS

6.11.17 This utility follows the existing A96 throughout this section of the study area.

Impacts

6.11.18 Table 6.10 summarises the number of interfaces with the BT network for each route option:

Table 6.10: Number of interfaces with telecommunications

Route Option	Impacts on BT U/G network	Impacts on BT O/H network	Impacts on THUS Network	Total
2A	21	6	5	32
2B	27	4	5	36
2C	26	6	4	36
2D	34	4	4	42
2E	21	4	5	30
2F	26	2	5	33
2G	22	2	4	28
2H	26	2	5	33
2I	27	2	4	33

6.11.19 It is evident from Table 6.10 that there are significantly more impacts between all proposed route options and the BT underground network than any other element of the telecommunications utility network.

6.11.20 Route Option 2D impacts on the telecommunications network on 42 occasions, the most amongst all route options, compared with the 28 impacts on Route Option 2G, the least amongst all route options. It should be noted that each impact varies in length, therefore the estimated length of diversions will vary between route options and may not correlate with the total number of impacts identified.

Scottish Water

Network

6.11.21 Scottish Water infrastructure covers the majority of the study area. The key elements of the network include:

Freshwater supply

6.11.22 The freshwater supply is comprised of abandoned water mains, water mains, private water mains and trunk mains. The network serves homes and businesses throughout the study area. A trunk water main runs south to north into Nairn.

6.11.23 A number of private water supplies (PWS) have been identified within the study area and these are discussed in Part 3, Chapter 12 (Geology and Soils) of this report and shown on Figures 12.1 to 12.9 (Volume 3).

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Wastewater infrastructure

- 6.11.24 The wastewater network is comprised of combined sewer outfalls, foul water sewers and surface water sewers. The network services homes and businesses in the study area, with the majority of services concentrated in the more densely populated areas at Nairn and Auldearn.

Impacts

- 6.11.25 Table 6.11 summarises the number of interfaces with the freshwater network for each route option:

Table 6.11: Number of interfaces with water utilities

Route Option	Impacts on Water Mains	Impacts on Private Water Mains	Impacts on Abandoned Water Mains	Impacts on Trunk Water Mains	Total Impacts
2A	22	5	9	1	37
2B	20	5	9	1	35
2C	19	4	6	1	30
2D	20	0	6	1	27
2E	16	4	10	1	31
2F	18	4	11	1	34
2G	16	3	7	1	27
2H	17	1	10	1	29
2I	16	0	8	1	25

- 6.11.26 Route Option 2A impacts on the water supply network on 37 occasions, the most amongst all route options. Route Option 2I impacts on the network 25 times, the least amongst all route options.

- 6.11.27 Table 6.12 summarises the number of interfaces with the foul water network for each route option:

Table 6.12: Number of interfaces with foul water utilities

Route Option	Impacts on Combined Sewer Outfall	Impacts on Foul Water Sewer	Impacts on Surface Water Sewer	Total Impacts
2A	0	5	0	5
2B	0	4	0	4
2C	0	1	0	1
2D	1	4	0	5
2E	0	4	0	4
2F	0	3	0	3
2G	0	0	0	0
2H	1	5	0	6
2I	1	2	0	3

- 6.11.28 It is evident from Table 6.12 that all proposed route options impact on the wastewater network significantly less than the number of impacts on the freshwater network. Route Option 2H impacts on the foul water network on 6 occasions, the most amongst all route options. Route Option 2G does not impact the network at all, the least amongst all route options. It should be noted that each impact varies in length, therefore the estimated length of diversions will vary between route options and may not correlate with the total number of impacts identified.

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Scotia Gas

Network

6.11.29 Scotia Gas infrastructure covers the majority of the study area. Key elements of the network include:

High pressure mains

6.11.30 This pipeline is to the south of the existing A96. This is the main gas transmission main supplying Inverness.

Intermediate pressure mains

6.11.31 There are no intermediate pressure gas mains in the study area for the Nairn Bypass.

Medium pressure mains

6.11.32 These are present on some local roads between Nairn and Auldearn.

Low pressure mains

6.11.33 These are present in a small number of locations, primarily in or around settlements.

Impacts

6.11.34 Table 6.13 summarises the number of interfaces with the gas network for each route option.

Table 6.13: Number of interfaces with gas utilities

Route Option	Impacts on Local High Pressure Pipeline	Impacts on Intermediate Pressure Mains	Impacts on Medium Pressure Mains	Impacts on Low Pressure Mains	Total Impacts
2A	0	0	5	0	5
2B	0	0	3	0	3
2C	3	0	0	0	0
2D	2	0	0	0	2
2E	0	0	4	0	4
2F	0	0	5	0	5
2G	3	0	0	0	0
2H	1	0	5	0	6
2I	2	0	0	0	2

6.11.35 It is evident from Table 6.13 that there are no impacts on the intermediate and low pressure gas mains within the study area. The majority of impacts are due to conflicts with the medium pressure main with some route options impacting on the high pressure pipeline.

6.11.36 It is likely that the impact and cost of a diversion to the high pressure gas main would, in itself, outweigh the remaining gas impacts combined, for each of the route options. Therefore it is likely that Route Options 2C and 2G would have the biggest impact. It should be noted that each impact varies in length, therefore the estimated length of diversions will vary between route options and may not correlate with the total number of impacts identified.

6.11.37 A C3 notice was issued to Scotland Gas Networks (SGN) in relation to the High Pressure Mains. The lead in time SGN require to complete any diversion is 24 to 30 months from the acceptance of the C4 notices. Additionally, the construction of SGNs diversionary work would only occur during a summer period of April to September.

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Government Pipeline and Storage System (GPSS)

Network

- 6.11.38 The Inverness – Lossiemouth fuel pipeline travels through the study area in a north-easterly direction. The pipeline runs adjacent to the B9091 Croy – Clephanton – Kildrummie – Nairn Road before veering off and travelling through farmland and settlements to the south of Nairn. The pipeline crosses the River Nairn and the existing A96 as it travels through the study area. This pipeline is covered under the Land Powers (Defence) Act 1958.

Impacts

- 6.11.39 Table 6.14 summarises the number of interfaces with the GPSS network for each route option.

Table 6.14: Number of interfaces with GPSS

Route Option	Impacts on GPSS
2A	2
2B	2
2C	1
2D	1
2E	2
2F	2
2G	1
2H	3
2I	2

- 6.11.40 All of the mainline route options cross the pipeline south of the Aberdeen to Inverness Railway Line, west of the River Nairn. All other identified impacts occur at proposed local roads associated with each route option. It should be noted that each impact varies in length, therefore the estimated length of diversions will vary between route options and may not correlate with the total number of impacts identified.

6.12 Constructability

- 6.12.1 All route options for the Nairn Bypass include lengths of both online and offline construction. Online construction generally involves using the existing single carriageway as one carriageway and constructing a central reserve and second carriageway parallel to it. Traffic can then be switched onto this new carriageway and the existing carriageway upgraded and widened as necessary. A continuous traffic management system would be required throughout construction to maintain one lane of traffic in each direction, and to reinforce that this is not yet a dual carriageway.
- 6.12.2 At the western end of the Nairn Bypass all route options involve online widening of the existing A96 Aberdeen – Inverness Trunk Road between Gollanfield and the U1029 Tomhommie – Ballinreich – Balnagowan Road, with Route Options 2A to 2D extending the online widening approximately 2.5km further east towards Delnies and the proposed Nairn West Junction A.
- 6.12.3 Route Options 2B and 2F are online between Auldearn and Boath House. Traffic management during construction may involve routing trunk road traffic through the village of Auldearn. At the eastern end of the scheme, some traffic management would be required to tie-in with the existing single carriageway.

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- 6.12.4 Offline construction, where the new road is constructed in a different corridor from the existing road, does not have the same traffic management issues as online construction. For offline construction, traffic management would only be required at junctions, where the proposed road crosses the existing road network, or where the proposed road ties-in with the existing road, or at site accesses.
- 6.12.5 Nairn West Junction A (on Route Options 2A, 2B, 2C and 2D) would be challenging to construct while maintaining the operation of the existing A96. This is due to the approximately 8m level difference between the existing A96 and the proposed roundabout level.
- 6.12.6 The construction of A939 Junction A (on Route Options 2C and 2G) would require the closure of the A939 Tomintoul – Granttown on Spey – Nairn Road. The B9090 Loch Flemington – Clephanton – Cawdor – Nairn Road may be a suitable diversion route.
- 6.12.7 All of the remaining junctions are partly or wholly offline and no significant disruption to the operation of the existing trunk and local roads is expected during construction.
- 6.12.8 At the next stage of the scheme development, careful consideration of construction phasing and the maintaining of access between local and strategic roads during the construction period will be required.

6.13 Non-Motorised User Assessment

- 6.13.1 For ease of reference, the term Non-Motorised Users (NMUs) is used to describe pedestrians, cyclists and equestrians.
- 6.13.2 The effects of the route options on all travellers, including NMUs, are considered in Part 3, Chapter 15 (Effects on All Travellers) of this report where the impacts of the route options are assessed.
- 6.13.3 The following objectives have been set in terms of NMU provision for the scheme:
- Improve safety for NMU traffic within the study area;
 - Enhance provision for NMUs in the A96 corridor with facilities to supplement the local Core Path Network, National Cycle Network and Green Networks;
 - Provide suitable facilities for NMUs to cross the proposed A96 dual carriageway;
 - Combine NMU crossings with junctions, accommodation works and local road / access crossings where possible;
 - Provide grade separated crossings solely for NMUs where site specific considerations can be demonstrated; and
 - Maintain connectivity of the path network between communities and amenities.
- 6.13.4 In order to meet the objectives for NMUs and address the impacts identified in Part 3, Chapter 15 (Effect on All Travellers) of this report, NMU improvements will be considered during design development of the preferred option during DMRB Stage 3.

6.14 Engineering Assessment Summary

Road Geometric Design

- 6.14.1 For all route options, the proposed A96 dual carriageway and junctions have been designed to meet DMRB standards with one exception: a substandard crest curve and stopping sight distance over the Gollanfield Rail Bridge. This departure is a result of online designs that

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mimic existing alignments and do not meet the desirable minimum standard for 120kph design speed.

6.14.2 All local road realignments have been designed to meet The Highland Council's standards.

Local Roads

6.14.3 Table 6.15 shows how many local roads and accesses are proposed to be stopped up for each route option. For Route Options 2A, 2B, 2C and 2D, it is proposed to stop up seven to nine local roads and six or seven accesses. For Route Options 2E, 2F, 2G, 2H, and 2I it is proposed to stop up five to seven local roads and two or three accesses.

Table 6.15: Local Road and Accesses proposed to be Stopped Up

Route Option	2A	2B	2C	2D	2E	2F	2G	2H	2I
Local Roads proposed to be stopped up	8	9	8	7	6	7	6	6	5
Access proposed to be stopped up	7	6	6	7	3	2	2	3	3
Total	15	15	14	14	9	9	8	9	8

Geotechnics and Earthworks

5.1.7 When considering the combined lengths of potentially unfavourable ground conditions for both mainline and local roads / junctions combined and considering alluvium and peat only, Route Option 2A is the most favourable and Route Option 2D is the least favourable.

5.1.8 Route Option 2C requires the most imported material for earthworks construction and has the poorest earthworks balance, while Route Option 2E requires the second lowest volume of imported material and has the best earthworks balance.

Hydrology

6.14.4 The environmental issues associated with drainage and hydrology are discussed in Part 3, Chapter 13 (Road Drainage and the Water Environment) of this report.

6.14.5 The Nairn East Junction options used by Route Options 2A, 2B, 2E, 2F and 2H are in cut on the flood plain for the Auldearn Burn and would need to be further investigated at DMRB Stage 3 should these route options be taken forward. There may also be the need for flood compensatory storage.

6.14.6 In addition, for Route Options 2E, 2F, 2G, 2H and 2I, the Alton Burn may prove to be an unsuitable outfall location as the level difference between the mainline and the burn is small.

Structures

6.14.7 All route options have one river crossing and two dual carriageway rail crossings, with Route Options 2E, 2F, 2G, 2H and 2I including an additional rail crossing for a single carriageway. Route Options 2B and 2F include six road bridges, and the all other designs incorporate seven road bridges.

6.14.8 All route option designs also contain a number of culverts and accommodation structures, but these generally do not present particular engineering complexity.

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Utilities

- 6.14.9 Route Options 2A, 2B, 2C, 2E, 2F and 2G cross the River Nairn in the vicinity of extra-high voltage (132kV) power lines, which would need to be diverted with considerable cost and disruption.
- 6.14.10 Route Option 2H affects the Inverness to Lossiemouth fuel pipeline in three locations, and Route Options 2C, 2D and 2G affect it in only one location. All other route options affect this pipeline in two locations.
- 6.14.11 Route Options 2C and 2G affect the high pressure gas network in three locations, 2D and 2I affect the network in two locations and Route Option 2H affect the network in one location. All other route options do not affect the high pressure gas network.

NMU

- 5.1.9 There are no significant engineering issues associated with the NMU's. NMU provision on the preferred option will be designed and developed during the DMRB Stage 3 assessment.

Constructability

- 6.14.12 From the perspective of constructability, sections of offline construction are considered preferable to online construction. Route Options 2B and 2F are online in a narrow corridor past Auldearn making construction more challenging, and likely resulting in diverting traffic through Auldearn. Therefore, with regard to constructability, Route Options 2B and 2F are deemed least favourable.

6.15 References

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