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**A96**  
**DUALLING**  
EAST OF HUNTLY TO ABERDEEN

# A96 Dualling

East of Huntly to Aberdeen scheme

**DMRB Stage 2 Scheme Assessment Report**

Volume 3 - Part 5

Assessment Summary and Preferred Option

Recommendation

December 2020

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# A96 Dualling East of Huntly to Aberdeen

## DMRB Stage 2 Scheme Assessment Report Volume 3

### Part 5 – Assessment Summary and Preferred Option Recommendation

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## 27 Assessment Summary

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### 27.1 Introduction

- 27.1.1 This chapter summarises the main findings of this Design Manual for Roads and Bridges (DMRB) Stage 2 Scheme Assessment Report for the six route options and the eight end-to-end options for dualling of the A96 between East of Huntly and Kintore.
- 27.1.2 It is a summary of the following assessments:
- Engineering Assessment - Volume 1, Part 2, Chapters 4 to 7;
  - Environmental Assessment - Volume 2, Part 3, Chapters 8 to 23; and
  - Traffic and Economic Assessment - Volume 3, Part 4, Chapters 24 to 26.
- 27.1.3 The route options were appraised in three geographical sections covering the East of Huntly to Colpy, Colpy to Pitcaple and Pitcaple to Kintore.
- 27.1.4 Summaries of the features and impacts identified in the Engineering, Environmental and Traffic and Economic assessments are presented within each geographical section within this chapter. Chapter 28 provides a summary of the end-to-end assessment undertaken and thereafter outlines the Preferred Option recommendation.

### 27.2 East of Huntly to Colpy

#### Engineering Assessment

- 27.2.1 From the engineering assessment, there are no substantial engineering issues affecting either of the route options beyond those which would be expected in a similar road scheme.
- 27.2.2 The main features of the engineering assessment for this geographical section are summarised below.

#### Mainline Alignment

- 27.2.3 At this stage, the Cyan route option has been designed without Departures from Standards however does include a one-step relaxation to its horizontal geometry to enable the alignment to follow that of the existing A96 more closely and avoid cutting through the adjacent Hill of Skares. The Red route option has been designed without Departures from Standards or relaxations but does include a cutting through the surrounding topography. Both route options are compliant with DMRB standards for a D2APc (formerly Category 7A) dual carriageway.

#### Junction Layouts

- 27.2.4 All junctions have been designed to meet DMRB standards without Departures from Standards or relaxations at this stage.

#### Local Roads and Accesses

- 27.2.5 Local roads and accesses will retain connectivity with the existing A96 and other local roads. Both route options will have similar effects.

### **Topography and Land Use**

- 27.2.6 The Red route option deviates further from the existing A96 corridor and existing ground levels and requires more extensive earthworks affecting the topography. The Cyan route option is considered to be more favourable as topography impacts are less extensive than those for the Red route option.

### **Geotechnics and Earthworks**

- 27.2.7 Both route options generate a large surplus of acceptable material for use in earthworks on adjoining route options. The requirement for very large cuttings through slate strata for the Red route option presents a significant engineering challenge. Therefore, the Cyan route option is considered more favourable from a geotechnical and earthworks perspective.

### **Hydrology and Drainage**

- 27.2.8 Both route options require bridge and culvert crossings of existing watercourses. Both route options require watercourse diversions. Overall, both route options perform similarly.

### **Structures**

- 27.2.9 Both route options have similar overall bridge requirements, however, the Cyan route option is marginally less favourable as it requires a more complex river crossing of Glen Water as well as various retaining structures.

### **Utilities**

- 27.2.10 Both route options interface with strategic infrastructure: the SGN high pressure gas network and SSE 275kV high voltage overhead electrical lines. The Cyan route option is considered more favourable due to a lower number of interfaces with major utility infrastructure. The interfaces on the Red route option are also likely to be more complex.

### **Non-Motorised Users (NMUs)**

- 27.2.11 There are no significant issues associated with provision for NMUs. NMU facilities will be designed and developed during DMRB Stage 3. The Cyan route option offers slightly better opportunities for NMU connectivity given its proximity to the existing A96 and local road network.

### **Health and Safety Considerations**

- 27.2.12 The Red route option is considered to be less favourable due to a higher number and greater complexity of constructability challenges.

### **Scheme Resilience**

- 27.2.13 The Cyan route option is considered to be more favourable due to its proximity to the existing A96 and the likelihood of winter weather having more effect on the Red route option.

### **Environmental Assessment**

- 27.2.14 There are no potential impacts of such significance that a route option should be discounted based on any individual environmental criteria. Both route options have the potential for adverse impacts upon the environment.

27.2.15 The main findings of the environmental assessment are summarised below.

### **Policies and Plans**

27.2.16 There is little difference between the Cyan and Red route options with regards to their predicted impacts on policies and plans. There is a slight preference for the Red route option, primarily as a result of the assessment against the Local Development Plan (LDP) policy HE1 (Historic Environment), relating to the setting of Colpy Cottage Palisaded Enclosure Scheduled Monument being adversely impacted by the Cyan route option.

### **Air Quality**

27.2.17 No significant air quality effects are predicted for either route option.

### **Noise and Vibration**

27.2.18 This assessment was undertaken using end-to-end forecast traffic figures. There are more predicted adverse impacts for the Red route option and more predicted beneficial impacts for the Cyan route option. There are also more residential receptors with a predicted increase in nuisance level caused by the Red route option. From a noise and vibration perspective, there is a preference for the Cyan route option.

### **People and Communities**

27.2.19 Both route options will result in a reduction in traffic flows on the existing A96 and A920 which is expected to lead to improvements in amenity and to facilitate access between local communities surrounding Colpy. A direct impact on a private burial site on Hill of Foudland is predicted to result in a major adverse effect for the Red route option. The Cyan route option is predicted to have slightly less impact on people and communities.

### **Agriculture, Forestry and Sporting Interests**

27.2.20 No material differences have been identified in predicted effects between the two route options.

### **Materials**

27.2.21 The predicted residual effect relating to the use of materials is moderate adverse for both route options since the requirement for materials for structures and pavements is similar. Both route options will generate a significant quantity of materials which are suitable for re-use. The Red route option has notably more unsuitable excavated material. Both route options have some potential for encountering contaminated land. The Red route option has a major residual impact for waste compared to a moderate residual impact for the Cyan route option, due to limited capacity of the existing local waste handling and disposal infrastructure. On balance, the Cyan route option is expected to have lower residual effects in relation to materials.

### **Visual Effects**

27.2.22 The Red route option has significant adverse visual effects, particularly where it crosses Hill of Foudland in a pronounced cutting. The Cyan route option follows the existing A96 more closely and its visual effect is reduced by screening offered by the existing topography. The Cyan route option is predicted to have significantly fewer adverse visual effects.

## Cultural Heritage

- 27.2.23 For the Cyan route option, there is a major adverse residual effect on the setting of Colpy Cottage Palisaded Enclosure Scheduled Monument. For the Red route option there are moderate adverse residual effects on the setting of Foudland Slate Quarries Regionally Significant Historic Environment Record Site. Given the major effect of the Cyan route option on Colpy Cottage Palisaded Enclosure, it is predicted to have a greater adverse residual effect on heritage assets than the Red route option.

## Landscape

- 27.2.24 The Cyan route option more closely relates to the existing road corridor and therefore has less impact than the Red route option as the Red route option cuts its way through highly visible slopes and existing natural gaps in adjoining hills. The Red route option would have a greater impact on the overall landscape character of these areas. In addition, both route options are predicted to have moderate adverse residual effects on the village of Colpy. Overall, the Cyan route option is predicted to have significantly fewer adverse effects on the landscape.

## Nature Conservation

- 27.2.25 The Cyan route option is predicted to have fewer adverse effects on nature conservation features due to the lesser impact upon the Wildcat Priority Area and the lesser level of habitat fragmentation caused.

## Geology, Soils, Contaminated Land and Groundwater

- 27.2.26 The Red route option has minor adverse residual effects predicted on peat and groundwater abstractions, and significant adverse residual effects are predicted on geological resources, specifically the Foudland area of safeguarded slate. The Cyan route option is predicted to have minor adverse residual effects on groundwater abstractions. Overall, the Cyan route option is predicted to have less impact on geology, soils, contaminated land and groundwater.

## Road Drainage and the Water Environment

- 27.2.27 Both route options include clear span structures across the River Urie. The Red route option requires more watercourse crossings in total than the Cyan route option. However, most of these crossings are of minor tributaries with no significant effects predicted. There are no significant residual effects on hydrology and flood risk for either route option. Design refinement or provision of compensatory storage will be required at DMRB Stage 3 for the Cyan route option to avoid reduction of the functional floodplain of the River Urie. The Red route option is predicted to have slightly less effect on the water environment due to a lesser impact on existing watercourses.

## Climate

- 27.2.28 For the whole life net carbon assessment, the Red route option results in lower net whole life carbon emissions than the Cyan route option. In relation to climate change resilience and adaptation, the impacts for both route options during construction and operational phases are not considered significant. Under the climate assessment the Red route option is predicted to have slightly less impact overall.

## Human Health

- 27.2.29 The predicted effects assessment identifies positive, neutral and negative predicted health effects for both the Cyan and Red route options. No material differences have been identified in predicted effects between the two route options.

## Traffic and Economic Assessment

- 27.2.30 Both the Cyan and Red route options transfer almost all the traffic from the existing A96 to the proposed dual carriageway, removing 98% to 99% of traffic. The Red route option is predicted to provide journey times approximately 30 seconds quicker than the Cyan route option due to its slightly shorter route around the Hill of Skares.
- 27.2.31 Both the Cyan and Red route options deliver similar safety benefits over the 60-year appraisal period. End-to-end options containing the Red route option deliver between 3% and 6% more accident and casualty savings than the corresponding end-to-end options containing the Cyan route option.
- 27.2.32 End-to-end options containing the Red route option offer total economic benefits that are between £20m and £26m more than the corresponding end-to-end options containing the Cyan route option. However, end-to-end options containing the Cyan route option cost between £28m and £40m less. As a result, end-to-end options containing the Cyan route option offer slightly better value, with the Net Present Value (NPV) higher than for the end-to-end options containing the Red route option by between £5m and £20m. The corresponding indexed Benefit-Cost Ratio (BCR) values are similar, with less than 3 percentage points between them. Table 28.1 in Chapter 28 includes a summary of the economic performance of each of the end-to-end options.

## 27.3 Colpy to Pitcapple

### Engineering Assessment

- 27.3.1 From the engineering assessment, there are no substantial engineering issues affecting either of the route options beyond those which would be expected in a similar road scheme.
- 27.3.2 The main features of the engineering assessment for this geographical section are summarised below.

### Mainline Alignment

- 27.3.3 Both route options have been designed to meet DMRB standards without Departures from Standard or relaxations at this stage.

### Junction Layouts

- 27.3.4 All junctions have been designed to meet DMRB standards without Departures from Standards or relaxations at this stage.

### Local Roads and Accesses

- 27.3.5 Local roads and accesses will retain connectivity with the existing A96 and other local roads. Both route options will have similar effects.

### **Topography and Land Use**

- 27.3.6 The topography is less constrained on the Pink route option since it is offline with less interaction with existing infrastructure.

### **Geotechnics and Earthworks**

- 27.3.7 The Pink route option is considered more favourable due to the Brown route option having more areas of potentially compressible ground. The Pink route option also generates a surplus of acceptable material which can be used elsewhere on the scheme thus reducing haul distances associated with the earthworks, whereas the Brown route option has a deficit of acceptable material, resulting in increased haul distances.

### **Hydrology and Drainage**

- 27.3.8 Both route options require bridge and culvert crossings of existing watercourses. The Pink route option requires a watercourse diversion but overall both route options perform similarly.

### **Structures**

- 27.3.9 The Brown route option is less favourable due to its requirement for larger and more complex river crossings.

### **Utilities**

- 27.3.10 The Brown route option performs slightly more favourably in terms of impacts on utilities due to additional complexities of interfaces with 275kV high voltage overhead electrical lines for the Pink route option. The SGN high pressure gas infrastructure is not interfaced by the Pink or the Brown route options although it runs parallel to the Brown route option.

### **Non-Motorised Users**

- 27.3.11 There are no significant issues associated with provision for NMUs. NMU facilities will be designed and developed during DMRB Stage 3. The Brown route option is considered to have more opportunity to improve NMU facilities based on the number of the existing NMU routes and settlements in its vicinity.

### **Health and Safety Considerations**

- 27.3.12 The Pink route option is considered slightly more favourable as it poses fewer constructability challenges and passes through a less constrained area with slightly more favourable topography.

### **Scheme Resilience**

- 27.3.13 The Brown route option is considered to be more favourable in terms of operational resilience because there is an additional junction on the Brown route option (Carden Junction) which provides more potential diversion and emergency access options than the Pink route option.

### **Environmental Assessment**

- 27.3.14 There are no potential impacts of such significance that an option should be discounted on the basis of any individual environmental criteria. Both route options have the potential for adverse impacts upon the environment.

27.3.15 The main findings of the environmental assessment are summarised below.

### **Policies and Plans**

27.3.16 There is little difference between the Pink and Brown route options with regards to their predicted impacts on policies and plans. There is also little difference between Pink and Brown route options with regards to their predicted impacts on planning applications. However, on balance, based on the minor impacts, there is a slight preference for the Brown route option.

### **Air Quality**

27.3.17 No significant air quality effects are predicted for either route option.

### **Noise and Vibration**

27.3.18 There are more predicted adverse impacts on residential and non-residential receptors for the Brown route option. There are also more predicted beneficial impacts for the Pink route option. Moreover, there are more residential receptors with a predicted increase in nuisance level caused by the Brown route option. There are also more residential receptors with a predicted decrease in nuisance level caused by the Pink route option. The Pink route option is therefore preferable in terms of noise and vibration.

### **People and Communities**

27.3.19 A reduction in traffic flows on the existing A96 for both route options is expected to lead to improvements in amenity and facilitate access between local communities including Colpy, Pitmachie, Old Rayne and Pitcaple. The Pink route option is predicted to have less impact on people and communities due to a lower impact on community facilities and severance, particularly in the vicinity of Logie Woodland.

### **Agriculture, Forestry and Sporting Interests**

27.3.20 The Pink route option has less impact on agricultural, forestry and sporting interests since the Brown route option directly affects more Prime Agricultural Land and farm units.

### **Materials**

27.3.21 The Pink route option has a predicted minor adverse residual effect on the depletion of natural resources and the Brown route option has a moderate adverse residual effect. The predicted residual effect regarding use of materials for both route options is moderate adverse. Both route options have low potential for encountering contaminated land. The Pink route option is expected to have a slightly lower residual effect.

### **Visual Effects**

27.3.22 The Pink route option is better screened by existing topography and is predicted to have fewer visual effects than the Brown route option.

### **Cultural Heritage**

27.3.23 There are a greater number of adverse residual effects on high sensitivity heritage assets as a result of the Pink route option than the Brown route option; including significant residual effects on the settings of four Scheduled Monuments. The

Brown route option is, therefore, predicted to have less impact on cultural heritage than the Pink route option.

### **Landscape**

- 27.3.24 The Pink route option landscape impacts are associated with the grade separated junction and the proposed earthworks on the dual carriageway at Kellockbank. The Brown route option keeps close to the existing A96 road corridor however cuts through Logie House estate. The Pink route option is predicted to have fewer adverse effects on the landscape than the Brown route option due to the noticeable change in landscape character at Logie House Estate.

### **Nature Conservation**

- 27.3.25 The Pink route option is predicted to have fewer negative effects on nature conservation features due to its lesser impacts on ancient woodland and non-woodland habitats of ecological value. The Pink route option also has a more favourable crossing point of the River Urie. Overall, there is a slight preference for the Pink route option in terms of nature conservation.

### **Geology, Soils, Contaminated Land and Groundwater**

- 27.3.26 The Pink route option is predicted to have minor adverse residual effects on groundwater abstractions and agricultural soils. The Brown route option is predicted to have no residual effects on peat and minor adverse residual effects on groundwater abstractions and agricultural soils. The Pink route option is predicted to have less overall impact on geology, soils, contaminated land and groundwater.

### **Road Drainage and the Water Environment**

- 27.3.27 Both route options include clear span structures across several watercourses. No significant effects are predicted for these watercourses for flood risk or fluvial geomorphology. The effects on road drainage and the water environment are similar for both route options.

### **Climate**

- 27.3.28 For the whole life net carbon assessment, the Pink route option results in lower net whole life carbon emissions than the Brown route option. In relation to climate change resilience and adaptation, the impacts for both route options during construction and operational phases are not considered significant. Under the climate assessment, the Pink route option is predicted to have slightly less impact overall.

### **Human Health**

- 27.3.29 Both route options have similar beneficial effects on health as a result of improved amenity and access between local communities, community services and facilities, and healthcare services. Both route options have predicted adverse effects on health as a result of impacts on the Durno and Logie Woodland. Both route options also impact on a number of local and core paths; although the Brown route option results in impacts on a greater number of these routes. Overall, the Pink route option is considered to have less adverse impact on human health.

## Traffic and Economic Assessment

- 27.3.30 Both the Pink and Brown route options transfer a significant volume of traffic from the existing A96 to the proposed dual carriageway. Both route options will remove between 78% and 96% of traffic between Colpy and Oyne Fork, and remove between 60% and 82% of traffic between Oyne Fork and Pitcaple.
- 27.3.31 Both the Pink and Brown route options transfer a significant volume of traffic from the A920 to the proposed dual carriageway. The Pink route option removes between 70% and 84% of traffic, and the Brown route option removes between 44% and 70% of traffic. Therefore, more traffic is expected to use the proposed dual carriageway with the Pink route option than the Brown route option.
- 27.3.32 The Pink route option offers greater journey time savings than the Brown route option, due to it being a slightly shorter route. On average, the journey times on the end-to-end options containing the Pink route option are approximately 35 seconds quicker than the corresponding options containing the Brown route option.
- 27.3.33 Both the Pink and Brown route options deliver similar safety benefits over the 60-year appraisal period. End-to-end options containing the Pink route option deliver between 2% and 7% more accident and casualty savings than the corresponding end-to-end options containing the Brown route option.
- 27.3.34 End-to-end options containing the Pink route option offer between £16m and £24m more benefits, and cost between £19m and £30m less, than the corresponding end-to-end options containing the Brown route option. As a result, end-to-end options containing the Pink route option offer better value, with the NPV higher by between £35m and £54m compared to the end-to-end options containing the Brown route option. The indexed BCRs values are also consistently greater, by between 8 and 11 percentage points, for the end-to-end options containing the Pink route option compared to those containing the Brown route option. Table 28.1 in Chapter 28 includes a summary of the economic performance of each of the end-to-end options.

## 27.4 Pitcaple to Kintore

### Engineering Assessment

- 27.4.1 From the engineering assessment, there are no substantial engineering issues affecting either of the route options beyond those which would be expected in a similar road scheme.
- 27.4.2 The main features of the engineering assessment for this geographical section are summarised below.

#### Mainline Alignment

- 27.4.3 Both route options have been designed to meet DMRB standards without Departures from Standard or relaxations at this stage.

#### Junction Layouts

- 27.4.4 All junctions have been designed to fully meet DMRB standards without Departures from Standard or relaxations at this stage.

### **Local Roads and Accesses**

- 27.4.5 Local roads and accesses will retain connectivity with the existing A96 and other local roads. Both route options will have similar effects.

### **Topography and Land Use**

- 27.4.6 The Violet route option generally has smaller cuttings and embankments, although these extend over a longer distance. It is only slightly more favourable than the Orange route option in terms of its impacts on topography and land use.

### **Geotechnics and Earthworks**

- 27.4.7 The Orange route option is more favourable since it has less potential for challenging ground conditions and it requires less imported fill material from elsewhere on the scheme or from external sources.

### **Hydrology and Drainage**

- 27.4.8 Both route options require significant bridge and culvert crossings of existing watercourses. Both route options require watercourse diversions. Overall, both route options perform similarly.

### **Structures**

- 27.4.9 The Orange route option has an additional major river crossing compared to the Violet route option. However, the Violet route option has significantly more structures and the major crossing of the River Don is larger and more complex than those on the Orange route option. The Orange route option is therefore considered more favourable.

### **Utilities**

- 27.4.10 Both route options have the same overall number of interfaces with strategic infrastructure. The Violet route option has fewer utility interfaces overall in comparison to the Orange route option. The Violet route option is favoured due to the potential additional complexity of the interfaces with the SSE 275kV transmission lines on the Orange route option.

### **Non-Motorised Users**

- 27.4.11 There are no significant issues associated with provision for NMUs. NMU facilities will be designed and developed during DMRB Stage 3. The Orange route option is considered to have more opportunity to improve NMU facilities based on the greater number of existing NMU routes and settlements in the vicinity.

### **Health and Safety Considerations**

- 27.4.12 The interface of the Violet route option with the existing A96 at Tavelty junction and along the A96 Kintore Bypass presents a significant construction challenge. The Orange route option is more favourable in terms of health and safety considerations.

### **Scheme Resilience**

- 27.4.13 The Orange route option is considered to be more favourable due to its proximity to the existing A96 and junctions at Drimmies, Blackhall Road and Thainstone providing more potential diversion and emergency access options.

## Environmental Assessment

27.4.14 There are no potential impacts of such significance that an option should be discounted on the basis of any individual environmental criteria. Both route options have the potential for adverse impacts upon the environment.

27.4.15 The main findings of the environmental assessment are summarised below.

### Policies and Plans

27.4.16 The impacts of the Orange route option on the LDP designated sites and their scale are largely responsible for the difference between the two route options in terms of compliance against policy. The Orange route option will occupy approximately 13% of the LDP designated Crichton development site. Based on the assessment, the Violet route option is considered preferable in terms of compliance against policies and plans.

### Air Quality

27.4.17 No significant air quality effects are predicted for either route option.

### Noise and Vibration

27.4.18 For residential receptors there are more predicted adverse impacts for the Violet route option than for the Orange route option. There are also substantially more predicted beneficial impacts for Orange route option. For non-residential receptors, there are more predicted beneficial impacts for the Orange route option. There are more residential receptors with a predicted increase in nuisance level caused by the Violet route option. The Orange route option is therefore preferable in terms of noise and vibration.

### People and Communities

27.4.19 The Orange route option is predicted to have significantly less effect on private properties and fewer effects on community facilities such as the equestrian centres and Girl Guiding centre located in proximity to the Violet route option. There is an overall preference for the Orange route option from a people and communities perspective.

### Agriculture, Forestry and Sporting Interests

27.4.20 The Orange route option is considered to result in less effect on agricultural, forestry and sporting interests as the Violet route option directly affects more farm units and Prime Agricultural Land.

### Materials

27.4.21 Both route options are similar regarding residual adverse effects, however, the volume of fill required for the Orange route option can potentially be met entirely using site won materials, and requires less materials for pavements and structures. It is considered that the Orange route option is slightly more favourable than the Violet route option for the materials assessment.

### Visual Effects

27.4.22 The Orange route option is predicted to have fewer visual effects due to its screening by existing woodland and topography.

## Cultural Heritage

- 27.4.23 The Orange route option is predicted to have a greater adverse residual effect on heritage assets than the Violet route option. Major adverse residual effects are predicted for the Orange route option at Mains of Balquhain Stone Circle and St Apolinaris' Chapel and Burial Ground Scheduled Monuments.

## Landscape

- 27.4.24 The Violet route option runs north-east of Inverurie through more open countryside. Therefore, it has a larger impact than the Orange route option which runs through a more undulating landscape. While both route options show similar overall levels of impact, the Orange route option is more contained and is therefore predicted to have fewer negative effects on the landscape.

## Nature Conservation

- 27.4.25 The Violet route option is predicted to have fewer negative effects on nature conservation receptors due to its lesser impacts on ancient woodland, habitat connectivity and protected species.

## Geology, Soils, Contaminated Land and Groundwater

- 27.4.26 Both route options are predicted to have minor adverse residual effects on peat, agricultural soils and groundwater abstractions. The Violet route option has more impact on agricultural soils but less impact on peat than the Orange route option. Both route options are predicted to encounter historic landfills. Overall, the Orange route option is considered to have less impact in terms of geology, soils, contaminated land and groundwater.

## Road Drainage and the Water Environment

- 27.4.27 Both route options require new crossings of extensive floodplain of either the River Don (Violet route option at Kintore) or the River Urie (Orange route option at Pitcaple). Viaducts are proposed to minimise flood risk and geomorphology impacts. Hydraulic modelling predicts negligible change in flood risk to sensitive receptors for both route options based on the DMRB Stage 2 design. Both route options are predicted to have slight adverse residual effects on flood risk for high grade agricultural land. Compensatory storage will be required to offset any loss of floodplain storage. The effects on road drainage and the water environment are similar for both route options.

## Climate

- 27.4.28 For the whole life net carbon assessment the Orange route option results in lower net whole life carbon emissions than the Violet route option. In relation to climate change resilience and adaptation, the impacts for both route options during construction and operational phases were not considered significant since all risks can be managed by applying mitigation into the design using appropriate design standards and management practices. Under the climate assessment, the Orange route option is predicted to have slightly less impact overall.

## Human Health

- 27.4.29 The Human Health assessment identifies multiple pockets of deprivation across Inverurie, which would be impacted by both the Violet and Orange route options. Data suggests higher levels of deprivation are located in southern Inverurie within

closest proximity to the Orange route option. The Orange route option may have some beneficial effects as a result of opening up access to employment opportunities for these communities, but existing high levels of deprivation could also exacerbate any adverse effects of the scheme due to increased population vulnerability. There are no predicted health effects as a result of access to open green space from the Violet route option compared with a range of moderate adverse effects along the Orange route option. On balance, the Violet route option is considered to have less impact on human health.

### Traffic and Economic Assessment

- 27.4.30 Both the Violet and Orange route options transfer a significant volume of traffic from the existing A96 to the proposed dual carriageway. Between Blackhall Roundabout and Inverurie Roundabout the Violet route option removes between 31% and 36% of traffic while the Orange route option removes 45% of traffic. Between Drimmies and Blackhall Roundabout the Violet route option removes between 48% and 57% of traffic while the Orange route option removes between 69% and 70% of traffic.
- 27.4.31 The Orange route option also removes between 19% and 21% of traffic from the A947 (between Newmachar and Aberdeen) compared to the Violet route option which removes between 14% and 17% of traffic.
- 27.4.32 Both route options remove approximately half of the trips that route through Inverurie to access the A96 and areas to the south of the town, however the Violet route option provides a slightly greater reduction.
- 27.4.33 Overall, the Orange route option attracts up to 33% more traffic than the Violet route option and removes more traffic from the existing A96 and A947.
- 27.4.34 The Orange route option offers greater journey time savings than the Violet route option. On average, journey times for the end-to-end options containing the Orange route option are approximately 70 seconds quicker than those containing the Violet route option.
- 27.4.35 The Orange route option also delivers significantly more accident and casualty savings than the Violet route option over the 60-year appraisal period. End-to-end options containing the Orange route option deliver between 20% and 26% more accident and casualty savings than the corresponding end-to-end options containing the Violet route option.
- 27.4.36 End-to-end options containing the Orange route option offer between £73m and £81m more benefits than the corresponding end-to-end options containing the Violet route option. Both the Orange and Violet route options have similar construction costs, within 1% (£5m to £6m) of each other for the corresponding end-to-end options. As a result, end-to-end options containing the Orange route option offer better value, with a higher NPV of between £67m and £83m compared to the end-to-end options containing the Violet route option. The indexed BCR values are also consistently greater, by between 19 and 22 percentage points, for those end-to-end options containing the Orange route option than those containing the Violet route option. Table 28.1 in Chapter 28 includes a summary of the economic performance of each of the end-to-end options.

## 28 Preferred Option Recommendation

### 28.1 Introduction

28.1.1 This chapter describes the evaluation of the six route options and the eight end-to-end options and recommends the Preferred Option (end-to-end option) to be taken forward for Design Manual for Roads and Bridges (DMRB) Stage 3 assessment. The Preferred Option recommendation has been identified through the DMRB Stage 2 assessment which incorporates the Scheme Objectives and the Scottish Government's appraisal criteria. Feedback following public consultations held in October 2018 and May 2019 has also been considered during the route option assessment process.

### 28.2 Stage 2 Value for Money Workshop

28.2.1 A Stage 2 Scheme Options Assessment Value for Money (VfM) workshop was held on 29 September 2020 and was facilitated by Capital Value and Risk Ltd.

28.2.2 A copy of the Stage 2 Scheme Options Assessment VfM Workshop Report is included in Volume 4a, Appendix A28.1.

28.2.3 At this workshop, the project team reported the assessment outcomes from the DMRB Stage 2 work using the following elements:

- The Scheme Objectives, as derived from the A96 Dualling Programme objectives;
- Scheme costs; and
- Monetised benefits.

#### **Scottish Government's Transport Appraisal Criteria**

28.2.4 The Scottish Government's transport appraisal criteria for the assessment of trunk road schemes are:

- Economy – supporting sustainable economic activity in appropriate locations and getting good value for money;
- Safety – to improve safety for all road users;
- Environment – protecting the built and natural environment;
- Integration – ensuring that all decisions are taken in the context of integrated transport, policy and planning; and
- Accessibility & Social Inclusion – improving access to everyday facilities for those without a car and reducing community severance.

28.2.5 Additionally, three other criteria were also considered alongside the five main criteria above relating to construction and maintenance, being promotable / deliverable through the statutory processes and facilitation of operational resilience. Sub-criteria were also developed to reflect the level of detail required for the assessment. Refer to the VfM Workshop Report in Volume 4a, Appendix 28.1 for more details.

28.2.6 A Utility Score was calculated for each end-to-end option reflecting the performance against the Scottish Government's transport appraisal criteria. This is documented in the VfM workshop report.

28.2.7 The Value Index is the Utility Score divided by the scheme cost for each end-to-end option. Options with a higher Value Index are considered to be preferred since they represent better value (ratio of Utility to cost).

### Scheme Cost Estimates

28.2.8 Scheme cost estimates have been calculated, including risk, for each of the end-to-end options. These are based on 2018 Q2 costs excluding VAT. Further information on scheme costs is contained in Volume 1, Part 1, Chapter 3.

### Monetised Benefits

28.2.9 The following criteria were also considered within the VfM process:

- Present Value of Benefits (PVB)
- Net Present Value (NPV)
- Indexed Benefit / Cost ratio (BCR)

28.2.10 The PVB is the sum of the transport user benefits and the accident benefits. The Present Value of Costs (PVC) is the scheme costs discounted to a common reference year (2010).

28.2.11 The NPV is calculated by the PVC subtracted from the PVB. The PVB, PVC and NPV are all presented in 2010 prices and values.

28.2.12 The BCR value is calculated by dividing PVB by the PVC which is then presented as an indexed BCR (the highest indexed BCR being 100). The BCR values are indexed to further illustrate the relative differences between the end-to-end options.

28.2.13 The end-to-end options were assessed against the column header criteria shown in bold in Table 28.1 at the VfM workshop. The VfM assessment was used to identify the Preferred Option.

**Table 28.1: End-to-end Performance Against VfM Criteria**

End-to-end options	Utility score (a)	Scheme cost £M (b)	Value Index (a/b)	Present Value of Benefits (PVB)	Present Value of Costs (PVC)	Net Present Value (NPV)	BCR	Indexed BCR
Cyan-Pink-Violet	3209	£890m	3.61	£274m	£496m	-£222m	0.55	79
Cyan-Pink-Orange	3408	£899m	3.79	£350m	£501m	-£151m	0.70	100
Cyan-Brown-Violet	3157	£943m	3.35	£250m	£526m	-£276m	0.48	68
Cyan-Brown-Orange	3386	£933m	3.63	£328m	£521m	-£193m	0.63	90
Red-Pink-Violet	3164	£960m	3.30	£297m	£535m	-£238m	0.56	79
Red-Pink-Orange	3354	£970m	3.46	£370m	£541m	-£171m	0.68	98

End-to-end options	Utility score (a)	Scheme cost £M (b)	Value Index (a/b)	Present Value of Benefits (PVB)	Present Value of Costs (PVC)	Net Present Value (NPV)	BCR	Indexed BCR
<b>Red-Brown-Violet</b>	3144	£993m	3.16	£273m	£554m	-£281m	0.49	71
<b>Red-Brown-Orange</b>	3326	£1003m	3.32	£354m	£560m	-£206m	0.63	90

## 28.3 Preferred Option Assessment

### Utility Score

28.3.1 The Utility Score was calculated for each end-to-end option. Part of the assessment was initially undertaken on a geographical section basis, i.e. by assessing the route options within the three geographical sections and identifying where there were key differentiators between these route options as outlined below. The three geographical section scores were combined for an end-to-end score with the traffic and economic assessment which was undertaken as an end-to-end exercise. Commentary below is made on the geographical section characteristics and the end-to-end characteristics identified in the assessment.

### East of Huntly to Colpy

28.3.2 Key issues identified by the assessment were:

- The Cyan route option results in fewer adverse effects on the landscape than the Red route option, as it is closer to the existing A96 corridor and avoids the steep topography through Hill of Foudland and Hill of Skares;
- The Cyan route option has a predicted impact under the assessment against the Local Development Plan policy HE1 (Historic Environment), relating to the setting of Colpy Cottage Palisaded Enclosure Scheduled Monument. Mitigation for this impact will be considered at DMRB Stage 3 which will include further consultation with Historic Environment Scotland and Aberdeenshire Council;
- The Cyan route option has less impact on local ecology and nature conservation by passing through less of the undisturbed Wildcat Priority Area habitat;
- Offline construction can be achieved for both route options; although there are more interfaces with the existing A96 for the Cyan route option, these can be constructed through appropriate phasing;
- The Red route option includes construction works of greater complexity at the Hill of Foudland. Diversion of high pressure gas mains and electricity transmission lines is necessary where the Red route option passes through a large cutting. The cutting is in slate strata and generates very large quantities of excavated material;
- The Cyan route option offers greater resilience benefits than the Red route option, particularly with regard to winter weather; and
- The Cyan route option provides slightly better opportunities to facilitate active travel.

## Colpy to Pitcaple

28.3.3 Key issues identified by the assessment were:

- The Pink route option is better screened by the surrounding topography. The Brown route option is more visible from higher elevations such as Bennachie and Meikle Wartle;
- The Pink route option has fewer adverse effects due to traffic noise and vibration since there are fewer residential receptors;
- The Pink route option affects fewer farm units and directly impacts less prime agricultural land than the Brown route option;
- The Brown route option has greater impact upon existing amenity areas, and existing NMU routes;
- The Pink route option has slightly less impact on ancient woodland and nature conservation areas including Logie Woodland; and
- Both route options can be constructed offline. The Pink route option has a lower number of significant structures and less extensive earthworks.

## Pitcaple to Kintore

28.3.4 Key issues identified by the assessment were:

- The Orange route option is predicted to have significantly less effect on private properties and fewer effects on community facilities such as the equestrian centres and Girl Guiding centre located in proximity to the Violet route option.
- Both route options feature large crossings of extensive floodplains;
- The Orange route option is considered to have less of an impact upon the wider landscape than the Violet route option since it is more contained within an undulating landscape;
- The Orange route option has less of an impact upon existing agriculture and forestry than the Violet route option. There are more adverse impacts on farm units and a greater amount of prime agricultural land directly impacted on the Violet route option;
- The Violet route option results in a greater number of adverse effects due to traffic noise and vibration since there are a greater number of residential receptors;
- The Orange route option impacts on the existing LPD land at Crichton, but this can be mitigated and offers better integration with future development, particularly to the south of Inverurie;
- The Orange Route option has greater opportunity for new NMU routes serving more populated areas;
- The Violet route option features more extensive and complex construction works to the existing A96 dual carriageway at Tavelly Junction and on the Kintore Bypass; and

- The Orange route option offers better connections with the existing A96 and hence improved operational resilience.

### End-to-End Assessment

- 28.3.5 Certain assessment criteria also had to be considered on an end-to-end basis because their performance is dependent on how the route options are combined. The eight end-to-end options were considered under Economy, Safety, Accessibility & Social Inclusion and Integration criteria.
- 28.3.6 All end-to-end options perform well in terms of improved overtaking opportunities and journey time reliability improvement from the provision of a consistent dual carriageway standard between East of Huntly and Kintore. The assessment under the Economy criteria identifies that Red-Pink-Orange is the best performing option in terms of total benefits, followed closely by Cyan-Pink-Orange and Red-Brown-Orange. Cyan-Brown-Violet is the poorest performing of the options. The best performing options attract more traffic from the A96 and surrounding roads on to the new A96 dual carriageway.
- 28.3.7 All options perform well and similarly under the Safety criteria. Options containing the Orange route option offer the greatest reduction in accident rates on the wider road network. Within towns and villages, options containing the Violet route option offer the greatest reduction in potential conflicts between vehicles and NMUs by removing a greater volume of through traffic from Inverurie.
- 28.3.8 All options perform well in terms of reducing traffic in urban areas, contributing to better conditions for active travel within the Accessibility & Social Inclusion criteria as well as in facilitating improved access to employment, education, local amenities and connections between the towns, villages and rural areas in Aberdeenshire as well as to Aberdeen. All the end-to-end options will provide the opportunity for improved NMU facilities. Options that include the Orange route option perform well in terms of reducing the length of journeys within the urban area of Inverurie and therefore improving conditions for active travel in the town. The Orange route option also reduces the volume of through traffic routeing through Inverurie by 47%, as it provides an alternative route between Inverurie and the B9001, therefore reducing the need to travel through the town centre.
- 28.3.9 The Integration criteria considers transport network coverage (including public transport facilities) and how the options fit with the LDP. End-to-end options containing the Violet route option provide better connectivity to Inverurie Railway Station while all the end-to-end options provide similar access to the rail stations at Inch and Kintore. The options will also support access to the station at Huntly which is slightly to the west of the western extent of the scheme. All options offer similar journey time savings for local and express buses.
- 28.3.10 The end-to-end options are considered to offer good access to existing and planned development areas within the LDP. Those containing the Orange route option provide more direct access to the larger housing and business development sites to the south of Inverurie including Crichton, whilst those containing the Violet route option provide more direct access to the Portstown/Uryside housing development site to the north. Between East of Huntly and Pitcaple, there are no large scale planned developments sites.

### Overall Assessment Score

#### Utility Score

- 28.3.11 Cyan-Pink-Orange has the best performing Utility Score.

### Cost

- 28.3.12 End-to-end options vary in cost between £890m and £1,003m (at Q2 2018 prices). Cyan-Pink-Violet is the least expensive and Red-Brown-Orange the most expensive. These costs are inclusive of a monetised risk allowance and optimism bias but excluding VAT. The risk allowance used in these estimates is the mean monetised risk value from a quantified risk register.
- 28.3.13 Costs are influenced by the end-to-end combination of coloured route options due to earthworks transport and re-use. The Red route option generates significant earthworks costs due to a large cutting at the Hill of Foudland. The four least expensive end-to-end options contain Cyan, and the four most expensive contain Red.
- 28.3.14 The Brown route option is more expensive than the Pink route option since it has larger structures and more earthworks. Orange and Violet are similarly priced, with the cost of end-to-end options influenced by the respective earthworks balance across the whole route.

### Value Index

- 28.3.15 The Value Index is the ratio of Utility Score to Cost. Cyan-Pink-Orange is the best performing and Red-Brown-Violet the poorest performing combination.

### Monetised benefits

- 28.3.16 The calculated values of NPV, PVB and BCR are identified in Table 28.1.

### Overall Ranking Conclusion

- 28.3.17 Refer to Table 6 within the Value For Money Appraisal Workshop Report in Volume 4a, Appendix A28.1.
- 28.3.18 Cyan-Pink-Orange is the best performing end-to-end option in four of the six criteria, namely, Utility Score, Value Index, BCR and NPV. Cyan-Pink-Orange is the second least expensive option and the third best performing option in relation to PVB. Cyan-Pink-Orange has the best overall ranking score.
- 28.3.19 Utilising the ranking methodology, the next best performing option is Cyan-Brown-Orange. This performs less well than Cyan-Pink-Orange on each of the six ranked criteria. The third ranked end-to-end option is Red-Pink-Orange which performs less well than Cyan-Pink-Orange in five of the six criteria, particularly cost (sixth) and value index (fourth).
- 28.3.20 The Value for Money assessment concludes that **Cyan-Pink-Orange** is preferred. When all criteria are considered, there is a clear differentiation of Cyan-Pink-Orange from the nearest ranked end-to-end option.

## 28.4 DMRB Stage 2 Preferred Option Recommendation

- 28.4.1 On the basis of the DMRB Stage 2 Scheme Assessment and the VfM workshop it is recommended that the following are taken forward as the Preferred Option for the A96 Dualling East of Huntly to Aberdeen Scheme:
- The Cyan route option for the East of Huntly to Colpy geographical section;
  - The Pink route option for the Colpy to Pitcaple geographical section; and
  - The Orange route option for the Pitcaple to Kintore geographical section.

- 28.4.2 Some of the key benefits the Preferred Option will provide include:
- Improved journey times and reliability for all trunk road traffic, including freight;
  - Reduction in through traffic on the existing A96 and on the local road network;
  - Significantly improved road safety for motorised and Non-Motorised Users;
  - Opportunities to facilitate active travel;
  - Improved connectivity between towns, villages and rural areas in Aberdeenshire as well as to Aberdeen City and to the wider strategic transport network; and
  - Improved transport connections and opportunities to grow the regional economy in the corridor, supporting sustainable economic growth.
- 28.4.3 The cost of the Preferred Option is in the range of £820m to £995m (at Q2 2018 prices). This cost is inclusive of optimism bias but excluding VAT. It is also inclusive of the minimum and maximum monetised risk value from a quantified risk register.
- 28.4.4 At DMRB Stage 3, the Preferred Option will be developed further including, where appropriate:
- Further refinement of the dual carriageway alignment;
  - Design development of junction locations and layouts;
  - Design development of local road improvements and private means of access;
  - Design development of Non-Motorised User (NMU) facilities;
  - Geotechnical design and earthworks, including ground investigation;
  - Development of hydrology and sustainable drainage proposals;
  - Determination of Bridge structural type, form and location;
  - Further consideration and proposals for utility diversions;
  - Further consideration of safety when developing construction and maintenance requirements;
  - Undertaking further environmental surveys; and
  - Development of suitable mitigation measures to reduce impacts on communities and the environment. These may include but are not limited to:
    - Provision of wildlife crossings and compensatory habitat;
    - Landscape planting;
    - Noise barriers; and
    - Environmental bunds.
- 28.4.5 The design development of the Preferred Option will be informed by consultation with affected parties, including landowners, statutory bodies, local authorities, community councils, other relevant interest groups, members of the public and road users. The Preferred Option is shown in Volume 5, Figure 28.1.

## 28.5 Economic Performance of the Preferred Option

- 28.5.1 Table 28.2 summarises the economic performance of the Preferred Option. The total PVB of £350m is accounted for by the economic impact of the scheme resulting from changes in journey time, vehicle operating costs, the number of accidents, global air quality emissions as well as taxation impacts. The PVC value reflects the cost of the scheme including scheme work costs, preparation and land costs plus optimism bias and a quantified risk assessment allowance.
- 28.5.2 In addition to the benefits to users from reduced travel time, changes in vehicle operating costs and a reduction in accidents, there are monetised economic impacts of transport changes that occur in the wider economy rather than to transport users. These Wider Economic Impacts (WEIs) relate to agglomeration, imperfect competition and labour market impacts which are estimated to provide a further £87m in benefits. Benefits due to the reduction of driver frustration are estimated to contribute up to a further £128m. These benefits and impact on the BCR are also reported in Table 28.2.
- 28.5.3 All costs and benefits are shown at 2010 prices and values and rounded to the nearest million.

**Table 28.2: Economic Impact of the Preferred Option**

<b>Preferred Option Economic Impacts</b>	<b>Present Value of Costs and Benefits (2010 Values and Prices)</b>
Scheme Costs (PVC)	-£501m
Transport User Benefits	£289m
Accident Benefits	£61m
Total PVB	£350m
NPV	-£151m
BCR	<b>0.70</b>
Driver Frustration Benefits	£128m
Wider Economic Impacts (WEIs)	£87m
BCR (incl. Driver Frustration)	0.95
BCR (incl. WEIs)	0.87
BCR (incl. Driver Frustration and WEIs)	1.13

- 28.5.4 Cyan-Pink-Orange has the second lowest estimated Scheme cost and demonstrates best value for money with a BCR of 0.70, excluding WEIs and the monetised impacts of driver frustration. The addition of driver frustration (£128m) increases the benefits and BCR of Cyan-Pink-Orange to 0.95. The addition of WEIs (£87m) increases the benefits and BCR of Cyan-Pink-Orange to 0.87. Including both driver frustration and WEIs provides a BCR of 1.13 for Cyan-Pink-Orange.



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