WELLINGTON ROAD JUNCTION IMPROVEMENTS

DMRB Stage 2 Options Assessment Report

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1. Introduction

1.1. Scheme Background

1.1.1. The Aberdeen City Region Deal (ACRD) is an agreement between the Scottish Government, UK Government, Aberdeen City Council (ACC) and Aberdeenshire Council and is currently valued at £936million.

1.1.2. The deal, signed in 2016, aims to stimulate investment in and the diversification of the local economy into new areas of activity through the programme area of: innovation, internationalisation, digital connectivity, and infrastructure across the region.

1.1.3. The ACRD Strategic Transport Appraisal identified opportunity to progress designs forward for a section of Wellington Road between Craigshaw Drive and Charleston Road North encompassing two major junctions and their influencing approaches, with the anticipation of achieving additional benefits for the External Links to Aberdeen South Harbour (ASH) project and Energy Transition Zone (ETZ).

1.1.4. The external links to ASH and Aberdeen South Harbour Link Road (ASHLR) project interfaces with the Wellington Road corridor at Hareness Roundabout and Souterhead Roundabout as harbour traffic takes access from the strategic trunk road network (A956/A90/A92) via Wellington Road.

1.1.5. Previous appraisal work on the Wellington Road corridor, the Wellington Road Multi-modal Corridor Study (WRMMCS), has identified a hybrid package of multi-modal improvements along the length of the corridor.

1.1.6. The WRMMCS considered historic options for signalisation of the roundabouts but did not encompass development of further options, outline designs, confirming feasibility, or subsequently assessing the impacts of such proposals.

1.1.7. In March 2023 ACC appointed Sweco UK Ltd as consultants to prepare a DMRB Stage 2 Option Assessment and an Outline Business Case (OBC), for the section of Wellington Road between Craigshaw Drive and Charleston Road North, termed Wellington Road Junction Improvements (WRJI) (*Figure 1-1*), building on the work of the WRMMCS.

1.2. Scheme Development History

1.2.1. The WRMMCS provided the background for the WRJI study. A summary of the study, at its various stages, is provided below. This DMRB Stage 2 assessment has taken into consideration the previous studies.

WRMMCS

Initial Appraisal (Case for Change) Study

1.2.2. In 2014, Nestrans commissioned AECOM to undertake a multi-modal transport study on the Wellington Road corridor, with the aim of generating and assessing options consistent with the aims and objectives of a previous 'locking in the benefits' study in relation to the Aberdeen Western Peripheral Route (AWPR) and that address current and future planned developments on the corridor.

1.2.3. The Initial Appraisal (Case for Change) Study was subsequently published in January 2015. This identified key problems, issues, opportunities and constraints on the corridor, developed Transport Planning Objectives (TPOs) for the study and generated a high-level long list, which was subsequently sifted for more detailed consideration.

Preliminary Options Appraisal

1.2.4. In 2017 ACC commissioned AECOM to undertake a Preliminary Options Appraisal, building on the Case for Change Study published in 2015.

1.2.5. The appraisal was published in April 2018, identifying a series of options and packages for assessment within the Preliminary Appraisal assessment framework and recommended a shortlist of improvement options for more detailed appraisal.

Detailed Options Appraisal

1.2.6. Subsequently, AECOM were commissioned by ACC in 2018 to complete a Detailed Options Appraisal in accordance with the Scottish Transport Appraisal Guidance (STAG) for the shortlisted options. This appraisal work of the Wellington Road corridor extended from the A92 Charleston Junction to the Queen Elizabeth Bridge. In June 2021 this work was published as the Wellington Road Multi-Modal Corridor Study (WRMMCS).

1.2.7. The conclusion of this assessment recommended a hybrid package of interventions, accommodating:

- a dedicated bus lane;

- junction improvements at Souterhead Roundabout;
- junction improvements at Hareness Roundabout, and
- provision of additional cycling facilities.

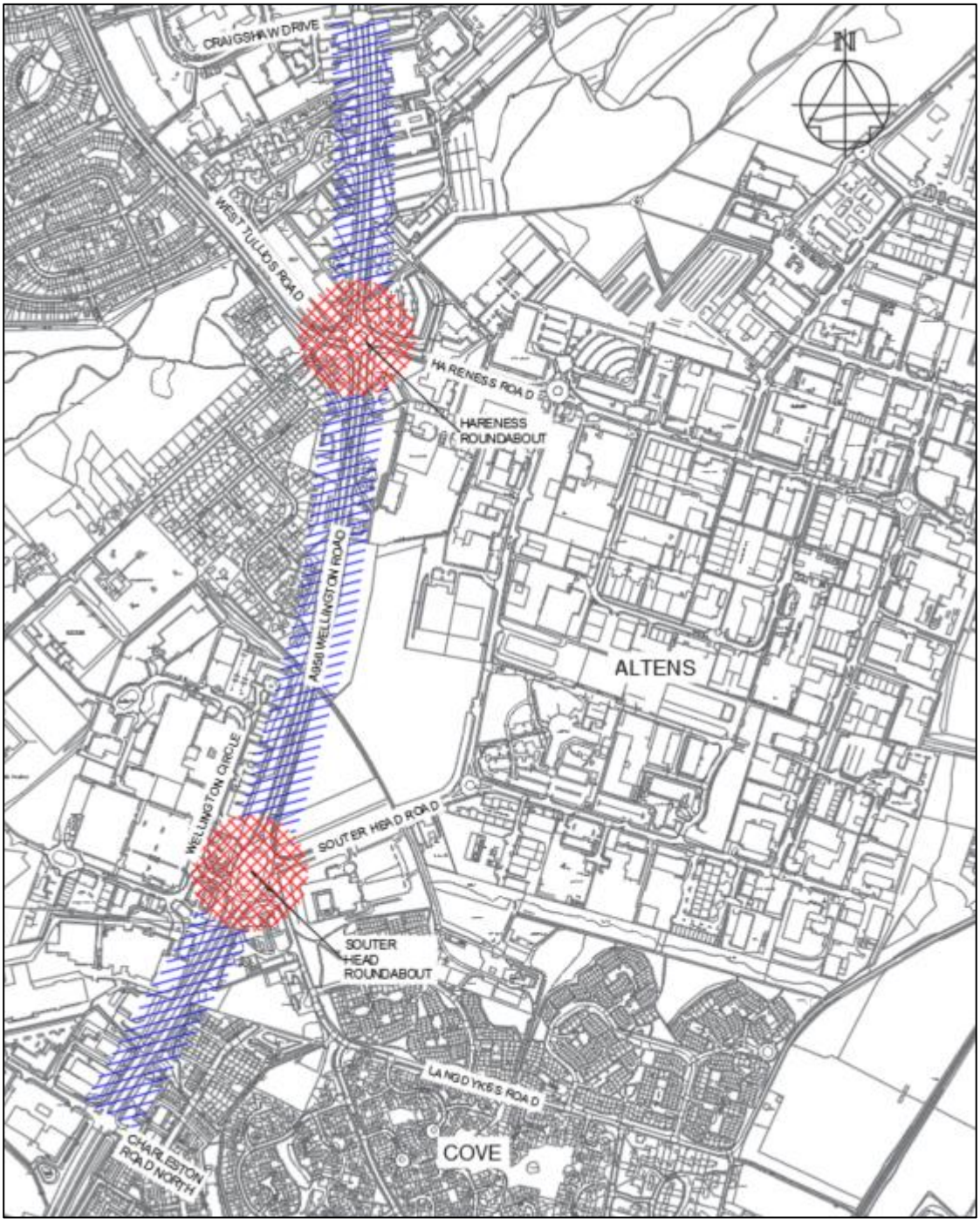


Figure 1-1 - Wellington Road Junction Improvements Scheme Extents (Mapping © Crown Copyright and database rights 2023 Ordinance Survey 100030649)

1.3. Adjacent Schemes

ASHLR

1.3.1. The ACRD sets out an intention to support the expansion of Aberdeen Harbour. The new ASH at Nigg Bay has recently been completed and opened in September 2023. Both the UK Government and the Scottish Government have each committed funding for providing improved land transport access arrangements to and from the South Harbour.

1.3.2. ACC are the promotor of the "External Transportation Links to Aberdeen South Harbour Project" (ETLASH). The Scottish Transport Appraisal Guidance (STAG) work is now concluded, and a Strategic Business Case approved on the basis of upgrades to Hareness Road and upgrades/realignment of the Coast Road, including a new crossing of the Aberdeen to Dundee railway line.

1.3.3. In June 2022 ACC appointed Sweco UK Ltd as consultants to provide support and services leading to the submission of a planning application and any associated orders for the ASHLR Project based on the preferred road corridor identified from STAG process:

- Option A4 - links Aberdeen South Harbour to Wellington Road via an upgraded Coast Road and Hareness Road, with a new road bridge over the Aberdeen to Dundee railway line;
- Option C1 – active travel provision remote from the ASHLR scheme, on the northern side of East Tullos Industrial Estate; and
- Option C4 - active travel provision following a similar route along the upgraded road corridor.

1.3.4. Part of active travel Option C1 rests within land included in the Aberdeen Development Plan for the proposed Energy Transition Zone (ETZ), as such this active travel option is not included within the ASHLR project but may be considered following the conclusion of the ETZ master planning process that has been progressed during 2023.

1.4. Scheme Objectives

1.4.1. Notwithstanding the work previously undertaken on the WRMMCS and in tandem with macro and micro traffic modelling, Sweco were appointed to undertake an iterative improvement option generation exercise, to generate feasible design options. In identifying options for appraisal, a range of individual interventions were examined:

- North and southbound bus priority measures;
- North and southbound freight priority measures;
- Combined bus & freight priority measures;
- At grade junction capacity improvements;
- Active travel improvements;
- Northbound link capacity improvements;
- With-flow segregated cycle tracks.

1.4.2. Options, which combine a number of interventions, were identified if they were deemed to have the potential to meet the Transport Planning Objectives (TPOs) previously agreed as part of the WRMMCS and shown in *Table 1.1* below.

Table 1.1: Transport Planning Objectives

Ref	TPO at Preliminary Appraisal Stage	Final TPO at Detailed Appraisal Stage
TPO1	Provide greater priority to sustainable modes of transport on the corridor and facilitate locking of the benefits of the AWPR	No change – TPO as at Preliminary Appraisal stage
TPO2	Facilitate efficient movement of freight on the corridor	Facilitate efficient movement of freight on the corridor, promoting access to Aberdeen South Harbour and the proposed Energy Transition Zone
TPO3	Reduce and manage traffic demands at key pinch points on the corridor, taking cognisance of the framework provided by the Roads Hierarchy	No change – TPO as at Preliminary Appraisal stage
TPO4	Improve accessibility to employment and education areas on the corridor	No change – TPO as at Preliminary Appraisal stage
TPO5	Promote a transport corridor which is safe for all users	No change – TPO as at Preliminary Appraisal stage
TPO6	Promote a transport corridor which supports air quality improvement strategies and improves public health	No change – TPO as at Preliminary Appraisal stage

1.5. Consultations

1.5.1. The successful delivery of the WRJI scheme will be dependent on effective engagement with key stakeholders and gaining their involvement through consultation. Consultations to be carried out during the assessment will:

- Engage and inform interested parties;

- Gather knowledge, expertise and opinions from Stakeholders to inform the assessment and decision making;
- Promote consultation with the community and their representatives, allowing issues and concerns to be understood and addressed; and
- Help de-risk the scheme promotion process.

1.6. Stakeholders

1.6.1. Stakeholders, statutory consultees and interested parties were identified and include the following (amongst others):

- Aberdeen City Council (ACC)
- NESTRANS
- Landowners and businesses along the route of the scheme
- Aberdeen Cycle Forum (ACF)
- Transport Scotland
- Utility suppliers

1.7. Assessment Report

1.7.1. This Stage 2 Options Assessment Report for the WRJI scheme has been prepared in accordance with the guidance for 'Preparation of the Stage 2 Report' as contained in the TD 37/93 'Scheme Assessment Reporting'.

1.7.2. The report describes the current Wellington Road layout and the assessment of a range of improvement options.

1.7.3. At Stage 2, the improvement options have been sufficiently developed to enable an assessment of their comparative impact and performance and to enable the appraisal of costs, engineering, traffic and environmental impacts of each.

1.7.4. The purpose of this report is to document the factors that have been considered in the assessment of improvement options, detailing advantages/disadvantages and constraints associated with each improvement option.

2. Existing Conditions

2.1. Introduction

2.1.1. This section of the report describes the engineering conditions of the existing Wellington Road within the scheme extents shown in *Figure 2-1*.

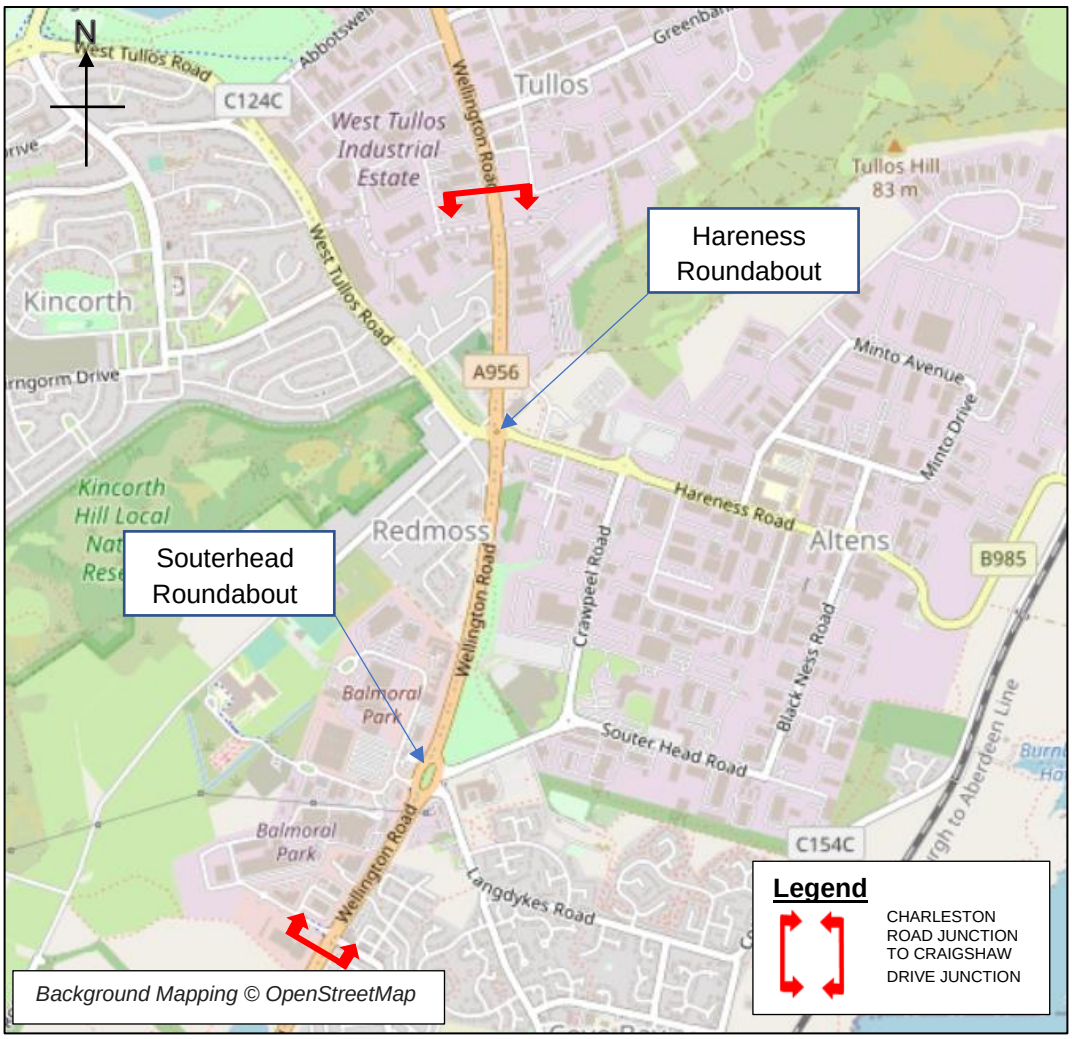


Figure 2-1 Wellington Road Scheme Extents

2.2. Scheme Location and Environment

Location

2.2.1. The scheme starts at the signalised crossroads junction of Wellington Road (A965), Charleston Road North and Wellington Circle, approximately 4.3 kilometres (km) to the south of Aberdeen Train Station and continues north along Wellington Road, for approximately 2km, encompassing Souterhead and Hareness Roundabouts, before it ends at the signalised crossroads junction of Wellington Road (A956), Craigshaw Drive and Altens Farm Road.

Topography

2.2.2. The land within the study area is generally falling from Cove Bay in the south towards Aberdeen City Centre in the north. There is a gradual rise from Charleston Road North signalised crossroads, 84m above Ordnance Datum (AOD), to Souterhead Roundabout at 87m AOD. The descent northwards begins gradually between Souterhead and Hareness Roundabouts to 73m AOD, prior to steeply falling towards 38m AOD at Craigshaw Drive signalised crossroads.

Climate

2.2.3. Aberdeen has an oceanic climate resulting in cold and rainy winters followed by cool and cloudy summers with the temperature ranging from -3° and 21° annually. Rainfall varies throughout the year averaging 70 millimetres (mm) a month with highs of 100mm in October and lows of 55mm in May. The average rainfall intensity is 0.36mm/hr in Aberdeen. Snowfall accounts for a small percentage of the annual precipitation and falls mostly between December and March. Aberdeenshire receives sunshine on average 4 hours a day annually with the summer months accounting for the most of it. The average annual windspeed in Aberdeen is 17km/h.

Land Use

2.2.4. The land within the study area is primarily urban in nature, comprising industrial and commercial premises of Altens Industrial Estate to the east and Balmoral Business Park to the west. There are residential areas to the south-east at Cove Bay, between Wellington and Redmoss Road and on Nigg Kirk Road. There are additional, less concentrated, areas of residential properties across the scheme extents. There is also an area of woodland to the east of Wellington Road between Souterhead and Hareness Roundabouts.

2.3. Existing Road Network

2.3.1. The existing road network consists of the section of Wellington Road (A956) between Charleston Road North signalised crossroads and Craigshaw Drive signalised crossroads.

2.3.2. This section is shown in Figures D2.1 to D2.4 in Appendix D.

2.3.3. Existing roads and streets potentially impacted by the proposed scheme are listed in *Table 2.1.*

Table 2.1 - Roads impacted by the proposed scheme

Road Name
Wellington Road (A956)
Charleston Road North
Souter Head Road
Wellington Circle
Langdykes Road (C8K)
Hareness Road (B985)
West Tullos Road (B985)
Redmoss Road
Nigg Kirk Road
Craigpark
Craigshaw Drive
Altens Farm Road

Route Description

2.3.4. The A956 Wellington Road is an all-purpose urban dual carriageway which links the A92 Dundee to Aberdeen trunk road to Aberdeen city centre and harbours. The road in this location is broadly defined as Category 5 from DMRB CD109 Table A.2 with a minimum 2 trafficked lanes in each direction with no hard strips and a central reserve. The speed limit is 40mph, and varying width footways are provided on both sides of the dual carriageway for the entirety of this section.

2.3.5. Within the scheme extents, Wellington Road runs 0.5km to the north from Charleston Road North signalised crossroads junction to Souterhead Roundabout, before continuing north for a further 0.9km to Hareness Road Roundabout, and then further north for a further 0.5km connecting to Craigshaw Drive and Altens Farm Road with a signalised crossroads junction.

2.3.6. There are 7 major/minor priority junctions and 11 direct access within this section, as shown in Figures D2.5 and D2.6 in Appendix D. There are gaps in the central reserve at some junctions to allow for movements in all directions.

Charleston Road North Signalised Crossroads Junction (JC1 and JC2)

2.3.7. This is a signalised crossroads junction connecting to Charleston Road North, which provides access to residential properties and amenities to the east of Wellington Road and Wellington Circle, which provides access to Balmoral Business Park to the west of Wellington Road.

Redmoss Road Junction (JC3)

2.3.8. This is a simple T-junction connecting to Redmoss Road from West Tullos Road, which provides access to the properties and amenities within the Redmoss area. Right turns from West Tullos Road are prohibited to Redmoss Road.

Nigg Kirk Road Junction (JC4)

2.3.9. This is a simple T-junction connecting to Nigg Kirk Road, which provides access to the properties and amenities to the west of the existing Wellington Road. There is a right turning facility on Wellington Road which allows for movements in all directions at this junction.

Craigpark Junction (JC5)

2.3.10. This is a left turn only junction which provides access to the properties on Craigpark.

Craigshaw Drive Signalised Crossroads Junction (JC6 and JC7)

2.3.11. This is a signalised crossroads junction connecting to Craigshaw Drive, which provides access to West Tullos Industrial Estate to the west of Wellington Road and Altens Farm Road which provides access to Shell to the east of Wellington Road.

Direct Accesses (AC1 to AC11)

2.3.12. Existing Direct Accesses in this section are listed in *Table 2.2*.

Table 2.2 - Existing direct accesses on Wellington Road

REF.	NAME	DIRECTION	DESCRIPTION
AC1	Porsche Centre	NB	Large junction style access from bus stop lay-by to commercial premises.
AC2	n/a	SB	Gated access to derelict land.
AC3	Shell Exit	SB	Separate entry and exit for service station (approximately 30m separation).
AC4	Shell Entry	SB	
AC5	Private	SB	Private driveway
AC6	The Wellington Hotel	NB	Skew access to hospitality venue car park. Through access to Abbotswell Crescent.
AC7	Private	SB	Private driveway
AC8	Private	SB	Private driveway
AC9	Loirston House	SB	Junction style access to office premises
AC10	Property access	EB	Access to commercial and office premises from the West Tullos Road arm of Hareness Road Roundabout.
AC11	Private Access	NB	Private driveway from bus stop lay-by.

Souterhead Roundabout

2.3.13. The existing Souterhead Roundabout is a 6-armed roundabout on Wellington Road located on the southwestern boundary of the Altens Industrial Estate, providing access to the industrial estate (via the existing Souter Head Road) to the northeast. Access to Wellington Circle Retail Park is provided to the west and Cove Bay to the southeast, via Langdykes Road. A north-west arm of the roundabout provides one-way access only to a petrol station, with vehicles exiting the petrol station via Wellington Circle. The existing layout of Souterhead Roundabout is shown in *Figure 2-2*.

2.3.14. The roundabout is partially signalised, with full time and part time signals positioned prior to Souterhead Road and Langdykes Road entry arms respectively. The main flow is south to north in the morning peak and north to south in the evening peak hour, which is expected given the arterial function of Wellington Road. Langdykes Road is the main bus corridor with most buses travelling north or south.

2.3.15. A combination of footways and shared-use paths are provided around the full roundabout. Crossings with dropped kerbs are provided at each arm of the roundabout with a signalised crossing provided approximately 30m from the south arm of the roundabout and 20m from the north arm of the roundabout.

Figure 2-2 - Existing Souterhead Junction Layout

Hareness Road Roundabout

2.3.16. The existing Hareness Road Roundabout is a 4-armed roundabout on Wellington Road located on the western boundary of the Altens Industrial Estate, providing access to the industrial estate (via the existing Hareness Road) to the east and West Tullos Road to the west. The main flow is tidal north/south along Wellington Road.

2.3.17. Crossings with dropped kerbs are provided at each arm of the roundabout and there are signalised crossing points over Wellington Road to the north at approximately 45m from the junction and West Tullos Road to the west approximately 60m from the junction. Footways are provided around the full roundabout.

2.3.18. As shown in *Figure 2-3* below, there is a small junction west of the roundabout which provides access to a barber shop and small office. Right turn movements are prohibited from West Tullos Road to Red Moss Road and from the barber shop access to West Tullos Road, therefore these movements undertake a U-turn at the roundabout. Within the surveyed 12-hour period (from Streetwise 2019 Traffic

Surveys), this accounted for was 230 PCUs. More detail on the traffic survey data is provided in Chapter 6.

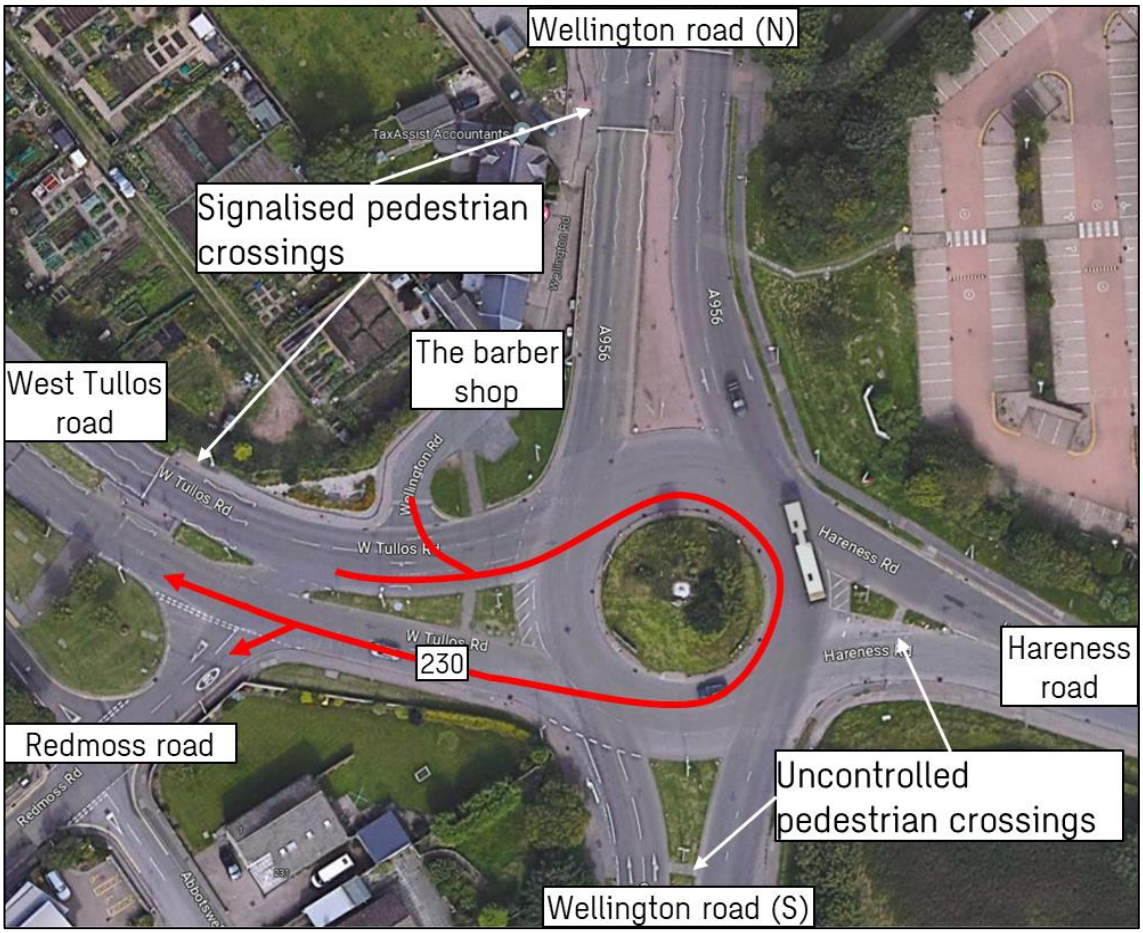


Figure 2-3: Hareness Junction Layout

Existing Geometric Design Standard

2.3.19. The existing Wellington Road geometry has been assessed against the topographical survey information received.

2.3.20. The horizontal geometry, vertical geometry and stopping sight distance (SSD) were checked against the requirements set out in Design Manual for Roads and Bridges (DMRB) CD109 Highways Link Design to identify where there are relaxations and departures from standard. Wellington Road is an urban road with a 40mph speed limit; therefore Table 2.5 of CD 109 was used to define a design speed of 70Akph.

2.3.21. Assessment of existing geometry is a limited assessment process and will not identify all relaxations and departures however it does provide a broad investigation of an existing road standard.

2.3.22. This section of Wellington Road is compliant in its horizontal and vertical geometry. Locations of SSD departures are indicated within the junction assessment below.

2.3.23. The road complies with the D2UAP cross section from DMRB CD127 Cross-sections and Headrooms Figure 2.1.1N1g.

Existing Junction Design Standard

2.3.24. The DMRB CD 123 Geometric Design of At-Grade Priority and Signal-Controlled Junctions and CD 116 Geometric Design of Roundabouts provides guidance on the geometric design of junctions and roundabouts. To comply with the standard, the following is required:

- When approaching a minor road junction, a driver shall be able to see a car waiting at the give-way line from the desirable SSD on the minor road (CD 123, 3.1 and 7.2).
- From a point 15m back from the give-way line on the centreline of a minor road, an approaching driver shall be able to see the full junction form (CD123, 3.2).
- From a setback of at least 2.4m, a driver shall be able to see the SSD of the major road unobstructed in both directions. For direct accesses, this shall be achieved from at least 2.0m (CD 123, 3.8).
- A minimum corner radius of 6m should be used for junctions in urban areas. Tapers should be provided where large vehicles are making turning movements and a minimum 10m radius used (CD 123, 5.6.1 and 5.6.2).
- Visibility on the immediate approach to a junction is considered 1.5 times the desirable SSD for the associated road. For major roads, it is measured from centreline to centreline. For minor roads, it is measured back from the give-way line (CD 109, 2.13).
- Entry lane width at roundabouts shall not exceed 10.5m for single carriageways and 15m for dual carriageways (CD 116, 3.11, 3.12 and 3.13).
- A minimum average effective flare length of 5m should be used at roundabouts in urban areas (CD 116, 3.17).
- The entry path radius shall be less than 100m shall be included in the design of roundabouts to ensure appropriate speeds are used entering and exiting the roundabout (CD 116, 3.26).

- Approach visibility at roundabouts shall be measured to an object at the give-way line and comply with the SSD for the associated road (CD 116, 3.43 and 3.45).
- At entry arms and while on the roundabout circulatory, visibility of other road users shall be provided and comply with CD 116 Table 3.49 based on the inscribed circle diameter (ICD) of the roundabout.
- At the give way line, drivers shall be able to see the full width of a pedestrian crossing across the next exit if it is within 20m of the give way line (CD 116, 3.59)

2.3.25. *Table 2.3* details the outcome of the assessment of existing major/minor priority junctions along the existing Wellington Road. Existing direct accesses are also assessed in *Table 2.4*.

2.3.26. *Table 2.5* below details the outcome of the assessment of Hareness Road and Souter Head roundabouts on Wellington Road.

Table 2.3 - Major/Minor Junctions - Wellington Road

Junction	Compliance to CD 123 Standards				Compliance to CD 109 Standards
	Minor Road SSD (3.1 & 7.2)	15m Set-Back Junction Form Visibility (3.2)	Major Road SSD (3.8)	Corner Radii (5.6.1 & 5.6.2)	Visibility to Junction (2.13)
Charleston Road North - JCT1	✓	✓	✓	✓	✓
Wellington Circle - JCT2	✓	✓	✓	✓	✓
Redmoss Road (from West Tullos Road) - JCT3	✓	✓	✗	✓	✗
Nigg Kirk Road - JCT4	✗	✓	✓	✓	✓
Craigpark - JCT5	✓	✓	✓	✓	✓
Craigshaw Drive - JCT6	✓	✓	✓	✓	✓
Altens Farm Road - JCT7	✓	✓	✓	✓	✓

Table 2.4 - Direct Accesses - Wellington Road

Junction	Compliance to CD 123 Standards	Compliance to CD 109 Standards
	Major Road SSD (3.1)	Visibility to Junction (2.13)
AC1	✓	✓
AC2	✓	✓
AC3	✓	✓
AC4	N/A	✓
AC5	✓	✓
AC6	N/A	✓
AC7	✓	✓
AC8	✗	✗
AC9	✗	✗
AC10	✗	✗
AC11	✗	✗

Table 2.5 - Roundabouts - Wellington Road

Roundabouts	Compliance to CD 116 Standards							
	Entry Lane Width (3.11, 3.12 & 3.13)	Effective Flare Length (3.17)	Entry Path Radius (3.26)	Approach Visibility (3.43 & 3.45)	Entry Visibility (Table 3.49)	Visibility to Right (Table 3.49)	Circulatory Visibility (Table 3.49)	Visibility to Pedestrian Crossing (3.59)
Hareness Road Roundabout (South Arm with Wellington Road)	✓	✓	✓	✓	✓	✓	✗	✓
Hareness Road Roundabout (West Arm with West Tullos Road)	✓	✓	✓	✗	✓	✓	✗	N/A
Hareness Road Roundabout (North Arm with Wellington Road)	✓	✓	✓	✓	✓	✓	✗	✓
Hareness Road Roundabout (East Arm with Hareness Road)	✓	✓	✓	✓	✓	✓	✗	✓
Souterhead Roundabout (North-West Arm to service petrol station)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Souterhead Roundabout (North Arm with Wellington Road)	✓	✓	✓	✓	✓	✓	✓	✓
Souterhead Roundabout (North-East Arm with Souter Head Road)	✓	✓	✗	✓	✓	✓	✗	N/A
Souterhead Roundabout (South-East Arm with Langdykes Road)	✓	✓	✓	✗	✓	✓	✗	✓
Souterhead Roundabout (South Arm with Wellington Road)	✓	✓	✗	✓	✓	✓	✓	✓
Souterhead Roundabout (West Arm with Wellington Circle)	✓	✓	✓	✗	✓	✓	✓	✓

Road Pavement Condition

2.3.27. A desktop study of the existing pavement conditions has been undertaken visually to determine and approximate the condition to inform the cost estimation process.

2.3.28. Some localised longitudinal cracking is visible through sections of Wellington Road, in particular on the southbound carriageway between Craigshaw Drive signalised crossroads and Hareness Roundabout.

2.3.29. The road pavement condition will be assessed in greater detail at DMRB Stage 3 following identification of a preferred option and will be informed by testing carried out during ground investigation works.

Lighting

2.3.30. Road lighting is provided along Wellington Road. *Table 2.6* below describes the locations of the existing lighting on the existing routes.

Table 2.6 - Street Lighting Locations on existing roads

ROAD NAME	LOCATION	START (Approx.)	END (Approx.)
Wellington Road	Verge	Charleston Road North signalised crossroads	Souterhead Roundabout
Wellington Road	Central reserve	Souterhead Roundabout	Hareness Road Roundabout
Wellington Road	Verge	Hareness Road Roundabout	Craigshaw Drive signalised crossroads

Road Restraint System

2.3.31. A road restraint system (RRS), or safety barrier, is provided along the existing Wellington Road to prevent errant vehicles from hitting hazards. *Table 2.7* shows the approximate locations of the VRS, its length, and the hazard being protected.

Table 2.7 - VRS Location on existing roads

BARRIER LOCATION	LOCATION	LENGTH (m)	HAZARD
Wellington Road (Charleston Road Junction – Souterhead Roundabout)	Central Reserve	340	Opposing Traffic
Wellington Road (Souterhead Roundabout -Charleston Rd Junction)	Southbound verge	60	Embankment and property

Signage

2.3.32. All signage along the sections of Wellington Road show destinations in English only. The location and carriageway direction of the signage is detailed in *Table 2.8* below.

Table 2.8 – Existing signage

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
Wellington Circle Junction	Northbound	30mph / 40mph	Dia. 670
Wellington Circle Junction	Northbound	30mph / 40mph	Dia. 670
Wellington Circle	Northbound	No parking in verge or footway	N/A
Wellington Circle	Northbound	No parking in verge or footway	N/A
Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Wellington Circle Junction	Northbound	30mph	Dia. 670
Wellington Circle Junction	Northbound	30mph	Dia. 670
50m north of Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
180m north of Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
20m north of Wellington Circle Junction	Northbound	20mph	Dia. 670
260m north of Wellington Circle Junction	Northbound	20mph	Dia. 670
260m north of Wellington Circle Junction	Northbound	Children going to and from school or playground ahead	Dia. 545

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
260m north of Wellington Circle Junction	Northbound	Children going to and from school or playground ahead	Dia. 545
300m north of Wellington Circle Junction	Northbound	Advance Direction Sign	N/A
310m north Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
400m north of Wellington Circle Junction	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
410m north of Wellington Circle Junction	Northbound	Urban Clearway	N/A
Langdykes Road	Northbound	Advance Direction Sign	N/A
Langdykes Road	Northbound	Dedicated Lane Advance Direction Sign	N/A
Entry to Souterhead Roundabout from Wellington Road	Northbound	40mph	Dia. 670
Entry to Souterhead Roundabout from Wellington Road	Northbound	40mph	Dia. 670
Entry to Souterhead Roundabout from Wellington Road	Northbound	Cyclists dismount	Dia. 966
Entry to Souterhead Roundabout from Wellington Road	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Exit to Wellington Circle from Souterhead Roundabout	Northbound	Cyclists dismount	Dia. 966
Exit to Wellington Circle from Souterhead Roundabout	Northbound	30mph / 40mph	Dia. 670
Exit to Wellington Circle from Souterhead Roundabout	Northbound	30mph	Dia. 670
Exit to Wellington Circle from Souterhead Roundabout	Northbound	Cyclists re-join carriageway	Dia. 966
Entry to Souterhead Roundabout from Wellington Circle	Northbound	Cyclists dismount	Dia. 966
Entry to Souterhead Roundabout from Wellington Circle	Northbound	40mph	Dia. 670
Entry to Souterhead Roundabout from Wellington Circle	Northbound	Cyclists dismount	Dia. 966
Wellington Circle	Northbound	No parking in verge or footway	N/A
Wellington Circle	Northbound	No parking in verge or footway	N/A

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
Northbound exit of Souterhead Roundabout	Northbound	Direction Sign	N/A
Northbound exit of Souterhead Roundabout	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Northbound exit of Souterhead Roundabout	Northbound	End of cycle lane, track or route	Dia. 965
50m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
50m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
60m north of Souterhead Roundabout northbound exit	Northbound	Area in which enforcement cameras are in use	Dia. 878
60m north of Souterhead Roundabout northbound exit	Northbound	Area in which enforcement cameras are in use	Dia. 878
140m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
140m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
300m north of Souterhead Roundabout northbound exit	Northbound	Cycling route wayfinder	N/A
300m north of Souterhead Roundabout northbound exit	Northbound	Cycling route wayfinder	N/A
330m north of Souterhead Roundabout northbound exit	Northbound	Urban Clearway	N/A
330m north of Souterhead Roundabout northbound exit	Northbound	Urban Clearway	N/A
350m north of Souterhead Roundabout northbound exit	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
390m north of Souterhead Roundabout northbound exit	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
460m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
460m north of Souterhead Roundabout northbound exit	Northbound	40mph / 40mph	Dia. 670

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
570m north of Souterhead Roundabout northbound exit	Northbound	Advance Direction Sign	N/A
600m north of Souterhead Roundabout northbound exit	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
680m north of Souterhead Roundabout northbound exit	Northbound	Urban Clearway	N/A
680m north of Souterhead Roundabout northbound exit	Northbound	Urban Clearway	N/A
740m north of Souterhead Roundabout northbound exit	Northbound	Cycle route left arrow	N/A
740m north of Souterhead Roundabout northbound exit	Northbound	Cycle route right arrow	N/A
740m north of Souterhead Roundabout northbound exit	Northbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Abbotswell Crescent	Northbound	20mph	Dia. 670
Abbotswell Crescent	Northbound	20mph	Dia. 670
790m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
790m north of Souterhead Roundabout northbound exit	Northbound	40mph	Dia. 670
Exit to West Tullos Road from Hareness Roundabout	Northbound	Direction Sign	N/A
West Tullos Road	Northbound	No stopping on the main carriageway	Dia. 642
West Tullos Road	Northbound	No stopping on the main carriageway	Dia. 642
Entry to Hareness Roundabout from West Tullos Road	Northbound	No stopping on the main carriageway	Dia. 642
Northbound exit of Hareness Roundabout	Northbound	Direction Sign	N/A
Northbound exit of Hareness Roundabout	Northbound	40mph	Dia. 670
30m north of Hareness Roundabout northbound exit	Northbound	No U-turns for vehicular traffic	Dia. 614

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
130m north of Hareness Roundabout northbound exit	Northbound	Area in which enforcement cameras are in use	Dia. 878
180m north of Hareness Roundabout northbound exit	Northbound	Urban Clearway	N/A
250m north of Hareness Roundabout northbound exit	Northbound	No U-turns for vehicular traffic	Dia. 614
280m north of Hareness Roundabout northbound exit	Northbound	30mph	Dia. 670
290m north of Hareness Roundabout northbound exit	Northbound	30mph	Dia. 670
290m north of Hareness Roundabout northbound exit	Northbound	Give Way	Dia. 602
410m north of Hareness Roundabout northbound exit	Northbound	40mph	Dia. 670
410m north of Hareness Roundabout northbound exit	Northbound	Vehicular traffic must proceed in the direction indicated by the arrow	Dia. 606
430m north of Hareness Roundabout northbound exit	Northbound	Advance Direction Sign	N/A
480m north of Hareness Roundabout northbound exit	Northbound	No U-turns for vehicular traffic	Dia. 614
Craigshaw Drive Junction	Northbound	30mph	Dia. 670
Craigshaw Drive	Northbound	No parking in verge or footway	N/A
Craigshaw Drive	Northbound	No parking in verge or footway	N/A
100m south of Altens Farm Road Junction	Southbound	40mph	Dia. 670
160m south of Altens Farm Road Junction	Southbound	No U-turns for vehicular traffic	Dia. 614
340m south of Altens Farm Road Junction	Southbound	Urban Clearway	N/A
340m south of Altens Farm Road Junction	Southbound	Urban Clearway	N/A
400m south of Altens Farm Road Junction	Southbound	Variable Message Sign	N/A
Exit to Hareness Road from Hareness Roundabout	Southbound	30mph	Dia. 670
Hareness Road	Southbound	No parking in verge or footway	N/A

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
Hareness Road	Southbound	No parking in verge or footway	N/A
Entry to Hareness Roundabout from Hareness Road	Southbound	40mph	Dia. 670
Southbound exit from Hareness Roundabout	Southbound	Direction Sign	N/A
60m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670
60m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670
60m south of Hareness Roundabout southbound exit	Southbound	Area in which enforcement cameras are in use	Dia. 878
160m south of Hareness Roundabout southbound exit	Southbound	Route Confirmatory Sign	N/A
170m south of Hareness Roundabout southbound exit	Southbound	Urban Clearway	N/A
170m south of Hareness Roundabout southbound exit	Southbound	Urban Clearway	N/A
330m south of Hareness Roundabout southbound exit	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
400m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670
400m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670
620m south of Hareness Roundabout southbound exit	Southbound	Urban Clearway	N/A
620m south of Hareness Roundabout southbound exit	Southbound	Urban Clearway	N/A
620m south of Hareness Roundabout southbound exit	Southbound	Advance Direction Sign	N/A
720m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670
720m south of Hareness Roundabout southbound exit	Southbound	40mph	Dia. 670

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
720m south of Hareness Roundabout southbound exit	Southbound	Dedicated Lane Advance Direction Sign	N/A
Entry to Souterhead Roundabout from Wellington Road	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Exit to Souter Head Road from Souterhead Roundabout	Southbound	End of cycle route	Dia. 965
Exit to Souter Head Road from Souterhead Roundabout	Southbound	30mph	Dia. 670
Exit to Souter Head Road from Souterhead Roundabout	Southbound	30mph	Dia. 670
Entry to Souterhead Roundabout from Souter Head Road	Southbound	40mph	Dia. 670
Entry to Souterhead Roundabout from Souter Head Road	Southbound	40mph	Dia. 670
Exit to Souter Head Road from Souterhead Roundabout	Southbound	Direction Sign	N/A
Souter Head Road	Southbound	No parking in verge or footway	N/A
Souter Head Road	Southbound	No parking in verge or footway	N/A
Souterhead Roundabout	Southbound	30mph	Dia. 670
Exit to Langdykes Road from Souterhead Roundabout	Southbound	30mph	Dia. 670
Exit to Langdykes Road from Souterhead Roundabout	Southbound	30mph	Dia. 670
Exit to Langdykes Road from Souterhead Roundabout	Southbound	Direction Sign	N/A
Entry to Souterhead Roundabout from Langdykes Road	Southbound	40mph	Dia. 670
Entry to Souterhead Roundabout from Langdykes Road	Southbound	40mph	Dia. 670
Langdykes Road	Southbound	End of cycle route	Dia. 965
Langdykes Road	Southbound	End of cycle route	Dia. 965
Langdykes Road	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
Langdykes Road	Southbound	Cycle route ahead	Dia. 950

SIGNAGE LOCATION	CARRIAGEWAY DIRECTION	SCHEDULE	DESCRIPTION
Langdykes Road	Southbound	Bend ahead	Dia. 512
Exit to Wellington Road from Souterhead Roundabout	Southbound	20mph	Dia. 670
Exit to Wellington Road from Souterhead Roundabout	Southbound	20mph	Dia. 670
Exit to Wellington Road from Souterhead Roundabout	Southbound	Children going to and from school or playground ahead	Dia. 545
20m south of Souterhead Roundabout southbound exit	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
20m south of Souterhead Roundabout southbound exit	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
40m south of Souterhead Roundabout southbound exit	Southbound	Urban Clearway	N/A
40m south of Souterhead Roundabout southbound exit	Southbound	Urban Clearway	N/A
180m south of Souterhead Roundabout southbound exit	Southbound	New Traffic Signals Ahead	N/A
190m south of Souterhead Roundabout southbound exit	Southbound	Advance Direction Sign	N/A
200m south of Souterhead Roundabout southbound exit	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
370m south of Souterhead Roundabout southbound exit	Southbound	Route for use by pedal cycles and pedestrians only	Dia. 956
400m south of Souterhead Roundabout southbound exit	Southbound	Route comprising two ways for use by pedal cycles only and by pedestrians only	Dia. 957
Charleston Road North Junction	Southbound	End of cycle route	Dia. 965
Charleston Road North Junction	Southbound	Route comprising two ways for use by pedal cycles only and by pedestrians only	Dia. 957
Charleston Road North Junction	Southbound	30mph	Dia. 670
Charleston Road North Junction	Southbound	40mph	Dia. 670

Bus Stops

2.3.33. Bus stops are provided along Wellington Road, with a mixture of simple stops and dedicated bus lay-bys. The locations of the existing bus stops within the scheme extents are shown in Figure D2.5 and D2.6 in Appendix D and are listed in *Table 2.9*.

Table 2.9 - Existing Bus Stops

REF.	BUS STOP NAME	LOCATION	DIRECTION	TYPE
BS1	Newlands Crescent	90m north of Wellington Circle Junction	Northbound	Layby
BS3	Souter Head Road	50m north of Souterhead Roundabout northbound exit	Northbound	Simple signed
BS5	Redmoss Park	590m north of Souterhead Roundabout northbound exit	Northbound	Simple signed
BS7	Altens Farm Road	120m north of Hareness Road Roundabout northbound exit	Northbound	Layby
BS8	Altens Farm Road	350m south of Altens Farm Road Junction	Southbound	Layby
BS6	Redmoss Park	300m south of Hareness Roundabout southbound exit	Southbound	Simple signed
BS4	Souter Head Road	800m south of Hareness Roundabout southbound exit	Southbound	Simple signed
BS2	Newlands Crescent	290m south of Souterhead Roundabout southbound exit	Southbound	Layby

Rest Areas/Parking

2.3.34. There are currently no existing rest / parking areas located within the study area on the existing Wellington Road.

2.4. Existing Active Travel Provision

Route Description

2.4.1. Currently, there are active travel facilities provided on both sides of Wellington Road for the entirety of this section. Between Charleston Road North and Hareness Road Roundabout there is a shared use footway/cycleway denoted by appropriate signage, which appears to revert to footway only north of Hareness Road Roundabout to Craigshaw Drive Junction (where no shared use signage is provided).

2.4.2. The shared use footway/cycleways are largely un-segregated, with a section of separated footway and cycle path located at the Charleston Road North signalised crossroads. This extends for approximately 40m on the northbound side of Wellington Road and 20m on the southbound side before merging into a shared path. North of this point until Hareness Road Roundabout the facility is shared for both cyclists and pedestrians. 150m south of Hareness Roundabout there is a junction with a shared-use path facility along Abbotswell Crescent, connecting into surrounding cycleways in the area.

2.4.3. Drop kerbs are provided at all road crossing locations with the exception of the southern end of the crossing between the junction of Nigg Kirk Road and Wellington Road. At controlled crossings, there is red coloured tactile paving. There is buff coloured tactile paving located at uncontrolled crossings on Souterhead Roundabout at Wellington Circle and Langdykes Road. There is also buff coloured tactile paving at the crossings of AC6 and AC7.

2.4.4. Existing active travel facilities along Wellington Road are listed in *Table 2.10* and shown in *Figure 2-4* below.

Table 2.10 - Existing active travel facilities on Wellington Road

COMMENCES	TERMINATES	DIRECTION	TYPE	TYPICAL WIDTH
Charleston Road North Junction	Wellington Circle	Northbound	Shared Use footway/cycleway (partially segregated)	3m, with 1m separation from carriageway
Wellington Circle	West Tullos Road	Northbound	Shared Use footway/cycleway (unsegregated)	2m, with 1.5m separation from carriageway
West Tullos Road	Nigg Kirk Road	Northbound	Footway	2m, with no separation from carriageway
Nigg Kirk Road	Craigshaw Drive	Northbound	Footway	3m, with 0.5m separation from carriageway
Craigshaw Drive	Altens Farm Road Bus Stop (BS8)	Southbound	Footway	2m, with no separation from carriageway
Altens Farm Road (SB) Bus Stop (BS8)	Hareness Road	Southbound	Footway	2m, with 1m separation from carriageway
Hareness Road	Souter Head Road	Southbound	Shared Use footway/cycleway (unsegregated)	2m, with 1m separation from carriageway
Souter Head Road	Langdykes Road	Southbound	Shared Use footpath/cyclepath (unsegregated)	2m, off-carriageway

Langdykes Road	Charleston Road North Junction	Southbound	Shared Use footway/cycleway (partially segregated)	2m, with 1m separation from carriageway

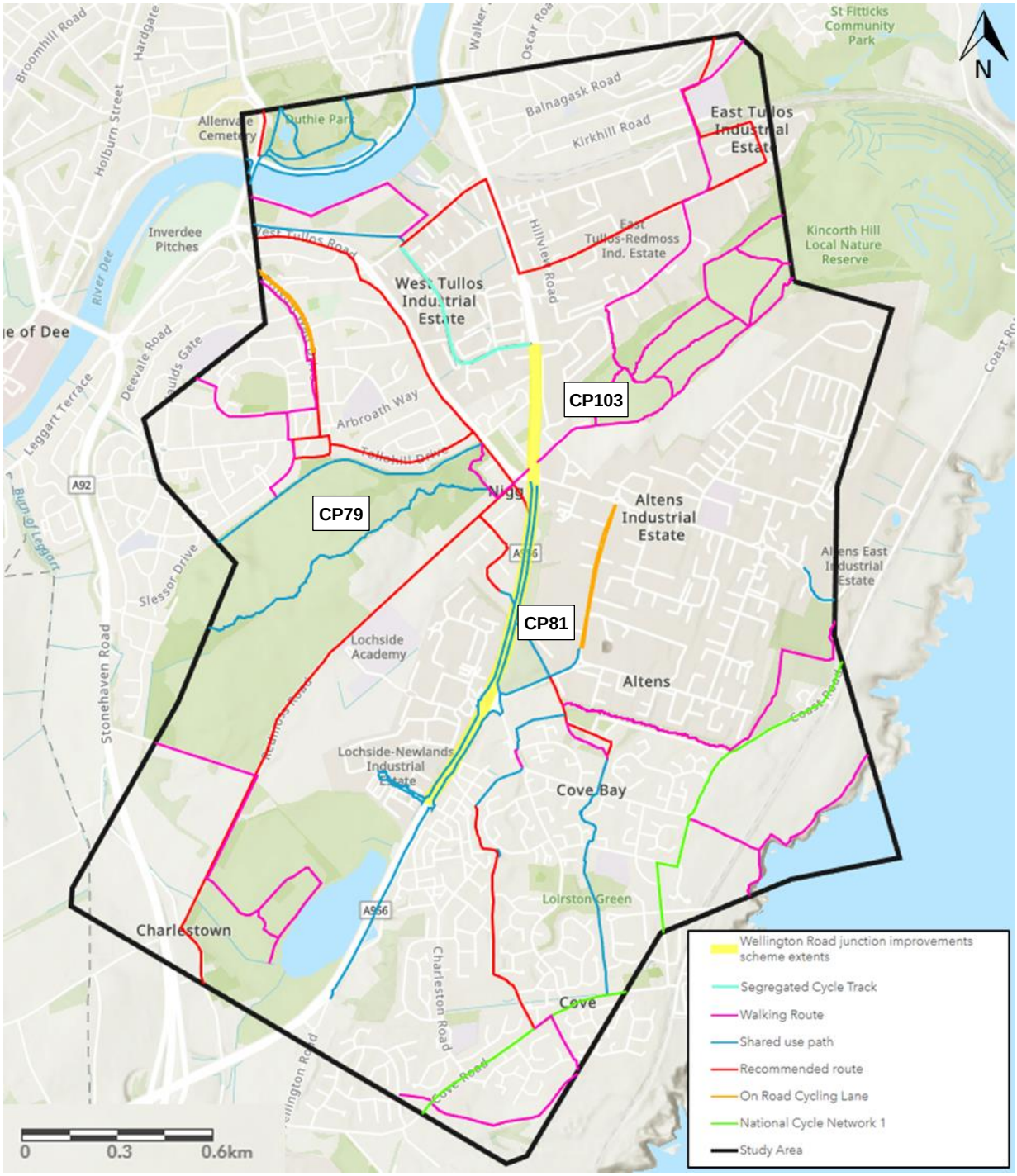


Figure 2-4: Existing pedestrian, cyclist, and equestrian facilities around Wellington Road

Designated Active Travel Routes

2.4.5. There are three routes in the study area which have been designated as core paths (CP) by ACC[1]. These are CP79 - Kincorth Hill, CP81 - Cove Road and CP103 - North Balnagask Road to Wellington Road.

2.4.6. To the north of the study area there is a 3.7km circular route around Kincorth Hill (CP79). This can be accessed via West Tullos Road from Hareness Roundabout. This route is made up of trodden earth, dust, and tarmac sections of the path, generally in good condition with varying gradients.

2.4.7. Situated close by to CP79 is the North Balnagask Road to Wellington Road Core Path (CP103). This can be accessed from the southbound footway of Wellington Road north of Hareness Roundabout. This is a long linear route running at the edge of both residential and industrial areas, flat in gradient and mostly positioned on roads and pavements. This route provides connections to the communities of Torry, Balnagask and Kincorth and links onwards to St Fitticks Church, Nigg Bay Golf Course and Tullos Hill.

2.4.8. Cove Road Core Path (CP81) can be accessed by the southbound footway on Wellington Road, approximately 600m south of Hareness Roundabout. It has been identified as a popular route with connections to Loriston Primary School & Community Education Centre. The route is tarmac, generally in good condition with varying gradients and thought to be wheelchair accessible. It travels within green space and is well linked to bus stops.

Existing Active Travel Standards

2.4.9. Existing footways and shared use footway/cycleways on Wellington Road are relatively inconsistent and are a result of various upgrades to the existing provision (for example at Charleston Road North Junction), and re-designating of existing footway as shared use.

2.4.10. The existing active travel provision has been assessed against Transport Scotland's Roads for All[2] and Cycling by Design[3] guidance to identify where there is potential for improvements.

2.4.11. Due to the relatively straight and flat nature of Wellington Road, the existing active travel facilities broadly comply with requirements for horizontal curvature and longitudinal gradient. However, between Hareness Roundabout and Craigshaw

[1] Core Paths Plan, Aberdeen City Council 2009
[2] Roads for All, Transport Scotland 2013
[3] Cycling by Design, Transport Scotland 2021

Drive signalised crossroads the road has a longitudinal gradient of between 5 and 7%, which exceeds the maximum recommended gradient for footways which is 5% (1 in 20).

2.4.12. Cycling by Design states that the absolute minimum width for a cycle track adjacent to carriageway which is shared with pedestrians should be 2.5m (in each direction). Additionally, it is stated that a minimum 1.0m buffer (separation from the edge of the carriageway traffic lane) should be provided. With reference to *Table 2.10*, it is noted that a majority of the existing shared use paths are not compliant.

2.4.13. The existing footways at the north of the scheme mostly comply with the absolute minimum 1.5m width recommended in Roads for All. However, there are short sections where the footway width reduces less than this value due to localised constraints. For example, at Altens Farm Road southbound bus stop (BS8) there is effectively no unobstructed footway width, as the bus stop shelter is positioned within the 2m footway.

2.5. Existing Traffic Conditions

2.5.1. The following observations from site visits during peak periods in March 2023 were made:

- Queues on northbound and southbound approaches (Wellington Road) of Souterhead Roundabout in both peak periods, most notably northbound in the AM;
- Queues on the east arm (Hareness Road) of Hareness Roundabout in the PM peak due to the heavy southbound movement on Wellington Road;
- Queues on the north east arm (Souterhead Road) of Souterhead Roundabout in the PM peak due to the heavy southbound movement on Wellington Road;
- Queues on the southeast arm (Langdykes Road) of Souterhead Roundabout in the AM peak due to the heavy southbound movement on Wellington Road and current signal settings; and
- Queueing on the south and north arm of Charleston Road North junction in the AM peak, during the red phase during the signal cycle. Queueing from the Souterhead roundabout can block back into Charleston Road North junction and queueing on the north arm can stretch up to Souterhead Roundabout.
- For safety reasons, it is perceived vulnerable users such as cyclists would benefit if segregated from motorised vehicles.

- For safety reasons, it is perceived pedestrian crossings should be more reactive to minimise crossing outside the pedestrian phases.

2.5.2. *Figure 2-5* and *Figure 2-6* present typical peak period weekday traffic speeds on Wellington Road as reported by Google Maps in January 2024.

Figure 2-5: Typical Traffic Speeds – Google Maps – Tuesdays 8:00 AM

Figure 2-6: Typical Traffic Speeds – Google Maps – Tuesdays 17:00 PM

2.5.3. *Figure 2-7* presents automatic traffic count data from a permanent ACC counter situated on Wellington Road to the north of the study area and south of the River Dee Crossing. A comparison is given between weekday two-way traffic flow data in October 2019 and October 2022.

2.5.4. This data shows a reduction in flows between 2019 (pre-pandemic) and 2022 (post-pandemic) of around 11% throughout a 24-hour period with the PM peak period to exhibiting the highest hourly two-way flow, approaching 1400 vehicles.

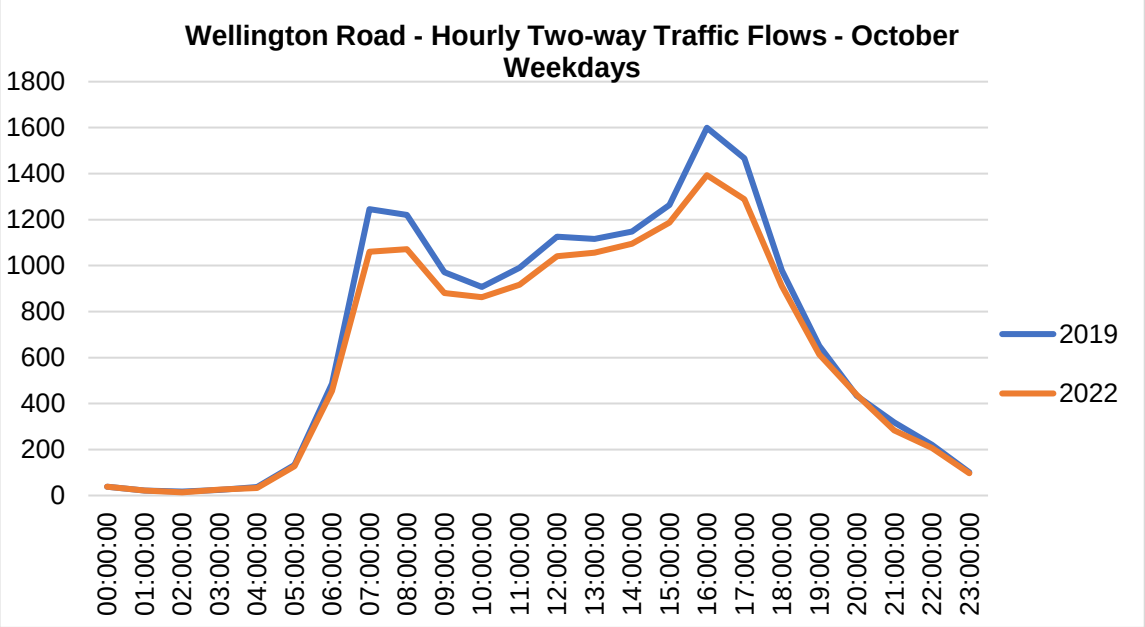


Figure 2-7: Two-way Traffic Wellington Road (South of River Dee Crossing)

Existing Personal Injury Accidents

2.5.5. Personal injury collision data was obtained from Aberdeen City Council for the road network in the vicinity of the site. In the 4 years from January 2018 to December 2022, there were a total of 3 reported collisions. Two of these incidents occurred on Crawpeel Road, east of Hareness Roundabout, both were categorised as slight. The other incident occurred at the signalised crossroads of Wellington Road (A956), Craigshaw Drive and Altens Farm Road, categorised as serious. The location of each of these incidents is shown in *Figure 2-8*.

2.5.6. The incident categorised as serious, located at the north side of the signalised crossroads of Wellington Road (A956), Craigshaw Drive and Altens Farm Road, involved a pedestrian and a vehicle. The incident occurred as a lorry travelling southbound on Wellington Road (A956) stopped at the junction on the inside lane. As the pedestrian began to cross in front of the lorry the lights changed from red to green and another vehicle on the outside lane continued to accelerate through the junction. It was at this point the pedestrian was struck by the vehicle. The pedestrian was taken by emergency services to Aberdeen Royal Infirmary for her injuries to be assessed.

2.5.7. The incident identified as the northern green dot on Hareness Road involved a cyclist and was categorised as slight. The incident occurred on the roundabout of Hareness Road and Crawpeel Road in July 2019. The incident was caused by a car driver failing to give way to a cyclist travelling around the roundabout. The

car collided with the rear wheel of the bicycle causing the cyclist to fall from his bike and suffer cuts and scrapes.

2.5.8. The incident identified as the southern green dot on Crawpeel Road involved two vehicles, one being a motorcycle, and was categorised as slight. The incident occurred February 2022, approximately 150m south of the Crawpeel Road and Hareness Road junction. A car travelling northbound on Crawpeel Road, pulled into the nearside carriageway without signalling and then began to perform a U-Turn manoeuvre to travel southbound. It was at this time the motorcycle, collided with the car propelling the rider from his vehicle onto the carriageway.

Figure 2-8 - Reported incidents within the vicinity of the scheme (2018-2022)

Bus Services

2.5.9. There are a total of eight bus stops along Wellington Road as listed in *Table 2.9*. Currently, these stops are serviced by seven First buses and five Stagecoach buses. Details of these services are shown in *Table 2.11* and in Figures D2.7 and D2.8 in Appendix D, based on current available timetable information:

Table 2.11 – Bus Services

SERVICE	OPERATOR	ROUTE	CALLS AT (See *Table 2.9*)	HOURS OF OPERATION	FREQUENCY
X8	Stagecoach	Aberdeen-Stonehaven Express	BS3, BS4, BS5, BS6, BS7, BS8	Monday to Friday: 4am-9pm	30 mins
				Saturday: 6am-9pm	60 mins
				Sunday: 8am-10pm	60 mins
3	First	Mastrick – Cove (Thistle)	BS3, BS4, BS5, BS6, BS7, BS8	Monday-Friday: 5am-11pm	30 mins
				Saturday: 6am-11pm	30 mins
				Sunday: 7am-11pm	30 mins
3A	First	Mastrick – Charleston (Thistle)	BS1, BS3, BS4, BS5, BS6, BS7, BS8	Monday-Saturday: 7am-10pm	30 mins
3B	First	Mastrick – Cove (Thistle)	BS4, BS6, BS8	Monday to Friday: 8am-9am	30 mins
3S	First	(School Service): Victoria Bridge: Lochside Academy	n/a	Monday to Friday: 8am and 4pm only	Daily
17S	First	(School Service): Faulds Gate Terminus – Lochside Academy via Cairngorm Drive and Gardner Drive	n/a	Monday to Friday: 8am and 3pm only	Daily
18A	First	Charleston/Redmoss – Dyce (Northern Lights)	BS3, BS4, BS5, BS6	Monday to Friday: 6am-7pm	20 mins
				Saturday: 6am-7pm	30 mins
18S	First	(School Service): Duthie Park – Lochside Academy via Abbotswell Primary and Cairngorm Drive	n/a	Monday to Friday: 8am and 3pm only	Daily
7S	Stagecoach	(School Service): Aberdeen Union Sq. – Stonehaven	n/a	Monday to Friday: 7am and 4pm only	Daily
21A	Stagecoach	(School Service): Cove, Earns Heugh	n/a	Monday to Friday: 8am and 4pm only	Daily

		Road – Lochside Academy			
22A	Stagecoach	(School Service): Torry – Lochside Academy	n/a	Monday to Friday: 8am and 4pm only	Daily
				Wednesday to Friday: 3pm only	Daily
22B	Stagecoach	(School Service): Torry – Lochside Academy	n/a	Monday to Friday: 8am and 4pm only	Daily

Key Trip Generators

2.5.10. Wellington Road serves multiple residential communities, retail parks and industrial estates, which results in varying types and levels of traffic at different times of the day. The key trip generators are shown in *Figure 2-9*.

2.5.11. It is anticipated that the majority of active travel trips on Wellington Road within the scheme area would be local residents travelling between the residential communities and local commercial, institutional, park and leisure facilities.

2.5.12. In the future, Wellington Road will be the primary access route to the Loriston Loch development situated immediately south of the scheme extent at Charleston Road North. The approved masterplan includes for 1,500 homes and eight hectares of employment land.

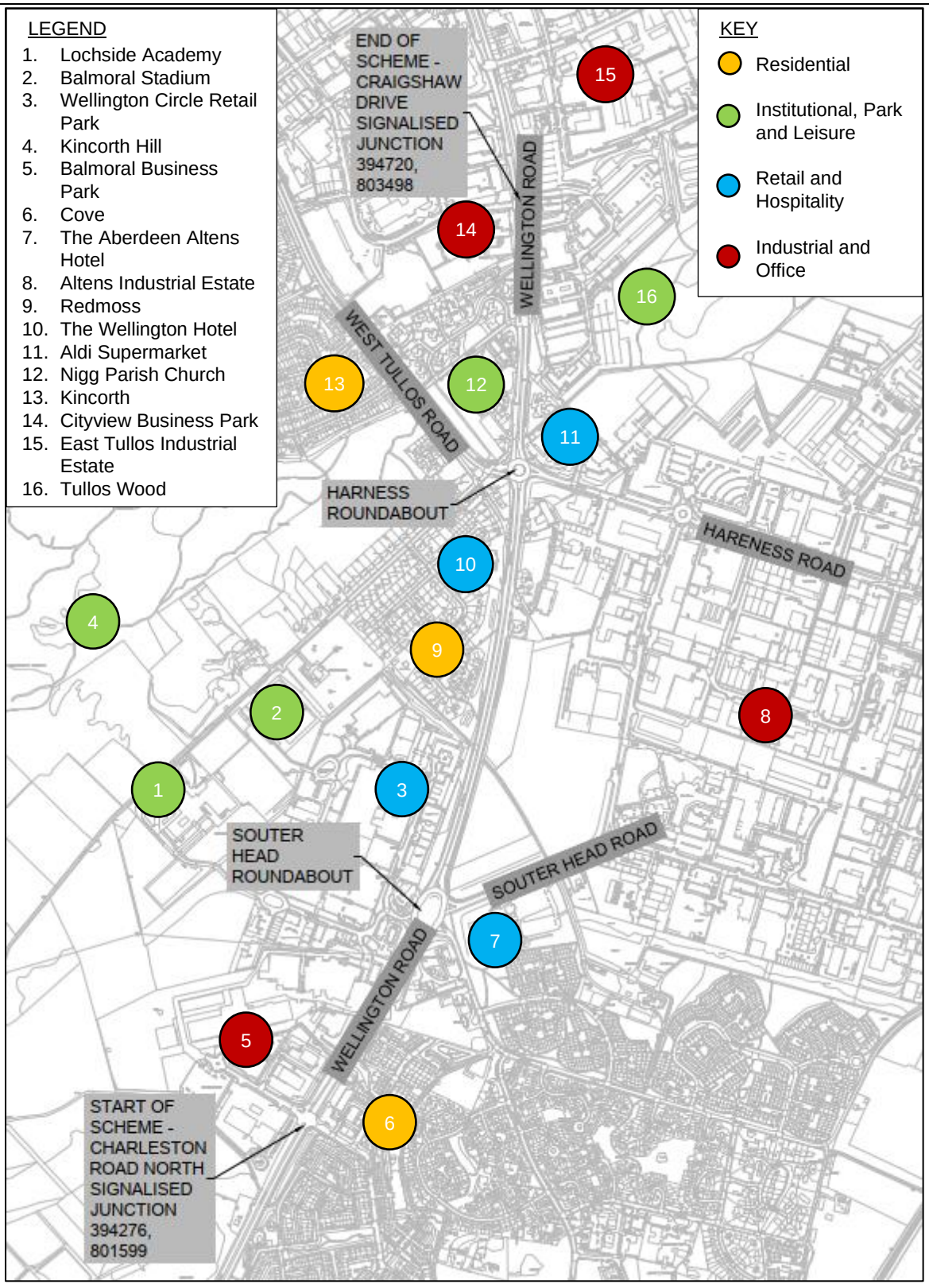


Figure 2-9 – Key Trip Generators (Mapping © Crown Copyright and database rights 2023 Ordinance Survey 100030649)

Schools

2.5.13. Wellington Road is a crucial link for students travelling to local schools by foot/cycle, public transport and private car. Schools and catchment areas in the vicinity of the scheme are shown in *Figure 2-10*.

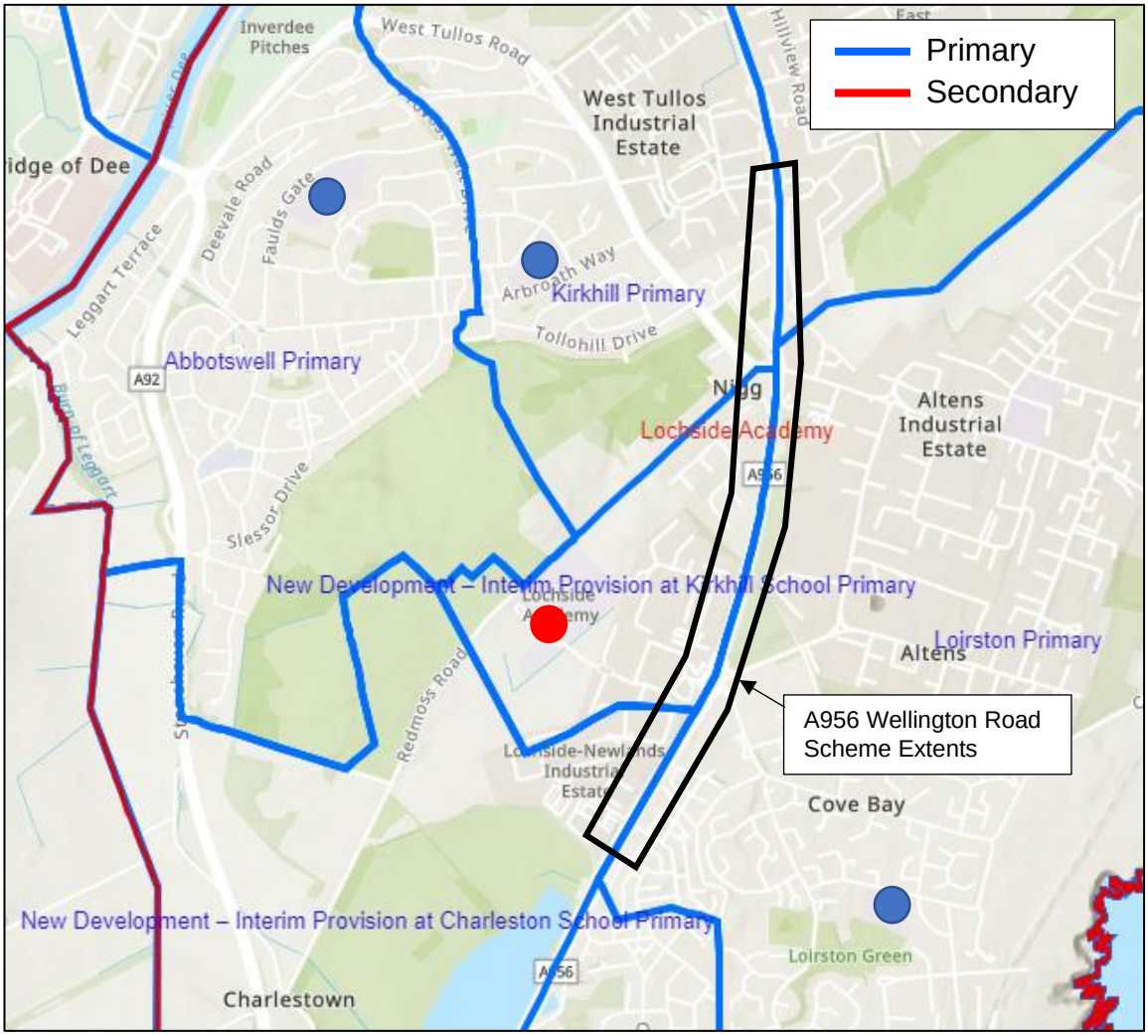


Figure 2-10 - Schools and catchment areas in vicinity of the scheme (Mapping © Esri, Intermap, NASA, NGA, USGS | Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS | Andrew Jones)

2.5.14. *Table 2.11* previously shows that there are numerous dedicated school bus services along Wellington Road, and the existing active travel facilities allow for onward connection to local schools.

2.5.15. Specifically, Lochside Academy is situated off Souter Head Roundabout, and the most direct route from Cove residential community to the school by foot and cycle is to use the active travel facilities on Wellington Road between Charleston Road

North and Souter Head Roundabout. Students travelling from Redmoss or Nigg are likely to use the more direct Redmoss Road.

2.6. Drainage

2.6.1. The road drainage systems along Wellington Road consist mainly of kerb and gullies, and combined kerb drainage.

2.6.2. Gullies on the existing A956 Wellington Road collect surface water runoff and link to sub-surface carrier drains that form the local drainage network.

2.6.3. Existing footpaths drain over the edge into the adjacent grass verge, with gullies provided at some locations.

2.6.4. Filter drains are provided at the toe of existing slopes, to the rear of some existing footpaths.

2.7. Public Utilities

2.7.1. To inform the assessment the New Roads and Street Work Act 1991 (NRSWA) procedure was followed with utility providers contacted as required (C2 enquiry) to identify the presence and locations of any apparatus. The companies listed below provided records that indicated their assets would likely be affected:

- British Telecom (BT)
- CityFibre
- Neos Networks (NEOS)
- Vodafone
- Scottish and Southern Energy Networks (SSEN)
- GTC
- Scotia Gas Networks (SGN)
- Indigo Pipelines
- Scottish Water (SW)

2.7.2. The locations of these utilities are shown in Figures D2.9 and D2.10 in Appendix D. All descriptions of the utilities in the following sections should be read from the southern end of the scheme extents at Charleston Road North signalised crossroads to the northern end at Craigshaw Drive signalised crossroads.

Gas

2.7.3. The existing gas network within the study area is operated by SGN and Indigo Pipelines.

SGN

2.7.4. At Wellington Circle Junction a SGN Low Pressure (LP) gas line runs along the western footway of Wellington Road for approximately 100m before connecting to a substation located on the junction of Wellington Road and the Porsche Centre Access (AC1). An SGN Intermediate Pressure (IP) gas line exits the substation and branches into two pipes, one pipe heads along the southwest verge of the AC1 access for approximately 50m before connecting to another substation. The second pipe continues north across the AC1 access, running parallel to Wellington Road for approximately 320m where it diverges. One pipe crosses Souterhead Roundabout and continues northeast along Souter Head Road. The second pipe heads west along Wellington Circle Road into the retail park.

2.7.5. From the Shell Entry Access (AC5) under the southbound footway of Wellington Road a LP gas line continues north for approximately 170m before terminating at the access of Loirston House (AC10). Approximately 100m along this pipe, a branch crosses perpendicular to Wellington Road and continues north under the northbound pavement for 30m. After this point it heads northwest along Abotswell Crescent.

2.7.6. An IP gas pipe follows the line of the north-eastern verge from Hareness Road into Hareness Roundabout and then onto Wellington Road. The pipe travels north for approximately 130m under the southbound verge before diverging. One pipe travels east underneath a nearby car park. The second pipe crosses Wellington Road to the west and then directs southwest towards West Tullos Road.

2.7.7. A LP gas pipe runs along the southbound pavement of Wellington Road approximately 30m north of Nigg Kirk Road Junction. The pipe travels north for approximately 120m before crossing perpendicularly underneath Wellington Road to the west side verge. At this point the line splits, one pipe travels south under Craigpark and the second pipe continues north under the northbound verge of Wellington Road. At the southwest corner of Craigshaw Drive Junction a pipe branches off to the west along Craigshaw Drive.

Indigo Pipelines

2.7.8. Low pressure pipelines service commercial and residential properties in the Cove Bay area, east of Wellington Road and south of Souterhead Roundabout. No services were identified which directly interact with the Wellington Road corridor.

Telecoms

2.7.9. The existing telecommunications within the study area is provided by BT, CityFibre, NEOS, and Vodafone.

BT

2.7.10. At the southern end of the scheme extents, BT cables are present underneath the northbound and southbound carriageways and footways of Wellington Road. There are also two perpendicular crossings of Wellington Road prior to the Porsche Centre Access (AC1). North of AC1, BT cables continue under the northbound footway and southbound carriageway. From approximately 70m to 150m northbound of the AC1 access on Wellington Road the cables cross from the southbound carriageway to the northbound footway. At this point, the cables divert with one line continuing north under the northbound verge towards Souterhead Roundabout. The second line directs back across Wellington Road in a north-easterly direction for approximately 150m into the southbound verge.

2.7.11. At Souterhead Roundabout, BT cables run along the footways on both sides of the carriageway into Wellington Circle and Langdykes Road and the southern verge of Souter Head Road. A line passes through the eastern side of the roundabout from south to north. This is met by a cable coming from Wellington Circle which crosses Wellington Road north of the roundabout and a cable from Langdykes Road which travels north across Souter Head Road. The three cables converge in the southbound footway of Wellington Road, approximately 30m north of the southbound entry into Souterhead Roundabout.

2.7.12. One line continues north of Souterhead Roundabout, travelling under the southbound footway and verge for approximately 820m until the approach to Hareness Roundabout. Approximately 280m along this route, there is a perpendicular crossing of Wellington Road. The BT line follows the footpath which connects the wooded area to the east of Wellington Road and north of Souterhead Roundabout to the footpath on the west of Wellington Road which travels in a north-westerly direction towards Campbell's Croft. Approximately 40m north of Hillview Cottage, a BT line crosses Wellington Road in a north-westerly direction into Abotswell Crescent.

2.7.13. On approach to Hareness Roundabout, the BT line continues north under the southbound footway and verge. There is a perpendicular crossing to the west across the southern edge of the roundabout and then onto West Tullos Road and a cable travels east along Hareness Road. Heading north, the cable crosses the roundabout to the north-eastern corner, underneath the footway and verge as it passes Aldi.

2.7.14. North of Hareness Roundabout the BT line continues under the footway and verge of the southbound carriageway until approximately 190m north of the southbound entry into Hareness Roundabout where it crosses Wellington Road into the northbound footway. 20m north of this point a second line crosses Wellington Road from the east. For approximately 110m north of this the BT cable is present only in the northbound footway and verge. At this point, a branch crosses Wellington Road in a north-easterly direction back to the southbound footway. North of this, there are cables present in both the northbound and southbound footways heading north towards Craigshaw Drive and the northern extents of the scheme. There is crossing of Wellington Road at Craigpark access AC14.

CityFibre

2.7.15. CityFibre has cables under both the northbound and southbound footways between the southern end of the scheme extents and the Porsche Centre Access AC1. At AC1, the line under the northbound footway heads west and ends. Under the southbound footway, the cable continues north until Souterhead Roundabout, where it follows the south-eastern footway into Langdykes Road. In the northbound footway a CityFibre cable is re-introduced approximately 90m north of AC1. This continues north until Souterhead Roundabout, where it follows the southwestern footway into Wellington Circle. There are two locations within this section where the CityFibre cables cross Wellington Road at a perpendicular angle. The first is approximately 30m north of Wellington Circle Junction and the second is approximately 60m south of Souterhead Roundabout. CityFibre cables are located within the footway on both sides of Langdykes Road and follow the footway north until Souter Head Road where it travels east.

2.7.16. There are no CityFibre cables from Souterhead Roundabout heading north until approximately 20m south the private access AC9. At this location, there are two CityFibre cables crossing Wellington Road from the northbound footway to the southbound footway. One cable continues north in the southbound footway towards Hareness Roundabout where it then follows the south-eastern footway onto Hareness Road. There is also CityFibre cable in the eastbound footway of Hareness Road which follows the north-eastern footway of Hareness Roundabout onto Wellington Road.

2.7.17. From Hareness Roundabout heading north, there are CityFibre cables in both the northbound and southbound footways. In the northbound footway, the cables continue until the access into Craigpark AC14. In the southbound footway, the cables continue to the northern end of the scheme extents at Altens Farm Road Junction JC5. There are two perpendicular crossings of Wellington Road, approximately 180m and 190m north of the northbound exit of Hareness Roundabout.

NEOS

2.7.18. Between Charleston Road North Junction JC1 and Souterhead Roundabout NEOS has fibre optic cables present within BT ducts. From JC1, the line heads north under the southbound carriageway for approximately 210m at which point it diverts to the northbound verge over a distance of approximately 90m. From this point, the line crosses Wellington Road in a north-easterly direction to the southbound footway over a distance of approximately 140m connecting to a NEOS chamber. NEOS also has fibre optic cable within BT ducts on Langdykes Road. From the intersection of Farmer Allan's Track and Langdykes Road, the fibre optic line runs north for approximately 230m under the northbound footway where it connects to a NEOS chamber.

2.7.19. NEOS have underground cables present from the northbound approach to Souterhead Roundabout until the northern extents of the scheme. A line crosses Langdykes Road approximately 50m prior to the northbound entry of Souterhead Roundabout and heads north to Souter Head Road under the grassed area between the footpath and Aberdeen Altens Hotel. The line then heads east along Souter Head Road under the westbound footway.

2.7.20. On Wellington Road a NEOS line follows the southbound verge north for approximately 100m into Souterhead Roundabout and onto Langdykes Road. Approximately 15m south of the southbound exit of Souterhead Roundabout the line splits and the second branch crosses Wellington Road perpendicularly to the northbound footway. From this point the line travels north across Souterhead Roundabout and then parallel to Wellington Road for 850m underneath the northbound verge. At this point the line travels northwest onto Abbotswell Crescent heading towards West Tullos Road. At the junction of Redmoss Road, Abbotswell Crescent and West Tullos Road, the line splits with one branch continuing northwest along West Tullos Road. The second branch travels east towards Hareness Roundabout, crossing Wellington Road and Hareness Road. From this point within the southbound verge of Wellington Road, the line continues north for 550m where it connects to a NEOS chamber.

2.7.21. On Hareness Road a NEOS line travels west for a distance of approximately 150m underneath the westbound footway and carriageway. At the junction of Hareness Road and Altens Farm Road the line crosses Hareness Road and travels north along Altens Farm Road. At the turning head on Altens Farm Road, the line crosses back onto Wellington Road and continues north underneath the southbound carriageway for approximately 345m up to and beyond Altens Farm Road JC5 and the northern extents of the scheme.

Vodafone

2.7.22. Between Charleston Road North Junction JC1 and Souterhead Roundabout a Vodafone cable runs under the southbound footway and verge. There are two branches off this line, which cross Wellington Road perpendicular to the carriageway. The first is located at Wellington Circle Junction JC1, the Vodafone cable heads west along Wellington Circle. The second is approximately 20m south of the northbound entry to Souterhead Roundabout, the cable follows the southwestern footway of the roundabout into Wellington Circle.

2.7.23. There are Vodafone cables around all arms of Souterhead Roundabout. There are cables in the verge and footway on both sides of Langdykes Road which continue north along the footway across Souter Head Road, with two connections into the line running along the northern verge of Souter Head Road. Cables run along the western side of Souterhead Roundabout, crossing Wellington Circle and Wellington Road. Three lines continue north, two within the northbound footway and one within the southbound footway. This continues for the full length of Wellington Road between Souterhead and Hareness roundabouts. There are connections into these lines at Abotswell Crescent and Loirston House. There is one perpendicular crossing of Wellington Road approximately 10m south of the northbound entry into Hareness Roundabout.

2.7.24. The Vodafone lines continue north on both sides into Hareness Roundabout crossing both West Tullos Road and Hareness Road. Vodafone cables within both footways of Hareness Road connect to the line within the southbound footway. North of Hareness Roundabout, there is a Vodafone line within both the northbound and southbound footway up to and beyond the northern extents of the scheme. There are two perpendicular crossings of Wellington Road within this section, approximately 20 and 50m south of the access into Craigpark (AC14).

Electricity

2.7.25. The existing electricity network within the study area is provided by SSEN and GTC.

2.7.26. The SSEN apparatus comprises of 11kV, 33kV, 132kV overhead (OH), a 132kV cable, fibre optic cabling and low voltage mains.

2.7.27. The GTC apparatus comprises of 11kV, 33kV, 33kV (proposed), live cabling and service cabling.

SSEN (132kV OH and 132kV Cables)

2.7.28. Between Charleston Road Junction and Souterhead Roundabout, there is a 132kV OH cable that is approximately located 50m south of the northbound entry to Souterhead Roundabout. The OH line starts within the substation located to the southeast of the roundabout and extends westward across Wellington Road and continues west.

2.7.29. From the same substation, a 132kV cable exits the substation and travels north from the south-eastern corner of the Souterhead Roundabout and crosses under the carriageway of Langdykes Road. The cable then heads north within the verge between Souterhead Roundabout and the footway connecting Langdykes Road and Souter Head Road. The 132kV cable crosses under Souter Head Road at the roundabout and then under the southbound lane of Wellington Road before reaching the northbound verge of Wellington Road, approximately 70m north of the northbound exit from Souterhead Roundabout. From this location, the cable continues along the verge northwards for approximately 230m. Over the next 240m the cable gradually heads northeast across Wellington Road into the southbound carriageway approximately 70m south of the Shell Petrol Station Exit access (AC4). The cable then continues northwards for another 150m before crossing northwest under Wellington Road and along Abbotswell Crescent where it extends towards West Tullos Road.

SSEN (33kV Cable)

2.7.30. From the southern end of the scheme extents heading north along Wellington Road, a 33kV cable travels under the southbound footway until entering the substation located to the southeast of Souterhead Roundabout. There is a perpendicular crossing of Wellington Road approximately 20m south of the northbound entry into Souterhead Roundabout. The lines cross Wellington Circle and continue north approximately 30m west but parallel to Wellington Road. There are multiple 33kV lines from the substation onto Langdykes Road. These head north towards Souter Head Road within the grassed area between the footway and the Aberdeen Altens Hotel, east along Souter Head Road and south down Langdykes Road.

2.7.31. North of Souterhead Roundabout, the 33kV lines continue in the land parallel to Wellington Road. Over a distance of approximately 200m, the lines move closer to Wellington Road and ultimately are within the northbound footway approximately 450m north of the northbound exit of Souterhead Roundabout. This continues for approximately 250m at which point the lines divert away from Wellington Road in a north-westerly direction onto Abbotswell Crescent.

2.7.32. Approximately 190m north of the southbound entry into Hareness Roundabout from Wellington Road, 33kV enter the southbound carriageway from the east. These continue north under the carriageway up to and beyond the northern extent of the scheme.

SSEN (11kV Cable)

2.7.33. SSEN 11kV cables run north under both the northbound and southbound footways of Wellington Road from the southern end of the scheme extents until Souterhead Roundabout. There are two perpendicular crossings of Wellington approximately 20 and 30m south of the northbound entry into Souterhead Roundabout. The 11kV lines follow the verge into Souterhead Roundabout and then onto Wellington Circle and Langdykes Road. The line within the southbound verge continues north, crossing Langdykes Road and Souter Head Road at the give way line into Souterhead Roundabout.

2.7.34. There are multiple 11kV lines from the substation onto Langdykes Road located on the southeast corner of Souterhead Roundabout. Several of these head north towards Souter Head Road between the grassed area between the footway and the Aberdeen Altens Hotel and then east along Souter Head Road.

2.7.35. Between the southbound entry of Souterhead Roundabout and southbound exit of Hareness Roundabout there is an 11kV line within the southbound footway of Wellington Road. There are two perpendicular crossings of Wellington Road approximately 10m south of the northbound entry into Hareness Roundabout. 11kV cables are located within both footways of Hareness Road and the southern footway of West Tullos Road. The 11kV lines continue through Hareness Roundabout, crossing Hareness Road and West Tullos Road. There is a perpendicular crossing of Wellington Road at the northbound exit with multiple lines heading northeast towards Aldi.

2.7.36. 11kV cables head north on Wellington Road from Hareness Roundabout within both the northbound and southbound footways. Approximately 240m north of the northbound exit the 11kV line within the northbound footway crosses perpendicular to Wellington Road into the central reserve. The line continues

under the central reserve for approximately 150m before it crosses Wellington Road into the southbound footway. The lines continue north under the southbound footway up to and beyond the northern extents of the scheme.

SSEN (Fibre Optics)

2.7.37. Fibre Optic cables run north along Wellington Road from the southern extent of the scheme under the southbound footway for approximately 200m. Over the next approximately 80m the cables direct towards the central reserve. At this point, they diverge and cross both sides of the carriageway into the northbound and southbound footways. There are two perpendicular crossings of Wellington Road approximately 10 and 20m south of the northbound entry to Souterhead Roundabout. There are multiple fibre optic lines from the substation onto Langdykes Road. These head north towards Souter Head Road within the grassed area between the footway and the Aberdeen Altens Hotel, east along Souter Head Road and south down Langdykes Road. There are also multiple lines crossing Wellington Circle.

2.7.38. North of Souterhead Roundabout fibre optic cables are present under both the northbound and southbound footways and the northbound verge of Wellington Road. Fibre optic cables cross Wellington Road from the northbound to southbound footway and ultimately back across to the northbound footway across the length of Wellington Road between Souterhead and Hareness Roundabouts. Cables diverge to Abbotswell Crescent and there are two perpendicular crossings of Wellington Road approximately 30m and 10m south of the northbound entry into Hareness Roundabout.

2.7.39. Multiple fibre optic cables cross Hareness Roundabout from West Tullos, Wellington Road and Hareness Road. North of Hareness Roundabout there are multiple fibre optic lines running north under both the northbound and southbound carriageways, footways and verges. This continues up to and beyond the northern extent of the scheme.

SSEN (Low Voltage Mains)

2.7.40. Low Voltage Mains (LV) are present in the southbound footway and northbound verge of Wellington Road between the southern end of the scheme extents and Porsche Centre Access (AC1). There is a perpendicular crossing of Wellington Road approximately 30m south of the northbound entry into Souterhead Roundabout. There is an approximately 300m long line under the southbound footway from the Shell Petrol Station exit (AC4) heading north beyond Loirston House. There are also two perpendicular crossings on this LV line, one into the

Wellington Hotel and another approximately 30m south of the northbound entry into Hareness Roundabout. LV lines cross Hareness Roundabout from the southwestern corner, north across West Tullos Road then east across Wellington Road into Aldi. A LV line runs north of Hareness Roundabout under the central reserve of Wellington Road with several branches heading west into the adjacent properties. North of Nigg Kirk Road there is a LV line under both the central reserve and northbound footway up to and beyond the northern extent of the scheme.

GTC (33kV Cables)

2.7.41. Between Charleston Road Junction and Souterhead Roundabout, GTC has live and proposed 33kV cables running parallel with Wellington Road along the verge of the southbound footway. The cables continue from Whitehills Close located to the east of Wellington Road and then divert north at a point 130m north of Charleston Road Junction, opposite AC1 access. The 33kV cables continue northwards for approximately 100m before continuing eastwards.

GTC (other apparatus)

2.7.42. GTC has other assets such as 11kV cabling, live cabling and service cabling located around Charleston Road Junction although these assets remain outwith the scheme.

Water Supply and Sewage

2.7.43. Properties throughout Wellington Road are served by SW.

2.7.44. The SW apparatus comprises a distribution main, trunk main, foul main, surface water channels and combined sewer.

SW (Distribution main, Trunk main and Foul main)

2.7.45. At Wellington Circle Junction, a water distribution main is located under the northbound footway, crossing under the Wellington Circle carriageway before continuing northwards under the northbound footway of Wellington Road. This distribution main continues for approximately 40m before diverting under the southbound carriageway of Wellington Road. There is a connection with a trunk main located at the AC1 access. The trunk main splits here with one pipe heading northwest further into the access. The other trunk main pipe continues northwards under the northbound footway of Wellington Road for approximately 80m before connecting to a Scottish Water Box and another distribution main. Both trunk and distribution mains continue north for 130m at the rear of the buildings located to

the west of Wellington Road where the distribution main connects to a hydrant. The trunk main continues before diverting and splitting under the carriageway of Wellington Circle with one pipe entering the retail park and the other continuing northbound.

2.7.46. The trunk mains, located under the west verge of Souterhead Roundabout, continues northbound before diverting northwest and running parallel with the buildings located between Wellington Circle and Wellington Road. Approximately 60m north of the northbound exit of Souterhead Roundabout the trunk main splits with another pipe being diverted east under the carriageway of Wellington Road and under the southbound footpath where it then diverts south splitting into two distribution mains that travel along Souter Head Road and Langdykes Road.

2.7.47. From the point approximately 60m north of Souterhead Roundabout the pipe line continues northwards along the edge of the properties adjacent to Wellington Road until it reaches the footpath that travels northwest towards Campbell's Croft. From this connection, the trunk main continues north for a further 80m under the northbound footway of Wellington Road before connecting to another hydrant and distribution main. Both trunk and distribution mains continue under the northbound footpath for a further 160m before a converging point where a foul main crosses the trunk and distribution main from southwest to northeast. At this point, the distribution main splits with one pipe continuing northwards under the northbound footway alongside the trunk main. The other pipe crosses under the Wellington Road carriageway and continues north under the southbound footway until 30m north of AC10 access where it connects with a hydrant and another trunk main. From the converge point under the west footpath the trunk and distribution mains continue north for a further 160m before the distribution mains divert northwest along Abbotswell Crescent, servicing the housing in this area. The trunk main continues north under the northbound footway until reaching Hareness Road Roundabout where it diverts under the carriageway and splits with one pipe continuing west along West Tullos Road while the other continues north under the southbound footway of Wellington Road.

2.7.48. Around Hareness Road Roundabout there are two distribution mains connections to the trunk mains located under the roundabout. One connection starts at the southeast corner of Hareness Road Roundabout and continues along the south footpath of Hareness Road further east. The other connection is from the trunk main located on the northern footpath of West Tullos Road to the west; this distribution mains diverts south towards Abbotswell Crescent and then further northwest into a wider network. Also located at the roundabout is a foul main which extends from the eastbound carriageway of Hareness Road and continues around the northeast of the roundabout before diverting north under the

southbound carriageway of Wellington Road. From here the foul main diverts northeast towards Altens Farm Road.

2.7.49. Between Hareness Road Roundabout and Craigshaw Drive Junction, a trunk main continues for the full length of this section under the eastern footpath of Wellington Road with two distribution mains connections. The first connection point is located approximately 10m north of Nigg Kirk Junction which diverts southwest along Nigg Kirk Road supplying housing in this area. The second connection point is located approximately 10m north of Craigpark which diverts southwest along Craigpark supplying housing in this area.

SW (other apparatus)

2.7.50. SW has other assets such as surface water, combined sewer and service connections located between Charleston Road Junction and Craigshaw Drive.

2.7.51. Between Charleston Road Junction and Souterhead Roundabout, there are two service connection pipes located at the AC1 access continuing northwest and approximately 70m south of Souterhead Roundabout to supply the nearby substation.

2.7.52. Between Souterhead Roundabout and Hareness Road Roundabout, there are multiple service connection pipes located at AC6, AC8, AC9, and AC10 supplying the nearby buildings.

2.7.53. Between Hareness Road Roundabout and Craigshaw Drive Junction, there are four service connection pipes located approximately between 50m and 140m north of Hareness Road Roundabout all supplying the nearby buildings to the west. There are an additional three connections to the east located approximately 180m north of the Hareness Road Roundabout, 10m north of Nigg Kirk Junction and 40m north of Craigpark. From Hareness Road Roundabout to Craigshaw Drive Junction there is a surface water channel that continues from under the carriageway of Hareness Road, diverting under Hareness Road Roundabout and continues north under the central reserve of Wellington Road until approximately 40m south of the junction with Craigshaw Drive. This surface water channel has multiple pipe connections along, Nigg Kirk Road, Craigpark and Altens Farm Road.

3. Development of Options

3.1. Development Process

3.1.1. The methodology adopted for the identification and assessment of scheme improvement options was undertaken in accordance with the Design Manual for Roads and Bridges (DMRB). This started with the identification of study area constraints and followed a step-by-step procedure leading to confirmation of a shortlist of route options which are described and assessed in this report.

3.1.2. The process is set out diagrammatically on the flowchart in *Figure 3-1* below.

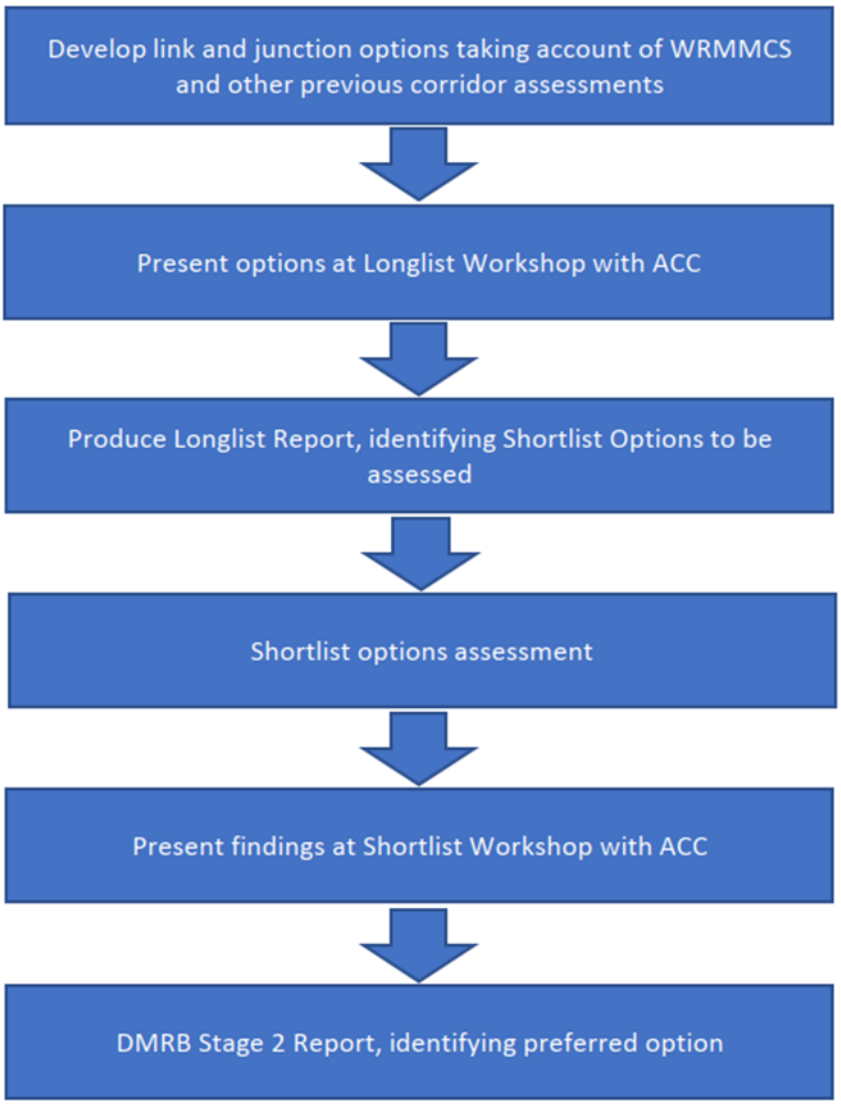


Figure 3-1 - Process for development of Options

3.1.3. The DRMB Stage 2 Option Appraisal will identify a preferred option that is expected to include a combination of different interventions providing the optimum solution to address the TPOs listed previously in *Table 1.1*. To identify the best performing and most feasible interventions, initial assessment work was split into the following components:

- Isolated junction modelling to confirm feasible junction configurations using LinSig and ARCADY;
- 2D design modelling of active travel interventions between the junctions to confirm solutions within the known cross-sectional constraints; and
- Traffic modelling to confirm the impact of dedicating existing traffic lanes for priority measures and confirm feasible solutions.

3.1.4. Isolated junction modelling and 2D active travel designs were undertaken and reported at the Longlist Options Workshop on the 4th May 2023 and summarised in the Longlist Options Report[4]. Paramics modelling was undertaken following confirmation of feasible junction options, after the Longlist Options Workshop.

3.1.5. Following this work the best performing, most feasible options were to be taken forward as a shortlist of 8 options into the DRMB Stage 2 Option Appraisal.

3.1.6. This shortlist of options was presented at the Shortlist Options Workshop on 23rd August 2023 and summarised in the Shortlist Options Report[5]. At the workshop, 3 additional hybrid options were identified which were added to the option appraisal, combining the best performing elements of the initial 8 options.

3.1.7. 11 options have therefore been identified for DMRB Stage 2 Assessment.

3.2. Design Constraints

3.2.1. The following physical features have been considered during the design process:

- Commercial, Residential and Industrial Properties: the options have been developed to avoid the need for property demolition and operational impact;
- Existing Topography: the alignments have been designed to minimise impact to adjacent embankments and subsequent earthwork import or export requirements;

[4] Wellington Road Junction Improvements – Longlist Options Assessment Report, Sweco 2023
[5] Wellington Road Junction Improvements – Shortlist Options Assessment Report, Sweco 2023

- Utilities: there are a number of underground and overhead utilities throughout the Preferred Corridor including a 132kV SSEN underground cable running adjacent to the corridor between Souterhead and Hareness roundabouts;
- Environmental Constraints: the options have been developed taking into consideration environmental receptors and noise and air quality implications of the developed options;
- Local Road Network: the options have been developed taking account of the existing local road network; and
- Junctions and Accesses: there are multiple existing direct junctions and accesses onto Wellington Road to be retained in conjunction with active travel proposals.

3.2.2. The design of the options has been developed using a topographical survey model that was received in June 2023.

3.2.3. Further survey work will be undertaken as required during the DMRB Stage 3 Assessment.

Initial Geographical Constraints

3.2.4. A desktop study, supplemented by a site visit, was undertaken to obtain details of physical constraint information adjacent to the existing Wellington Road corridor within the study area. These constraints are shown in *Figure 3-2*.

3.2.5. The potential implications of widening the existing cross-section at each identified constraint has been summarised in *Table 3.1*.

3.2.6. Where constraints are in the form of property boundary or a high value asset these have been marked red. This has informed the option refinement, with particular emphasis on minimising or avoiding impact to the highlighted key constraints.

Figure 3-2 - Corridor Constraints (©2023 Microsoft Corporation ©Maxar ©CNES(2023) Distribution Airbus DS)

Table 3.1: Corridor Constraint Implications

	Constraint	Potential Cross-Section Widening Implications
1	Embankment at shop front	• Steepened earthworks or retaining wall solution. • Impact to access steps.
2	VRS	• Re-positioning and replacement of VRS. • Hazard exacerbated by associated embankment impact. • Re-positioning of lighting column behind VRS.
3	Embankment	• Steepened earthworks or retaining wall solution.
4	Adjacent to property	• Physical impact to adjacent property outbuildings and garden. • Visual impact of introducing a potential retaining wall, closer to and in front of property.
5	Car park	• Reduce number of usable spaces available in carpark.
6	SSE Sub-station	• Diversion of high-voltage utility assets.
7	Embankment	• Steepened earthworks or retaining wall solution.
8	Embankment	• Woodland clearance required; extent exasperated by steep embankment.
9	Petrol station	• Impact forecourt and subsequently adjacent petrol pump viability.
10	Smiddy Cottage	• Physical impact to adjacent property and garden.
11	Carpark	• Clearance of planting and area adjacent to carpark. • Reduction of parking spaces. • Re-positioning of existing retaining wall.
12	Garden wall	• Steepened earthworks or retaining wall solution. • Physical impact to adjacent property garden.
13	Turning head	• Steepened earthworks or retaining wall solution. • Removal or reduction of turning head.
14	Garden wall	• Steepened earthworks or retaining wall solution. • Physical impact to adjacent property garden.
15	Adjacent to property	• Physical impact to adjacent properties.
16	Allotments	• Physical impact to adjacent allotment plots and access track.
17	Embankment	• Steepened earthworks or retaining wall solution.
18	Turning head	• Removal or reduction of turning head.
19	Cemetery	• Physical impact to cemetery. • Re-positioning of existing retaining wall.
20	Flats	• Physical impact to adjacent properties.
21	Embankment	• Steepened earthworks or retaining wall solution.

3.3. Design Criteria

3.3.1. Preliminary designs for each of the options have been developed to inform the DMRB Stage 2 assessment with the preferred option being developed further during DMRB Stage 3. For the current Stage 2 assessment, the following design criteria have been applied.

Design Speed

3.3.2. As Wellington Road (A956) is within an urban environment, the design speed is selected with reference to the speed limit of the road (DMRB CD 109, Table 2.5). A design speed of 70Akph was therefore selected based on the 40mph speed limit over the scheme extents.

Road Alignment and Layout

3.3.3. The DMRB sets out the standards to be used for the design of various elements of the scheme to ensure the layout is acceptable in terms of quality, health, safety and whole-life sustainability.

3.3.4. The improvement options have been designed in accordance with the following DMRB standards and government guidance:

- Cycling by Design 2021;
- Keeping Buses Moving: Local Transport Note (LTN) 1/97;
- DMRB CD 109 – Road link design;
- DMRB CD 127 – Cross-sections and headrooms;
- DMRB CD 123 – Geometric design of at-grade priority and signal-controlled junctions; and
- DMRB CD 116 – Geometric design of roundabouts.

Junctions

3.3.5. Existing junctions and accesses connecting to the preferred alignment will be retained and any required amendments designed to DMRB CD 123 standard during the DMRB Stage 3 assessment.

3.3.6. Any amendments to existing roundabouts will be to DMRB CD 116.

Active Travel Facilities

3.3.7. Walking and cycling links have been developed between the Charleston Road North signalised crossroad junction and Craigshaw Drive signalised crossroad

junction in line with Roads for All[6] and Cycling by Design (CBD)[7] guidance. Three types of cycle facility were considered, all of which were to be adjacent to the existing carriageway:

- Segregated with-flow – which consists of a one-way cycleway segregated from a footway;
- Segregated two-way flow – which consists of a bidirectional cycleway segregated from a footway; and
- Shared use path – which consists of a combined footway/cycleway which is unsegregated.

3.3.8. Three further cycle facility types are also discussed within CBD which have not been progressed for practicality or safety purposes:

- Mixed traffic street: inappropriate for design speed and traffic flows on the adjacent Wellington Road;
- Detached or remote cycle track: available space adjacent to the existing corridor means this is not a feasible solution; and
- Cycle lane: doesn't provide physical protection from motor traffic, providing a low level of service in relation to safety.

3.3.9. The active travel cross-sections align with the design requirements within CBD Table 3.7, with dimensions based on a peak of less than 300 cycles per hour identified from Cycling Scotland[8].

3.3.10. For the segregated cycle tracks, "Stepped cycle track (adjacent to the carriageway)" layout has been used, as shown in *Figure 3-3*, providing physical protection from motor traffic and segregation between cyclists and pedestrians (CBD, Table 3.1). Kerbed separation provides this protection without the 1.0m width recommended for cycleways at footway level and is preferred by blind and partially sighted pedestrians.

[6] Roads for All by Transport Scotland, 2013
[7] Cycling by Design by Transport Scotland, 2021
[8] Cycling Scotland (online source): https://usmart.io/org/cyclingscotland/

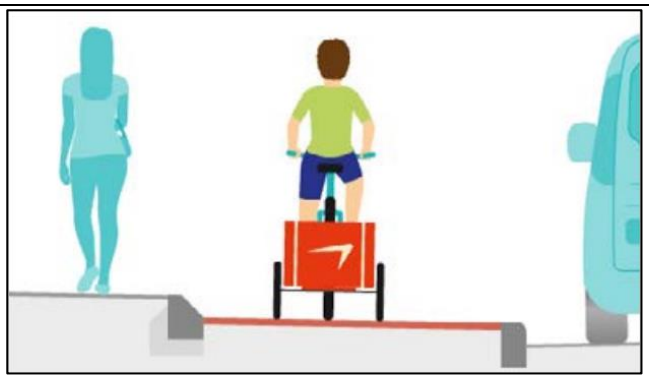


Figure 3-3 - Layout of stepped cycle track adjacent to carriageway (Cycling by Design, Transport Scotland 2021)

3.3.11. Options include a buffer from road traffic, as per CBD Table 3.8.

3.3.12. In locations where no new active travel facility is proposed, the existing provision will be maintained. The existing provision is signed as shared-use path, both northbound and southbound, between Charleston Road North and Hareness Roundabout. There is a lack of signage north of Hareness Roundabout to clarify the status of the NMU provision, however there is existing footway on both sides of the carriageway.

3.3.13. Where existing bus stops are to be retained, the cycleway will follow the 'Bus stop bypass' layout from CBD Figure 3.22 where possible, as shown in *Figure 3-4*. Where there is insufficient space to provide a bypass layout, a 'Cycle track as bus boarder' layout from CBD Figure 3.24 would be provided, as shown in *Figure 3-5*.

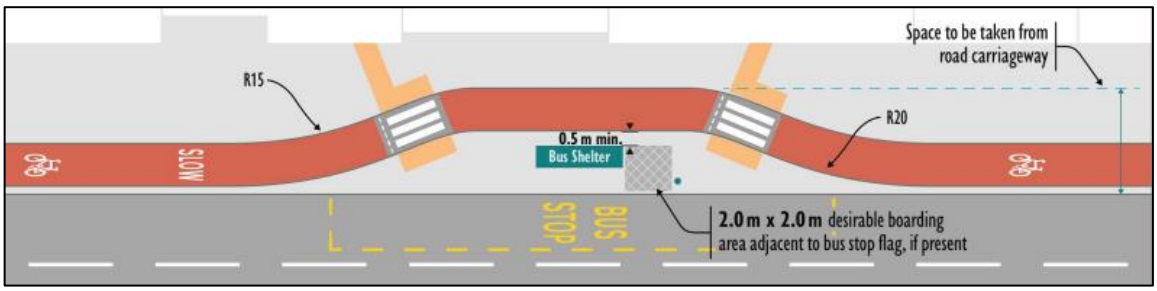


Figure 3-4 - Bus stop bypass (with island) layout (Cycling by Design, Transport Scotland 2021)

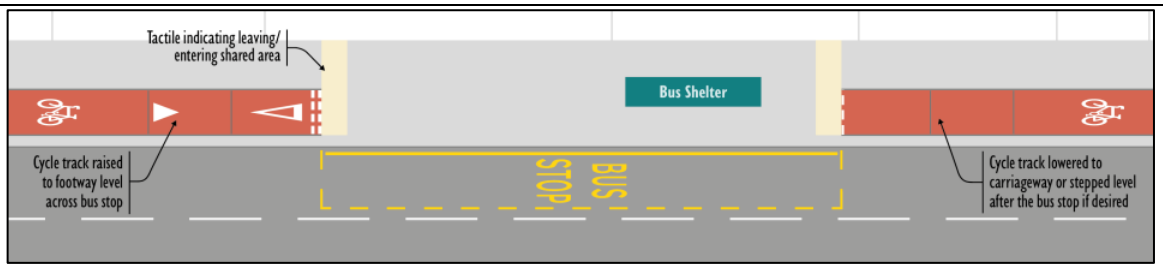


Figure 3-5 - Cycle track as bus boarder layout (Cycling by Design, Transport Scotland 2021)

Drainage

3.3.14. A preliminary assessment has been carried out identifying existing and potential tie-ins to the drainage systems which is detailed further in Chapter 4. The design would be developed further during a future DMRB Stage 3 assessment using the preferred option. An assumption has been made that there is sufficient capacity available in the existing drainage system to convey the additional run-off from new hard surface areas. It is also assumed that this additional capacity includes an allowance for Climate Change adaptation. If this is not the case, vegetated buffer strips may be required to absorb or attenuate the additional run-off. A drainage survey will be required at Stage 3 to determine the capacity of the existing system.

Earthworks

3.3.15. 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 Sweco in June 2023.

3.3.16. Other data sources that have been consulted include:

- British Geological Survey (BGS) mapping.
- Topographical survey.
- Aerial photography.
- Site Visits.

3.3.17. The following earthworks slopes have been implemented in the absence of a ground investigation and are therefore subject to review at later project stages:

- Embankments – 1m vertical and 3m horizontal (1:3 slopes).
- Cuttings – 1:2 slopes.

Pavement Design

3.3.18. The pavement design for the scheme will be undertaken to CD 226 Design for new pavement construction and CD 236 Surface course materials for construction.

3.3.19. For the Stage 2 assessment, an assumption has been made that full depth reconstruction will take place where carriageway realignment is proposed.

3.3.20. At DMRB Stage 3 this will need to be revaluated with appropriate survey information to determine the optimum solution.

Structures

3.3.21. No structure design is to be undertaken as part of the assessment but relative cost and impacts of any structures required have been fed into the options appraisal. Outline designs will be carried out during the DMRB Stage 3 assessment and will be designed for collision loading.

Departures from Standard

3.3.22. For the purposes of this assessment report, all options have been designed to be compliant with design standards as far as practical. This is to encourage a fair assessment of options based on the maximum standard which can be achieved.

3.3.23. Introducing efficiencies and optimisation of the preferred option will be undertaken during DMRB Stage 3, where additional Departures from Standards will also be identified.

3.4. Souterhead Junction Options

3.4.1. Several options were tested for Souterhead Roundabout including keeping the junction in its current form with additional pedestrian crossings, additional bus priority lanes, and testing the junction as signalised crossroads. *Table 3.2* below outlines the full options that were tested for Souterhead Road.

Table 3.2: Souterhead Junction Modelling Options

Option	Description
1	Do Nothing - junction remains as per existing layout.
2a	Signalised crossings on Wellington Circle, Souter Head Road and Langdykes Road.
2b	Signalised crossings to internal island of roundabout.

3	Improved pedestrian provision along Wellington Road (S) only.
4	Segregated northbound bus lane with relocated bus laybys.
5	Three lanes of northbound traffic on Wellington Road (S), to tie in with existing flare to 3 lanes at junction.
6	AECOM staggered junction / signalised crossroads.
7	Hybrid of option 2a and 3 – overall improved pedestrian crossing facilities at the junction.
8	As per option 7, with inclusion of signalised crossing of Petrol Station access.
9	As per option 7, with inclusion of short bus lane on Langdykes Road and signalised pedestrian crossing at location of existing uncontrolled crossing.
10	As per option 7, with the inclusion of a southbound bus lane on Wellington Road.
11	Hybrid of option 4 and option 9 with northbound signalised bus priority on Wellington Road.
12	As per option 11, with southbound signalised bus priority on Wellington Road.
13	Signalised pedestrian crossings over each arm, with signalised bus priority on Wellington Road (S) and Langdykes Road.

3.4.2. Following the longlist assessment works, as summarised in the Longlist Options Assessment Report[9], the following options were taken forward into the shortlist of options assessed in the DRMB Stage 2 Option Appraisal:

- Option 8; and
- Option 13.

3.4.3. The modelling showed that the junction operates significantly better as a roundabout than any form of the signalised crossroads tested, which all resulted in long queues.

3.4.4. Option 8 provides signalised pedestrian crossing facilities across all arms of the junction. The predicted queueing noted is similar to option 1 (existing layout), with a slight reduction in queuing on Wellington Road (S) in the morning peak hour.

3.4.5. Option 13 is as per option 8 with the inclusion of signalised pedestrian crossing facilities across all arms, but also includes bus priority on Langdykes Road and on Wellington Road (S). This option provides overall benefit to both active travel users and public transport users with little to no detriment to the junction overall.

[9] Wellington Road Junction Improvements - Longlist Options Assessment Report, Sweco 2023

3.5. Hareness Junction Options

3.5.1. Several options were tested for Hareness Roundabout including keeping the junction in its current form with changes to geometry and approaches, and further options testing the junction operation as signalised crossroads. *Table 3.3* below outlines the full options that were tested for Hareness Road.

Table 3.3: Hareness Junction Modelling Options

Option	Description
1	Do Nothing – junction remains as per existing layout
2	Base model with additional lane on southern arm
3a	Retain existing roundabout with signalised crossings at 20m setback
3b	Retain existing roundabout with signalised crossings at 60m setback
4	Signalised crossroads as drawn by AECOM
5	Signalised crossroads with inclusion of a right turn arrow on the western arm
6	Signalised crossroads with a left turn slip lane on southern arm as shown in an AECOM option
7	Option 4 tested with an additional short lane northbound and central reserve
8	Option 5 tested with an additional short lane northbound and central reserve
9	Option 6 re-tested decreasing the northbound left turn lane length to 40m

3.5.2. The modelling showed that the junction operates significantly better as a roundabout than any form of the signalised crossroads tested, which all resulted in queueing traffic. Despite the signalised crossroads performing badly, it was recommended that Option 5 was brought forward to microsimulation modelling to ensure a robust assessment had been undertaken before discounting the signalised option. The Paramics modelling confirmed major impact on traffic flows and was therefore not be taken forward into the DRMB Stage 2 Option Appraisal.

3.5.3. It was also recommended that Option 3a and b were taken forward to the microsimulation modelling to identify a preference between signal crossing locations. With only very slight differences between times in network performance (scoring no difference in impact), and a significant preference for non-motorised users for the 20m set-back, new pedestrian crossings would be set-back 20m within the option being taken forward into the DRMB Stage 2 Option Appraisal.

3.5.4. Option 3a retains the roundabout in its existing form but provide additional signalised pedestrian crossings on Hareness Road and Wellington Road (S). This option maintains the current vehicle operation, as well as improving active travel provision.

3.6. Wellington Road Link Options

3.6.1. The Aberdeen Sub-Area Model (ASAM) 19, the strategic multi-modal transport model for the North-East of Scotland, was used to inform decisions relating to re-designating existing lanes for bus and / or freight priority.

3.6.2. All tests were reported based on the 'Without Policy' scenario to assess a worst-case traffic operational scenario in a design year of 2041. These tests did not take account of potential traffic rerouting effects on parts of the road network outwith the Paramics model extents or peak spreading whereby people adjust the times of their journeys.

3.6.3. The results were based on the following peak hours:

- 07:30 – 08:30; and
- 16:30 – 17:30

3.6.4. *Table 3.4* below outlines the initial tests undertaken using the Wellington Road Paramics Model.

Table 3.4: Paramics Modelling Options

No.	Test	Description
0	Do Minimum	The Do-Minimum model comprises assumptions around committed infrastructure and traffic forecasts (including those relating to committed development in the area).
1	Northbound and Southbound Bus Lanes (Existing Lane)	Introduction of northbound and southbound bus lanes on Wellington Road from Charleston Road North to Hareness Roundabout using exiting nearside lanes.
2	Northbound and Southbound Bus & Freight Lanes (Existing Lane)	Introduction of northbound and southbound shared bus and freight lanes on Wellington Road from Charleston Road North to Hareness Roundabout using exiting nearside lanes. 'Freight' is defined as all HGV traffic.
3	Northbound and Southbound Freight Lanes (Existing Lane)	Introduction of northbound and southbound freight lanes on Wellington Road from Charleston Road North to Hareness Roundabout using exiting nearside lanes. 'Freight' is defined as all HGV traffic.
4	Hareness Signalised Crossroads	Reconfiguration of Hareness Roundabout as signalised crossroads with improved pedestrian facilities.

Dedication of Existing Lanes

3.6.5. The Paramics modelling identified all southbound dedicated lanes tests had a major impact on the road network and so should not be taken forward into the DRMB Stage 2 Option Appraisal.

3.6.6. The Paramics modelling identified all northbound dedicated lanes tests would have nearly a 2 minute reduction in bus journey times in AM peak and nearly a 1 minute reduction in PM peak. This benefit comes to the detriment of the other road users who experience approximately 8 minute delay from provision of a bus lane and approximately 6 minute delay from provision of a bus & freight and freight only lane.

3.6.7. Results from bus & freight dedication against freight dedication showed very similar improvements and delays. This was likely because buses benefitted from queuing traffic south of Charleston Road North, where these buses join Wellington Road. From the public's perception this benefit may not be understood if the lane was dedicated for freight only and would be perceived as merely prioritising freight use and not helping to promote bus usage. The modelling concluded a freight only dedicated lane option would not be taken forward into the DMRB Stage 2 Option Appraisal.

3.6.8. The modelling concluded the options to be taken forward into the shortlist of options assessed in the DRMB Stage 2 Option Appraisal were:

- Northbound dedicated lane for buses; and
- Northbound dedicated lane for buses and freight.

Additional Northbound Bus Lane

3.6.9. The Paramics modelling demonstrated approximately 8 minutes delay in the AM peak from provision of a new northbound dedicated bus lane. Previous option assessment work investigated within the WRMMCS identified opportunity for an additional bus lane between Charleston Road North and Hareness Roundabout but discounted it because it "is counter to current policy position and it could introduce safety implications for active travel users by increasing crossing lengths".

3.6.10. Current policy would not naturally promote the construction of an additional lane, however, it would help promote a shift to bus use (on a possible route for the Aberdeen Rapid Transit scheme).

3.6.11. Signalised crossings would facilitate safe crossings for active travel users, particularly where the crossing of Wellington Road will be made in 2 stages via a staggered crossing in the central reserve.

3.6.12. An additional bus lane option was therefore taken forward into the shortlist of options to be assessed in the DRMB Stage 2 Option Appraisal.

Link Improvements Summary

3.6.13. Based on the outcomes of the Wellington Road Paramics Modelling, link improvement component options have been identified for assessment. These components are listed in *Table 3.5*.

Table 3.5 - Wellington Road Link Improvements Component Options

Section	Component Option Description
Charleston Road North signalised crossroads to Souterhead Roundabout	No change to existing carriageway
	Dedicated northbound bus lane (existing Lane 1)
	Dedicated northbound bus and freight lane (existing Lane 1)
	Additional Northbound bus lane
Souterhead Roundabout to Hareness Roundabout	No change to existing carriageway
	Dedicated northbound bus lane (existing Lane 1)
	Dedicated northbound bus and freight lane (existing Lane 1)
	Additional Northbound bus lane
Hareness Roundabout to Craigshaw Drive signalised crossroads	No change to existing carriageway

3.7. Active Travel Facility Options

3.7.1. Constraints adjacent to the existing corridor were identified from *Figure 3-2* and used to confirm the feasibility of accommodating the improved active facilities within the available land, with an emphasis on avoiding critical constraints.

3.7.2. Provision is not required on both sides of the carriageway for segregated two-way flow or shared use path and can be positioned on either the northbound or southbound side, with appropriate crossing points considered. In locations where no new active travel facility is proposed, the existing provision will be maintained.

3.7.3. An initial sifting exercise has been undertaken to determine whether to facility would be provided on the northbound or southbound side of Wellington Road. *Table 3.6* below, indicates the location of corridor constraints with amber and red

highlighted cells. Critical constraints are highlighted in red and relate to property or other key receptors, all other identified design constraints are shown in amber.

3.7.4. As detailed within the analysis below, compliant (with the exception of additional bus lane options between Souterhead and Hareness roundabouts) segregated two-way flow active travel provision could be accommodated within the proposed solutions. CBD guidance states “shared use facilities should only be used as a means of delivering route continuity where all other options have been examined and documented in the Design Review”. Following confirmation of the suitability of the segregated two-way flow cycle track route, a shared use path option was not considered for further assessment.

Table 3.6 - Segregated Two-Way Flow Constraints Impact

Section	Constraint Ref.	Constraint Description	Northbound	Southbound
Charleston Road North signalised crossroads to Souterhead Roundabout	1	Embankment at shop front		
	2	VRS		
	3	Embankment		
	4	Adjacent to property		
	5	Car park		
	6	SSE Sub-station		
	7	Embankment		
Souterhead Roundabout to Hareness Roundabout	8	Embankment		
	9	Petrol station		
	10	Smiddy Cottage		
	11	Carpark		
	12	Garden wall		

	13	Turning head		
	14	Garden wall		
Hareness Roundabout to Craigshaw Drive signalised crossroads	15	Adjacent to property		
	16	Allotments		
	17	Embankment		
	18	Turning head		
	19	Cemetery		
	20	Flats		
	21	Embankment		

Charleston Road North signalised crossroads to Souterhead Roundabout

3.7.5. Commencing at Charleston Road North signalised crossroads junction, the new segregated two-way active travel provision will be provided on the northbound side to Souterhead Roundabout, avoiding two key constraints identified adjacent to the southbound carriageway.

3.7.6. This provides connectivity to key locations, such as Lochside Academy, and avoids critical constraints identified adjacent to the southbound carriageway.

3.7.7. This solution remains viable when an additional bus lane is implemented over this section.

Souterhead Roundabout to Hareness Roundabout

3.7.8. For the majority of improvement options, the new segregated two-way active travel provision will be provided on the northbound side continuing from Souterhead Roundabout until the proposed signalised crossing of the southern arm of Hareness Roundabout. The cycleway will then cross over to the southbound side at the signalised crossing and continue through Hareness Roundabout.

3.7.9. Providing this facility on the northbound side will impact the existing turning head and access on Abbotswell Crescent and require retaining wall re-alignment at The Wellington Hotel carpark.

3.7.10. Active travel provision from the northbound carriageway will provide connectivity to the residential area of Redmoss and maintain continuity with the northbound provision in the southern section of the route.

3.7.11. However, for options where there is an additional lane provided on the northbound carriageway between Souterhead and Hareness roundabouts, the cycleway will cross at the signalised junction on the north arm of Souterhead Roundabout and continue on the southbound side to Hareness Roundabout. Providing a northbound active travel provision in combination with an additional carriageway lane would result in significantly greater impact to constraints. A re-aligned footway, replicating the current level of provision, will be provided adjacent to the additional northbound lane.

3.7.12. Providing this facility on the southbound side will impact the shell petrol station and nearby properties, limiting the active travel cross-section in this area.

Hareness Roundabout to Craigshaw Drive signalised crossroads

3.7.13. The cycleway will be provided on the southbound side continuing from Hareness Roundabout to Craigshaw Drive signalised crossroads.

3.7.14. Providing this facility on the northbound side would result in a non-compliant cross section and would impact several critical constraints including potential property curtilage. A retaining wall would likely be required to avoid some of the more serious impacts which would result in a greater cost and construction complexity. Although providing the facility on the southbound side has significantly lesser impact on constraints, it is also acknowledged that this will reduce its amenity to accessing key trip generators on the northbound side.

3.7.15. As such, further analysis was carried out over this section to validate the side of the cycleway provision and highlight the works required to accommodate a northbound segregated two-way active travel provision. Two additional options from the northbound carriageway were developed for comparison to the southbound option over this section.

Alternative Option Comparison

3.7.16. Due to the constrained nature of this section, both options required extensive existing carriageway realignment, in contrast to the southbound option. The options are shown in Figure D3.1 of Appendix D and are outlined below:

- Alternative Option 1: retains right-turn to Nigg Kirk Road, requiring northbound and southbound carriageway realignment;
- Alternative Option 2: removes right turn to Nigg Kirk Road, requiring only northbound carriageway realignment.

3.7.17. Due to the concentration of significant constraints northbound from Hareness Roundabout, significantly sub-standard active travel cross-sections were required, the range of provisions used over this section are shown in *Table 3.7*.

Table 3.7 - Active Travel Cross-Sections

Active Travel Cross-Sections		
Desirable	1m buffer, 3m cycleway, 0.125m upstand, 2m footway, 0.5m verge	6.625m
Absolute	1m buffer, 2m cycleway, 0.125m upstand, 1.5m footway, 0.5m verge	5.125m
One step below absolute	0.5m buffer, 2m cycleway, 0.125m upstand, 1.5m footway, 0.5m verge	4.625m
Two steps below absolute	0.5m buffer, 2m cycleway, 0.125m upstand, 1.5m footway, 0m verge	4.125m
Three steps below absolute	0m buffer, 2m cycleway, 0.125m upstand, 1.5m footway, 0m verge	3.625m

3.7.18. A minimum 2m cycleway has been used to ensure the facility can operate effectively as two-way, based on a dynamic width envelope of 1m noted in CBD. The minimum footway width used was 1.5m, the absolute minimum value from CBD, Table 3.7.

3.7.19. As indicated in the option descriptions, existing carriageway re-alignment was undertaken in order to maximise the level of provision provided and allow a viable segregated two-way provision from the northbound carriageway. Additionally, the existing bus-layby north of Hareness Roundabout is proposed to be moved online in order to accommodate active travel provision in this area.

3.7.20. The traffic implications on the network of removing the right turn to Nigg Kirk Road and re-positioning of the bus lay-by have not been assessed at this stage.

3.7.21. Both alternative options would also require realignment and extension of an existing retaining wall adjacent to the cemetery.

3.7.22. A basic cost comparison of key components is provided in *Table 3.8* below, highlighting an increase in anticipated costs as the level of impact to existing carriageway increases.

Table 3.8 - Indicative Cost Comparison

	Initial Option	Alternative 1	Alternative 2
Existing Pavement Works	£0	£361,800	£174,400
Retaining Wall	£0	£27,200	£27,200
Utilities	£1,368,000	£2,359,000	£1,678,200

3.7.23. An overall comparison of the options north of Hareness Roundabout is provided below in *Table 3.9*.

Table 3.9 - Active Travel Comparison

		Initial Option (m)	%	Alternative Option 1 (m)	%	Alternative Option 2 (m)	%
Active Travel Cross-Section	**Total**	585		625		625	
	Desirable	415	70%	100	16%	100	16%
	Absolute	175	30%	110	18%	140	22%
	Substandard Total	0	0%	415	66%	385	62%
	Substandard 4.625m	0	0%	85	14%	115	18%
	Substandard 4.125m	0	0%	230	36%	170	28%
	Substandard 3.625m	0	0%	100	16%	100	16%
	Retaining Wall	0	0%	50	9%	50	9%
Carriageway Re-alignment	Central reserve Northbound	0	0%	390	80%	430	89%
	Central reserve Southbound	0	0%	290	60%	0	0%
	Kerb line Northbound	0	0%	425	86%	425	86%
	Kerb line Southbound	0	0%	310	61%	0	0%
	Constraints impacted	Constraints impacted	1		7		7
	Critical constraints impacted	Critical constraints impacted	0		5		5

3.7.24. This demonstrates the significant reduction in quality of active provision for both alternative options, with sub-standard provision required for over half of the total length, in comparison to a compliant cross-section from the southbound carriageway.

3.7.25. Carriageway realignment works are extensive for both alternatives, though localised to the northbound carriageway in option 2, increasing cost, carbon and traffic management provisions required through the construction phase.

3.7.26. The constraint impact is significantly greater for alternative options, including impact to residential garden and works in close proximity to existing property with associated constructability considerations required.

3.7.27. Based on the additional analysis above, this validates the active travel provision from the southbound carriageway north of Hareness Roundabout.

3.7.28. Tie-in arrangement and detailing at DMRB Stage 3 will provide the opportunity to investigate localised active travel connections where key trip generators are on the opposite side of the carriageway. West Tullos Road and the respective existing signalised crossing facility is a connection that may be improved through localised land acquisition, which will be investigated further at DMRB Stage 3.

With-Flow

3.7.29. In contrast to the segregated two-way active travel provision discussed above, the with-flow option requires segregated provision in both directions to operate effectively. As such, it has significantly greater constraint impact and requires existing carriageway realignment to produce a feasible solution.

3.7.30. With a possibility of a proportion of cyclists being school children travelling to and from Lochside Academy, there is a safety and practicality issue of enforcing the one-way flow. Whilst school children will be travelling in the same direction, other users such as commuters would likely be headed in the opposite direction:

- AM - children travel southbound to school and commuters travel northbound into Aberdeen; and
- PM - children travel northbound from school and commuters travel southbound from Aberdeen.

Active Travel Provision Summary

3.7.31. Figures D3.2 and D3.3 in Appendix D show the developed active travel provisions over the scheme extents to inform the comparison between with-flow and two-way flow options. Comparison is based on the options without an additional bus lane, which will be combined with the preferred form of active travel provision in the subsequent options discussed in later sections.

3.7.32. *Table 3.10* below summarises the performance of the provision based on the standard of cross section achieved, existing carriageway amendments and the impact on identified constraints. This highlights with a segregated two-way solution there is a reduced impact to adjacent constraints and existing carriageway, while providing a better standard of active travel provision.

Table 3.10: Active Travel Option Comparison

	Segregated With-flow	Segregated Two-way
Total length of provision (m)	3830 (1870m NB, 1960m SB)	1920 (1335m NB, 535m SB)
Length of provision of desirable minimum cross section (m)	1955 (51%)	1165 (61%)
Length of provision of absolute minimum cross section (m)	1465 (38%)	755 (39%)
Length of provision of non-compliant cross section (m)	410 (11%)	0
Length of re-aligned central reserve (m) – Northbound carriageway impact	805 (43%)	0
Length of re-aligned central reserve (m) – Southbound carriageway impact	945 (48%)	0
Length of re-aligned carriageway edge (m) Northbound carriageway impact	750 (40%)	55 (4%)
Length of re-aligned carriageway edge (m) Southbound carriageway impact	865 (44%)	0
Anticipated land acquisition (m^2)	570	540
Constraints impacted	21	5
Critical constraints impacted	10	1

3.7.33. All the improvement options within the DRMB Stage 2 Option Appraisal therefore provide a segregated two-way active travel facility across the scheme extents, to the desirable minimum cross section, providing a 3m cycle track and 2m footway where achievable, with the option of reducing to the absolute minimum provision of a 2m cycle track and 1.5m footway to avoid localised constraints.

3.7.34. *Figure 3-6* shows the typical cross section which will be applied in the first instance, adopting the preferred minimum values where there is no significant impact on adjacent constraints. Where there would be any impact on constraints that could be avoided by reducing the cross section, the absolute minimum values can be provided as shown in *Figure 3-7*.

3.7.35. *Figure 3-8* and *Figure 3-9* indicate the location of the proposed active travel provision when the existing carriageway as retained and when an additional bus lane is provided respectively.

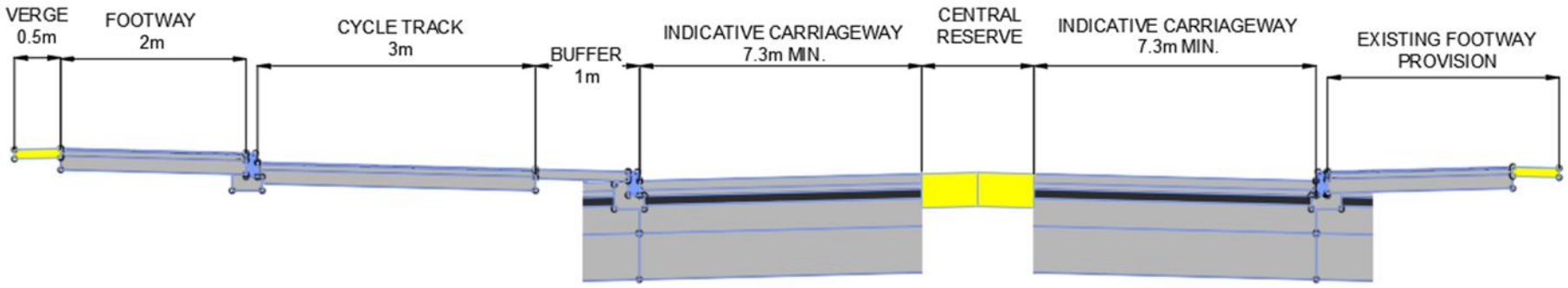


Figure 3-6: Segregated Two-Way Flow - Desirable Minimum Width

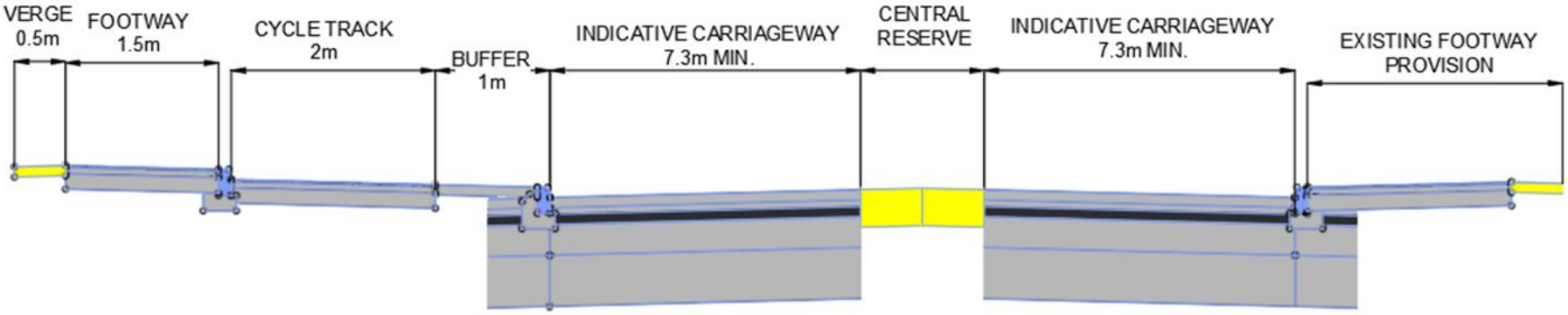


Figure 3-7: Segregated Two-Way Flow - Absolute Minimum Width

Figure 3-8 - Segregated Two-Way Flow Option Constraints (©2023 Microsoft Corporation ©Maxar ©CNES(2023) Distribution Airbus DS)

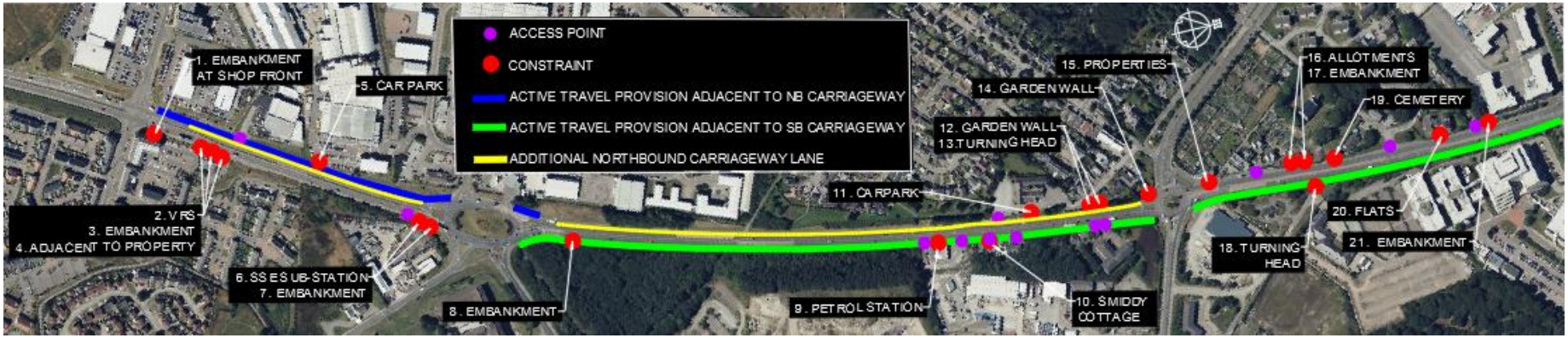


Figure 3-9 - Segregated Two-Way Flow Option with Bus Lane Constraints (©2023 Microsoft Corporation ©Maxar ©CNES(2023) Distribution Airbus DS)

3.8. Improvement Options for Assessment

3.8.1. Following completion of the longlist options appraisal, the best performing improvement components to be assessed in combination at the DMRB Stage 2 Option Appraisal are:

- 1 junction option at Hareness Junction: existing roundabout with additional signalised crossings at 20m setback.
- 2 junction options at Souterhead Junction: existing roundabout with improved signalised crossings; and existing roundabout with improved signalised crossings and bus priority entry lanes.
- 4 northbound carriageway link component options for both Charleston Road signalised crossroads to Souterhead Roundabout and between Souterhead and Hareness Roundabouts. There is one option taken forward for the section north of Hareness Roundabout. Option details provided in *Table 3.5*.
- All options to have segregated two-way flow active travel provision relative to the combination of interventions.

3.8.2. These components were initially combined into 8 different improvement options, designated Option A to Option H, with an incremental approach for the assessment.

3.8.3. Following the Shortlist Options Workshop in August 2023, an additional 3 hybrid options were identified which include an additional bus lane to the south of Souterhead Roundabout (Option D) and Options A to C between Souterhead and Hareness Roundabouts. North of Hareness Roundabout the solution is consistent across all options. The additional 3 options have been designated Option I to Option K.

3.8.4. *Figure 3-10* below shows a schematic representation of the 11 design options to be progressed at DMRB Stage 2 Option Appraisal with an incremental approach for the assessment. These do not include the segregated two-way the active travel interventions that will be included in all options, as summarised in Section 3.7.

3.8.5. *Table 3.11* below lists the intervention components for each option within the DMRB Stage 2 Option Appraisal.

3.8.6. There are several existing junctions and accesses along the route which will be crossed by the proposed improvement options. Access will be maintained to

Wellington Road in each case and the detail of the crossing will be incorporated into the Preferred Option during the DMRB Stage 3 Assessment.

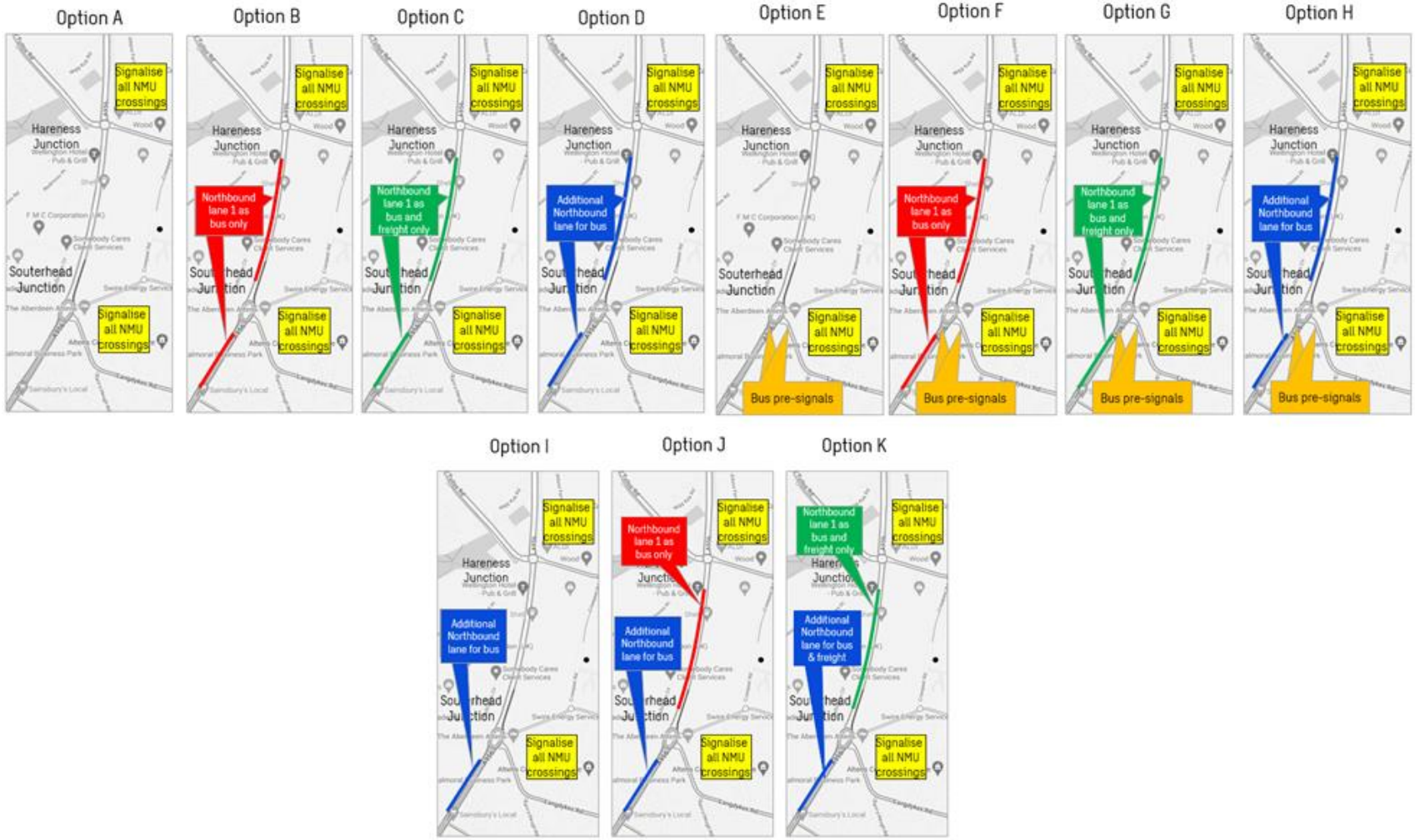


Figure 3-10: Shortlist Option Schematic Representation

Table 3.11: Combination Shortlist Option Components

Section	Intervention	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Hareness Roundabout	Additional signalised pedestrian crossings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Souterhead Roundabout	Improved signalised crossing facilities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Bus pre-signals					✓	✓	✓	✓			
Charleston Rd North to Souterhead Roundabout	Two-way segregated cycleway – northbound side	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	No change to Existing Carriageway	✓										
	Northbound Lane 1 – Dedicated Bus Lane		✓				✓					
	Northbound Lane 1 – Dedicated Bus and Freight Lane			✓				✓				
	Add new Lane – Dedicated Bus / Bus and Freight Lane				✓				✓	✓	✓	✓
Souterhead Roundabout to Hareness Roundabout	Two-way segregated active travel provision – northbound side	✓	✓	✓		✓	✓	✓		✓	✓	✓
	Two-way segregated active travel provision – southbound side				✓				✓			
	No change to Existing Carriageway	✓				✓				✓		
	Northbound Lane 1 – Dedicated Bus Lane		✓				✓				✓	
	Northbound Lane 1 – Dedicated Bus and Freight Lane			✓				✓				✓
	Add new Lane – Dedicated Bus Lane				✓				✓			
Hareness Roundabout to Craigshaw Drive	Two-way segregated cycleway – southbound side	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	No change to Existing Carriageway	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Options A, B and C

3.8.7. The route, shown in Appendix D Figures D3.4 to D3.6, commences at the signalised crossroads junction at Charleston Road North, providing segregated two-way active travel provision from the northbound carriageway edge line to Souterhead roundabout. The cross-section is initially to absolute minimum standard, minimising impact to adjacent business, prior to widening to desirable minimum north of the Balmoral Group car park, narrowing again to absolute minimum at the proposed signalised crossing of Wellington Circle at Souterhead Roundabout.

3.8.8. The route then continues from the northbound carriageway edge line, maintaining the provision on passing Souterhead Roundabout to the south of Hareness Roundabout. The cross-section is absolute minimum while adjacent to Souterhead Roundabout, reducing impact to the adjacent petrol station, prior to widening to desirable minimum north of the roundabout. This is maintained until approaching the Wellington Hotel, where the section is narrowed to absolute minimum, to avoid impact to the adjacent car park, turning head and properties.

3.8.9. 20m south of Hareness Roundabout the route then crosses Wellington Road at the proposed signalised crossing. The route continues from the southbound carriageway edge to the end of the scheme extents at Craigshaw Drive signalised crossroads junction. The cross-section remains absolute minimum immediately following the signalised crossings of Wellington Road and Hareness Road, minimising impact to Loirston House and Aldi, prior to widening to desirable minimum. With the exception of localised narrowing to absolute minimum in order to avoid a turning head, desirable minimum cross-section is maintained to the end of the scheme extents.

3.8.10. The physical engineering interventions are the same for Options A, B and C, however, Options B and C will include additional road markings on the existing carriageway to indicate bus and bus and freight priority in the northbound lane 1 respectively between Charleston Road North signalised crossroads junction and Hareness Roundabout.

Option D

3.8.11. The route, shown in Appendix D Figure D3.7, commences at the signalised crossroads junction at Charleston Road North, providing segregated two-way active travel provision from the northbound carriageway edge line to Souterhead roundabout. An additional nearside bus lane is provided from the Porsche Centre Access (AC1) to the existing pedestrian crossing of Wellington Road south of the

roundabout, requiring narrowing of the existing central reserve over this section to avoid impact to adjacent property. The active travel cross-section is initially to absolute minimum standard, minimising impact to adjacent businesses, prior to widening to desirable minimum north of the Balmoral Group car park, narrowing again to absolute minimum at the proposed signalised crossing of Wellington Circle at Souterhead Roundabout.

3.8.12. The route initially continues from the northbound carriageway edge line, passing Souterhead Roundabout, prior to using the existing signalised crossing, with the active travel provision then from the southbound carriageway edge line to Hareness Roundabout. The additional bus lane commences north of Souterhead Roundabout to Hareness Roundabout, again requiring narrowing of the existing central reserve adjacent to The Wellington Hotel and the Shell Petrol Station. The existing footway provision from the northbound carriageway edge is replaced adjacent to the proposed additional bus lane. The cross-section is absolute minimum while adjacent to Souterhead Roundabout, reducing impact to the adjacent petrol station, prior to widening to desirable minimum following the crossing of Wellington Road. This is maintained until approaching the Shell Petrol Station, where the section is narrowed to a sub-standard provision, to avoid impact to the adjacent businesses and accommodate the additional bus lane.

3.8.13. North of Hareness Roundabout, the provision is identical to Options A to C described previously.

Option E

3.8.14. Option E, shown in Appendix D Figure D3.8, has a bus priority pre-signal arrangement on the northbound approach to Souterhead Roundabout. This essentially requires an additional bus lane provision from the Porsche Centre Access (AC1) to the existing pedestrian crossing of Wellington Road south of the roundabout, requiring narrowing of the existing central reserve over this section to avoid impact to adjacent property. This ensures buses can gain access to the pre-signals area during peak times. The active travel cross-section is initially to absolute minimum standard, minimising impact to adjacent businesses, prior to widening to desirable minimum north of the Balmoral Group car park, narrowing again to absolute minimum at the proposed signalised crossing of Wellington Circle at Souterhead Roundabout.

3.8.15. A bus priority pre-signal arrangement is also provided on approach to Souterhead Roundabout from Langdykes Road, requiring existing carriageway re-alignment to accommodate. Desirable minimum active travel provision is provided adjacent to the re-aligned section of Langdykes Road, passing Souterhead Roundabout

prior to connecting back to the primary active travel route via the existing signalised crossings.

3.8.16. North of Souterhead Roundabout, Option E is identical to Option A described previously.

Options F and G

3.8.17. Options F and G, shown in Appendix D Figure D3.9 and D3.10, are mostly identical to respective Options B and C (dedicated bus lane and dedicated bus and freight lane respectively) described previously, but with the provision of bus priority measures on the northbound approach to Souterhead Roundabout.

3.8.18. A bus priority pre-signal arrangement is also provided on approach to Souterhead Roundabout from Langdykes Road as described in Option E.

Option H

3.8.19. Option H, shown in Appendix D Figure D3.11, is mostly identical to Option D (additional northbound bus lane), with the addition of bus priority measures on the northbound approach to Souterhead Roundabout and on Langdykes road as described previously.

Options I, J and K

3.8.20. Following the Shortlist Options Workshop, these additional options have been identified for assessment consisting of combinations of alternative improvements from previous options.

3.8.21. Options I, J and K, shown in Appendix D Figure D3.12 to D3.14, will have an additional bus lane provided between Charleston Road North and Souterhead Roundabout, similar to Option D described previously. Between Souterhead and Hareness roundabouts the following improvements would be provided:

- Option I retains the existing carriageway, similar to Option A;
- Option J provides a dedicated northbound bus lane, similar to Option B; and
- Option K provides a dedicated northbound bus and freight lane, similar to Option C.

3.8.22. North of Hareness Roundabout, the provision is identical to all Options described previously.

3.9. Preliminary Cost Estimate of Design Options

3.9.1. Cost estimates have been prepared for the Improvement Options described in Section 3.8.

Works Costs

3.9.2. Quantifiable items have been measured and a cost per unit has been applied based on the rates within Spons Price Book 2023[10].

3.9.3. The cost estimate is based on material quantities calculated for the scheme and includes roadworks, pavement, earthworks, environment and landscaping, statutory undertakers and preliminaries.

3.9.4. A number of items are not considered appropriate to be quantified at this stage, therefore, allowances have been included as a percentage of the total works costs based on previous schemes. The percentage allowances are shown below in *Table 3.12*.

Table 3.12 - Percentage Allowance

Works Elements	Percentage of Construction Costs
Preliminaries (including for traffic management, contractor's head office overheads, insurances and profit)	12%
Accommodation Works	2%
Landscaping	2%
Traffic Signs	1%

3.9.5. Pavement depths were based on the expected traffic flows with costs determined based on the volume of each pavement layer required, with rates determined from Spon's Price Book.

3.9.6. Earthworks volumes used to inform the costs were calculated assuming the proposed depth of pavement described above and using slopes of 1:3 for embankments and 1:2 for cuttings. It has been assumed 90% of the total cut is reusable, pending ground investigation confirmation. Rates for excavating, compacting, disposing and importing material were determined from the Spon's Price Book.

[10] Spon's Civil Engineering and Highways Works Price Book, Thirty-seventh Edition, Taylor and Francis 2023

Preparation Costs

Statutory Undertakers

3.9.7. Potential utility conflicts have been identified through the New Roads and Street Works Act 1991 C2 process and a cost allowance for diversion (assumption as Stage 2, pending further consultation) has been included based on previous examples with inflationary indexes applied as required.

Preparation and Administration Costs

3.9.8. A percentage allowance of 9% has been included for the item “Preparation and Administration Costs” and is applied to the sum of works costs, utilities costs and land and property costs. This has been derived from DMRB (Volume 15, Section 1, Part 6 The Network Evaluation from Surveys and Assignment (NESA) Manual).

3.9.9. Similarly, a percentage allowance of 5% has been included for the item “On-site Supervision and Testing” and is applied to the sum of works costs, utilities costs and land and property costs. This has also been derived from the NESA Manual.

Risk and Optimism Bias

3.9.10. The risks to the overall scheme have been identified in a risk register and a 10% risk allowance has been applied to the works and utility costs.

3.9.11. A quantified risk register will be prepared during the DMRB Stage 3 assessment process using a Monte Carlo simulation of the risk register items.

3.9.12. An allowance for Optimism Bias (OB) has been included within the scheme cost estimate. Optimism Bias is the demonstrated systematic tendency for appraisers to be overly optimistic about key parameters. For this reason, an uplift is applied to the risk adjusted cost. The uplift applied is dependent upon the nature of the scheme and the stage to which the scheme relates. Due to the incorporation of a risk value for the Preferred Option it has been determined appropriate for the Optimism Bias to be reduced from 44% to 23% at this stage. The OB allowance is 23% for roads work and 14% for land and property extracted from guidance published by the UK government (TAG Unit A1.2 Scheme Costs) and Scottish Government (STAG Technical Database Section 13).

Cost Estimate Summary

Table 3.2 – Cost Estimates

Design Option	Cost Estimate SPONS 2023 (excluding VAT)
Option A	£10,543,800
Option B	£10,548,100
Option C	£10,548,100
Option D	£16,444,100
Option E	£13,555,400
Option F	£12,984,600
Option G	£12,984,600
Option H	£18,689,800
Option I	£11,205,500
Option J	£11,209,000
Option K	£11,209,000

3.9.13. Increases in inflation are not captured within the scheme cost estimate but have been considered in the Outline Business Case (OBC).

4. Engineering Assessment

4.1. Introduction

4.1.1. Further to the existing conditions mentioned in Chapter 2, this chapter describes the assessment of the improvement options with respect to engineering. It includes a description of the engineering impacts of each option, these include:

- Geographic Constraints;
- Engineering Standards;
- Topography and land-use;
- Geotechnics and earthworks;
- Drainage;
- Utilities; and
- Constructability.

4.2. Geographic Constraints

4.2.1. The options have been designed considering the existing constraints, summarised in *Table 3.1* previously. This assessment is shown in *Table 4.1*, where green cells indicate no impact, amber cells indicate impact on minor constraint, and red cells indicate impact on significant constraint.

4.2.2. The assessment found that the least impactful options are those without any additional northbound lane, Options A-C and F-G.

4.2.3. The assessment found that all options had an impact on the existing garden wall/retaining wall which facilitates the turning head on Abbotswell Crescent on the northbound side of Wellington Road. Additionally, all options would impact the existing turning heads on Abbotswell Crescent and Altens Farm Road on the southbound side.

4.2.4. The most impactful options are those with an additional northbound lane between Souterhead and Hareness roundabouts, Options D and H. These options provide the cycleway on the southbound side between Souterhead and Hareness roundabouts, and therefore impact additional constraints on the southbound side.

Table 4.1 - Assessment of Geographic Constraints

Ref.	Constraint Description	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
1	Embankment at shop front											
2	VRS											
3	Embankment											
4	Adjacent to property											
5	Car park											
6	SSE Sub-station											
7	Embankment											
8	Embankment											
9	Petrol station											
10	Smiddy Cottage											
11	Carpark											
12	Garden wall											
13	Turning head											
14	Garden wall											
15	Adjacent to property											
16	Allotments											
17	Embankment											
18	Turning head											
19	Cemetery											
20	Flats											
21	Embankment											

4.3. Engineering Standards

Mainline and Junctions

4.3.1. All options retain the existing D2UAP cross section from DMRB CD127 Cross-sections and Headrooms Figure 2.1.1N1g as a minimum on Wellington Road. Options D-E and H-K provide an additional lane on the northbound carriageway for varying portions of Wellington Road, which is 3m width, in line with 'Keeping Buses Moving' guidance (LTN 1/97 4.4)[11].

4.3.2. The existing, approximately 7%, maximum gradient between Hareness Roundabout and Craigshaw Drive is retained in all options, which is an existing relaxation from DMRB CD109.

4.3.3. All existing junctions and direct accesses are retained in all options. For options A-C and F-G, where there is no change to the carriageway extents, the existing junction geometry is retained including all existing departures as summarised in *Table 2.3* and *Table 2.5*.

4.3.4. In options D-E and H-K, where there is an additional northbound lane, the existing junctions and accesses would be modified to tie into the new edge of carriageway to a similar standard as the existing arrangements.

4.3.5. Similarly, the existing geometry for Souterhead and Hareness roundabouts is to be retained for all options, including existing departures as summarised in *Table 2.5*.

Active Travel Facilities

4.3.6. The vertical geometry for all of the active travel facilities are dictated by the adjacent and adjoining Wellington Road. As a result, through the northern section between Hareness Road and Craigshaw Drive signalised crossroads the vertical geometry exceeds the maximum recommended gradient of 3% from CBD. A maximum gradient of approximately 7% would be provided over a length of 270m as shown by the profiles on Figure D2.1 toD2.4 of Appendix D.

4.3.7. The cross section of the active travel facility varies to avoid localised constraints in all options. Typically, the cross section varies between the desirable minimum and absolute minimum cross section as shown in *Figure 3-6* and *Figure 3-7*. The

[11] Keeping Buses Moving, Local Transport Note 1/97 by Department for Transport, 2001

length of each cross-section standard for each option, and the associated proportion of the approximately 2km total length, is summarised in *Table 4.2*.

Table 4.2 - Length of Desirable Minimum, Absolute Minimum and Non-compliant cross section of active travel facility for each option

Design Option	Length Desirable Minimum Cross Section	% of total facility	Length Absolute Minimum Cross Section (m)	% of total facility	Length Non-compliant Cross Section (m)	% of total facility
Option A	1120m	57%	840m	43%	0m	0%
Option B						
Option C						
Option D	1290m	58%	620m	28%	320m	14%
Option E	1380m	62%	840m	38%	0m	0%
Option F						
Option G						
Option H	1290m	58%	620m	28%	320m	14%
Option I	1110m	56%	860m	44%	0m	0%
Option J						
Option K						

4.3.8. Options A-C and E-G have the greatest extent of Desirable Minimum cross section, followed closely by Options I-K. Options D and H, which incorporate an additional bus-lane between Souterhead and Hareness roundabouts, require a non-compliant active travel cross section adjacent to the Shell service station on the southbound side, to avoid impact to adjacent property. This involves reducing the buffer between the main carriageway and active travel provision to 0.5m.

4.3.9. Tie-in arrangement and details with the existing active travel facilities have not been refined at this stage for the options since this will be undertaken for the preferred option at DMRB Stage 3. For the purposes of this assessment all tie-in arrangements have been kept consistent to encourage a fair assessment.

4.4. Topography and Land Use

Topography

4.4.1. The existing topography will be nominally affected by the options proposed, with options developed adjoining to the existing Wellington Road alignment.

4.4.2. Changes to the topography will be through the introduction of new road embankments and cuttings as a result of the overall cross-section widening works.

Land Use

4.4.3. All options are within an urban setting and were developed with consideration to adjacent residential, commercial and industrial premises.

4.4.4. All options utilise existing undeveloped ground (i.e., lawn and landscaping) within the existing highway boundary to provide the active travel facilities.

4.4.5. The options have been developed to avoid impact on the curtilage of private properties where possible, however, all options result in encroachment of adjacent land along Wellington Road. This impact is notably increased in Options D and H, with impact both from the northbound and southbound carriageway between Souterhead and Hareness Roundabouts.

4.4.6. The following areas will be impacted:

- Shrub and lawn bordering Balmoral Business Park;
- Area of landscaping between Wellington Road and Redmoss Park;
- Hedge and lawn bordering The Wellington Hotel and Abbotswell Crescent; and
- Woodland bordering Altens Industrial Estate (Options D and H only).

4.5. Geotechnics and Earthworks

General Ground Conditions

4.5.1. An assessment of the likely ground conditions affecting the scheme has been determined largely from British Geological Survey (BGS) 1:63,360 scale; 1:50,000 scale; 1:10,560 scale and 1:10,000 scale series geological maps for the area. A search of the BGS GeoIndex interactive map and BGS Lexicon was also conducted for relevant historical borehole logs and geological information. At present there is no intrusive ground investigation information available for the scheme.

Superficial Geology

4.5.2. The superficial geology underlying the scheme predominantly comprises sand, gravel, and boulders of the Lochton Sand and Gravel Formation from the south of the corridor up to Hareness Roundabout. The Banchory Till Formation is located to the west and northwest of the scheme and comprises gravelly and sandy

diamicton. No superficial deposits are noted to be present to the southwest of Hareness Roundabout.

4.5.3. The Lochton Sand and Gravel Formation comprises sand and gravel of variable thickness, generally from 3m to 5m, but has been proven up to 14m in some locations. The parent group of the Lochton Sand and Gravel Formation is the Caledonia Glacigenic Group, with the sand and gravel clasts in this deposit originating from the East Grampian Highlands.

4.5.4. The Banchory Till Formation comprises gravelly and sandy clay of variable thickness, generally 2 to 5m thick but has been proven up to 8m in some locations. The parent group of the Banchory Till Formation is the East Grampian Glacigenic Subgroup.

4.5.5. In general, the superficial geology recorded within BGS borehole logs correlates with the published mapping, indicating glacial clays (till / boulder clay) or sands and gravels along Wellington Road to a maximum thickness of 5.1m.

Bedrock

4.5.6. The solid geology underlying the scheme comprises predominantly semipelite and psammite of the Aberdeen Formation.

4.5.7. The Aberdeen Formation is described as interlayered psammite and semipelite metasediments with subsidiary pelite and sporadic minor calcareous horizons. The thickness of the individual metasedimentary layers varies considerably, but rarely exceed 2m. However, the Aberdeen Formation as a whole is of significant thickness, likely up to several kilometres, but is not directly measurable due to intense folding and migmatisation. The parent group of the Aberdeen Formation is the Argyll Group, part of the Dalradian Super Group.

4.5.8. The depth to rockhead varies considerably across the scheme from 1.05m to 5.1m bgl. In historical BGS logs rockhead was generally described as either a granite or a (mica)schist and was noted to be weak, weathered and/or fractured within upper sections.

Made Ground and Fill

4.5.9. One area of made ground has been identified within the scheme study area on the geological mapping. The area is located in the southeast within Cove Bay in an area formerly used as a Sand and Gravel Pit. The made ground is likely material used to infill the pit.

4.5.10. Although no made ground deposits are shown on the BGS published mapping in other areas, this does not preclude the presence of made ground. Due to the built up and industrial nature of the land in the vicinity of Wellington Road, made ground of variable thickness should be expected across the entirety of the scheme.

Other Identified Ground Issues

4.5.11. Based on the Zetica UXO Risk Maps there is a moderate risk of unexploded ordnance (UXO) across the scheme. Although the majority of the scheme is in a low-risk area, i.e. having 15 bombs per 1000 acres or less, the north of the scheme is a moderate risk area with a bombing density of 15 to 49 bombs per 1000 acres and a Luftwaffe Target area.

Identified Geotechnical Constraints

4.5.12. The following main geotechnical and geo-environmental hazards have been identified within the Study Area:

- Potential made ground of uncertain depth and nature.
- Superficial deposits of uncertain strength, stiffness, thickness, and nature (potentially with poor engineering characteristics).
- Potential for shallow or perched groundwater levels.
- Potentially difficult conditions for excavations and cuttings.
- Potentially contaminated soil or groundwater.
- Potential for ground gas (sourced from made ground/infilled ground).
- Potential for chemical attack on buried concrete.
- Limited existing ground investigation data.
- Potential for subsidence over infilled excavations (quarries and pits);
- Potential for flooding leading to instability of foundations and slopes; and,
- Potential for unrecorded unexploded ordnance.

4.5.13. From a geotechnical perspective there is little to no variation in the improvement options, therefore all of these constraints are applicable to all options, resulting in none of the options having a greater impact than another.

Earthworks

4.5.14. The earthworks quantities associated with each option have been estimated based on the information available at this stage. This estimate is a broad assessment of the impact of the scheme on required bulk earthworks movement and cut/fill balance. These quantities are shown in *Table 4.3*, where all options resulted in a surplus of material to be disposed.

Table 4.3 - Estimated Earthworks Quantities

Design Options	Bulk Cut Material (m^3)	90% Acceptable Cut Material (m^3)	Bulk Fill Material (m^3)	Total Bulk Earthworks Movement (m^3)	Cut/Fill Balance (m^3)
Option A	1835.00	1651.50	805.00	2640	+846.50
Option B	1835.00	1651.50	805.00	2640	+846.50
Option C	1835.00	1651.50	805.00	2640	+846.50
Option D	3165.00	2848.50	2110.00	5275	+738.50
Option E	2800.00	2520.00	1045.00	3845	+1475.00
Option F	2630.00	2367.00	1030.00	3660	+1337.00
Option G	2630.00	2367.00	1030.00	3660	+1337.00
Option H	3905.00	3514.50	2380.00	6285	+1134.50
Option I	2055.00	1849.50	755.00	2810	+1094.5
Option J	2055.00	1849.50	755.00	2810	+1094.5
Option K	2055.00	1849.50	755.00	2810	+1094.5

4.5.15. Options A-C have the most favourable earthworks quantities at this stage, as they require the minimum total bulk earthworks movement, with the second most balanced earthworks cut/fill. Although Option D has the most balanced earthworks cut/fill, by approx. 100 m^3, the total bulk earthworks movement is approximately 100% greater than Options A-C.

4.5.16. Option H exhibits the least favourable earthworks at this stage, as the total bulk earthworks movement is approximately 140% greater than Options A-C and has a greater surplus of material.

4.6. Hydrology and Drainage

Summary

4.6.1. This section considers the impacts of the proposed options on the existing drainage systems and any remedial works or new drainage infrastructure that might be required.

4.6.2. In all options there is an increase in hard surface area, to varying amounts. This would result in an increase in sheet flow for surface water draining from these areas. Subsequently, this may result in an increase in existing quantities of gullies and further lengths of combined kerb drains or a greater capacity specification for combined kerb drains to prevent ponding on the roads. Any likely increases are expected to be greater for Options D-E and H-K inclusive, where there would be a vary extent additional northbound lane.

4.6.3. Drainage management would be required at the back of the proposed retaining wall, adjacent to The Wellington Hotel. This would be incorporated in the structural design of the retaining solution at Stage 3.

4.6.4. For this Stage 2 Options Assessment an assumption has been made that the existing drainage network is of sufficient capacity to convey the additional surface water run-off. At Stage 3 detailed design this would have to be further assessed.

4.6.5. A survey of existing drainage would be required along with a CCTV survey to inform the detailed design at Stage 3 on the available capacity in the existing drainage system and to confirm the capacity of the existing collection system to cater for the increased hard surface areas.

4.6.6. Potential Sustainable Drainage Systems (SuDS), such as including a vegetated buffer between the active travel facilities and the main carriageway could improve management of the surface water from the additional hard surfaces. Introducing SuDS measures could also contribute to the adaption of the drainage system for Climate Change.

4.6.7. An existing culvert crosses the Wellington Road in the vicinity of Redmoss housing estate. Adequate cover will need to be maintained over the culvert when planning any excavations for active travel facilities cutting into embankments at this crossing location. A survey of the culvert is required at Stage 3 to confirm the levels and size of this culvert crossing. Similarly, the presence of other utility crossings will have to be considered for any planned excavations.

4.6.8. For Stage 3, it may be necessary to carry out some additional topographic survey south along Langdykes Road should the preferred option include works in this area.

4.6.9. The options have been considered together where similar impacts from the proposed road improvements apply.

4.6.10. For all options, it is proposed to repurpose portions of the existing grassed and vegetated areas to the back of the existing footway to facilitate the active travel facilities. Lengths of filter drain and the associated manholes are required to be relocated along the toe of the new embankment edges, where the slope falls in the direction of the footway.

4.6.11. Raised table crossings are proposed at some junctures where the footway/cycleway continues through vehicular access' to properties, as indicated on Figures D3.4 to D3.14 of Appendix D. These raised table crossings would impede the natural flow of surface water run-off in some cases. Additional gullies would be required to intercept these flows where the accesses for properties fall in the direction of Wellington Road.

4.6.12. In order to tie in with proposed footways/cycleways levels and verge levels, remedial works would be required to raise the covers and frames of a number of existing manholes.

4.6.13. In considering the additional signalised crossings throughout the Wellington Road Junctions Improvement scheme, where the pavement surfaces at the crossings are to remain unchanged then no drainage alterations would be expected.

4.6.14. Options D-E and H-K include narrowing of the central reserve and additional northbound bus lanes, to varying extents, which would further increase the hard surface area contributing surface water run-off to the existing drainage network. Furthermore, there would be a requirement to lower the level of several manholes covers and frames which currently exist within the existing vegetated central reserve.

4.6.15. It is also proposed, in Options D and H, that a stretch of the existing footway between Souterhead Roundabout and Hareness Roundabout be widened to facilitate the active travel provision adjacent to the southbound side of Wellington Road, hence gullies would require to be relocated.

4.6.16. For Options D-E and H-K inclusive the design/construction of the new bus lane would require many existing gullies and some existing combined kerb drains to be relocated. These drainage assets would be relocated from the existing kerb edge which would be required to be set back to facilitate the new bus lane. This new hard surface area along with that of the area required for the proposed NMUs and the further widening in conjunction with the narrowing of the central reserve may add a significant volume of surface water run-off into the existing drainage network.

4.6.17. Bus pre-signal zones associated with options E-K inclusive would result in an increase in hard surface area and a subsequent increase in surface water run-off. Some additional gullies would need to be introduced at these locations. At Langdykes Road there is also a proposal for a realignment to allow for the provision of a bus priority pre-signals arrangement. Gullies would need to be relocated to suit the proposed realignment.

4.6.18. Additionally, Option E includes an additional northbound lane in advance of the pre-signals on Wellington Road and will subsequently result in a greater increase in hard surface area and subsequently a greater number of gullies would need to be introduced for this option.

4.7. Structures

4.7.1. All options require a retaining wall adjacent to The Wellington Hotel, with a maximum height of approximately 1.5m. For options which include an additional bus lane between Souterhead and Hareness Roundabouts (D and H) the wall will be approximately 200m in length. For all other options the wall will be approximately 175m in length.

4.8. Utilities

4.8.1. There are a number of underground, overhead, and private utility services throughout Hareness Road and Coast Road as summarised in Section 2.7. This includes:

- Telecommunications – BT, Vodafone network, Neos and CityFibre.
- SSEN – 132kV, 33kV, 11kV, low voltage and fibre optic.
- SGN – intermediate and low-pressure gas pipelines
- Scottish Water – mains water distribution and sewer network.

4.8.2. A preliminary inquiry (C2) was issued in accordance with the New Roads and Street Works Act (1991) to each of the statutory undertakers to provide details of their apparatus within the Preferred Corridor. Due to the narrow site corridor and the density of utility provisions identified, each of the options have significant interaction with the identified apparatus.

4.8.3. It is recommended initial consultation be undertaken with the relevant statutory undertakers in advance of a budget estimate (C3 enquiry) to be requested during the DMRB Stage 3 assessment.

4.8.4. SSEN are at the early stages of replacing underground 132kV cables which provide the opportunity to promote and coordinate advanced works.

4.9. Constructability

4.9.1. All options require works directly adjacent to the existing Wellington Road corridor requiring lane closures and traffic management to safely undertake the works on the existing pavement (if required) and footways.

4.9.2. Options D, E and H-K provide varying extents of additional bus lanes, requiring existing carriageway realignment and subsequently more extensive traffic management arrangements through the construction phase.

4.9.3. Options E-H provide bus priority pre-signals on Langdykes Road, again requiring existing carriageway realignment, in this instance likely utilising the local road network to provide safe diversions through the construction phase.

4.9.4. Disruption to non-motorised users is expected to be minimal in all options, as there is a footway on each side of the existing Wellington Road which would provide a diversionary route during construction. Temporary NMU crossings may be required to maintain this diversionary route.

5. Environmental Assessment

5.1. Introduction

5.1.1. This chapter presents an environmental appraisal of the options to identify any key differentiators, and best- and worst-performing options from an environmental perspective, as part of the DMRB Stage 2 assessment.

5.1.2. The high-level assessment has generally been desk-based, informed by a review of existing studies, design information and online sources, including:

- AECOM (2021) Wellington Road Multi-Modal Corridor Study – Detailed Appraisal (Sections 3.4 & 9.2)
- AECOM (2021) Wellington Road Multi-Modal Corridor Study – Detailed Appraisal: Appendices (Appendix G – Environment Appraisal)
- Stantec (2021) External Transportation Links to Aberdeen South Harbour – STAG Detailed Appraisal Report (Chapter 9, Section 9.2: Environmental Appraisal; Appendix F – STAG Environmental Appraisal)
- Stantec (2022) External Transportation Links to Aberdeen South Harbour – Updated Strategic Business Case
- Aberdeen City Council (2023) Aberdeen Local Development Plan (adopted June 2023). Available online: https://www.aberdeencity.gov.uk/services/planning-and-building-standards/local-development-plan/aberdeen-local-development-plan
- Sweco UK DMRB Stage 2 design options

5.1.3. Key policies and plans that provide the policy and environmental context for the Scheme is provided in Section 5.5.

5.1.4. In addition, the appraisal was informed by:

- A Preliminary Ecological Appraisal (PEA) (including an extended Phase 1 habitat survey undertaken on 31 May 2023) to map the habitats present on site and assess their potential to support notable and protected species, as well as to record any protected species identified during the survey. A summary of the PEA is provided in Appendix A (Section A.5: Biodiversity and Habitats) and contained in full in Appendix C.
- Data received from North East Scotland Biological Records Centre (NESBReC).

5.1.5. NatureScot was consulted on the need to undertake Habitats Regulations Appraisal (HRA) screening in June 2023. NatureScot confirmed that due to the distance from the Scheme to the European sites, and the fact they were not

hydrologically-connected, a HRA would not be required for this project. No other environmental surveys or consultations with statutory or non-statutory consultees have been undertaken at this stage.

5.1.6. The environmental appraisal is supported by the following reports and figures included in the appendices:

- Appendix A – Environmental Assessment – this appendix contains a more detailed assessment by topic, which is summarised in this chapter
- Appendix B – Options Appraisal Carbon Report (Sweco, 2023a)
- Appendix C – Preliminary Ecological Appraisal Report (Sweco, 2023b)
- Appendix D – Environmental figures:
    - Figure D5.1 – Environmental Constraints (65209389-SWE-LE-00-D-J-30001)
    - Figure D5.2 – Aberdeen Local Development Plan (LDP) Constraints (65209389-SWE-LE-00-D-J-30002)
    - Figure D5.3 – Extended Phase 1 Habitat Map Overview (65209389-SWE-LE-00-D-J-30004)
    - Figure D5.4 – Extended Phase 1 Habitat Map Sheets (65209389-SWE-LE-00-D-J-30005)
    - Figure D5.5 – Designated Sites and Protected Woodland (65209389-SWE-LE-00-D-J-30003)
    - Figure D5.6 – National Coastal and Landscape Character (65209389-SWE-LE-00-D-J-30006)

5.2. Structure and Scope of this chapter

5.2.1. The remainder of this chapter is structured as follows:

- Section 5.3 – summary of the whole life carbon appraisal for each option
- Section 5.4 – general study area
- Section 5.5 – key policies and plans
- Section 5.6 – summary of environmental assessment

5.2.2. Section 5.6 provides a summary of the assessment outcomes, including potential mitigation and enhancement measures, and next steps at DMRB Stage 3. More detailed assessment information is provided in Appendix A for each key environmental topic/receptor, in line with DMRB.

5.3. Carbon

5.3.1. Whole life carbon is a key consideration of each option at DMRB Stage 2 and in the ongoing design development. A summary of the carbon appraisal for each option is provided below, and more information is available in Sweco's Options Appraisal Carbon Report (2023) (see Appendix B).

5.3.2. The Stantec 2021 Report (referenced in Section 5.1) refers to the Nestrans 2040 Regional Transport Strategy [12], which notes the 'need to place increasing emphasis on energy transition to low carbon'. Although there is currently no statutory requirement for assessing whole life carbon at this project stage, a strategic estimate has been undertaken in support of the DMRB Stage 2 optioneering process and in light of recent international, national and local carbon reduction requirements and activities.

5.3.3. To provide an indicative comparison of the whole life carbon emissions (tCO2e) associated with each option, a high-level estimation has been made based on outline material quantities used for the cost estimate and emissions factors from CESSM4 (2013) for construction emissions and assumptions from the TUBA models for user emissions.

5.3.4. Table 5.1 provides a summary of the assessment results for all shortlisted options. A rank between 1 and 11 has been provided, based on the total estimated carbon emissions of each option. An impact score has also been given – note that all options are ranked as negative given the increase in emissions that would be expected both through construction and operation of the Scheme.

Table 5.1 – Whole Life Carbon Emissions Appraisal Summary

Option	Option A	Option B	Option C	Option D
Construction (tCO_2e)	476	476	476	1,069
Operation (user) (tCO_2e)	3,426	8,044	7,119	4,125
Total emissions (tCO_2e)	3,902	8,520	7,595	5,194
Ranking	1	10	8	7
Impact Score	-1	-3	-3	-2

[12] Nestrans (2021) Regional Transport Strategy for the North East of Scotland 2040. Final November 2021. Available online: https://www.nestrans.org.uk/wp-content/uploads/2021/12/Nestrans-RTS_PUBLISHED.pdf

Option	Option E	Option F	Option G	Option H
Construction (tCO_2e)	691	686	686	1,678
Operation (user) (tCO_2e)	3,701	8,514	7,609	3,225
Total emissions (tCO_2e)	4,392	9,200	8,295	4,903
Ranking	4	11	9	6
Impact Score	-2	-3	-3	-2

Option	Option I	Option J	Option K
Construction (tCO_2e)	596	597	597
Operation (user) (tCO_2e)	3,835	3,564	3,370
Total emissions (tCO_2e)	4,431	4,161	3,967
Ranking	5	3	2
Impact Score	-2	-1	-1

5.3.5. As shown in Table 5.1, Option A is shown to have the lowest whole life carbon emissions, as well as the joint lowest carbon emissions through construction. Options B and F have the highest whole life carbon emissions, despite lower emissions at the construction stage than Options D and H. The higher whole life carbon emission totals for Options B and F are the result of significantly higher emissions during operation compared to the other modelled options.

5.3.6. Moving forward, in line with PAS 2080:2023, once a preferred option has been selected, and in line with the Carbon Management Plan produced for the Scheme, carbon workshops will be held with the design team to ensure that opportunities to minimise emissions during DMRB Stage 3 are assessed and implemented. This will include developing a detailed bottom-up carbon assessment of the preferred option that can be used to identify hotspots and ensure continued carbon mitigation actions are taken through future project stages and into construction.

5.4. General Study Area

5.4.1. A buffer of up to 1km surrounding the scheme boundary has generally been used for the environmental assessment. A wider buffer of up to 2km was used for ecologically designated sites (see Figure D5.1: Environmental Constraints and Figure D5.2: Aberdeen LDP Constraints).

5.4.2. The built-up land use within the 1km study area of the scheme boundary is mostly commercial and some residential areas, i.e.:

- Altens and East and West Tullos Industrial Estates to the east, north and south-west; and
- residential area of Torry and Balnagask to the north-east, Nigg and Kincorth to the west and north-west, and Cove Bay to the south / south-east.

5.4.3. The River Dee is located to the northwest of the scheme (approximately 850m away at its closest extent) and is a designated Special Area of Conservation (SAC). A section of Wellington Road is a designated Air Quality Management Area (AQMA) before it crosses the River Dee and continues into Aberdeen City beyond. To the south of the scheme boundary is Loirston Loch (on west side of Wellington Road), and beyond Altens Industrial Estate and residential communities to the east, is agricultural land with the cliffs and the North Sea coast beyond.

5.4.4. Some of the land within the 1km study area is designated 'Green Belt' and 'Green and Blue Infrastructure', namely 'Green Space Network'; policies NE1 and NE2, respectively, in the 2023 Aberdeen Local Development Plan[13] (see Figure D5.2 and Section 5.5 below for more information).

5.4.5. Between the communities of Tullos and Altens is Tullos Hill, which has a stretch of designated ancient woodland, scheduled monuments, and recreational paths. Within the study area is National Cycle Network (NCN) Route 1 and a small number of core paths (CPs), of which two (CP81 and CP103) intersect the scheme boundary.

5.5. Key Policies and Plans

5.5.1. As well as DMRB, the appraisal has been informed by, and taken due cognisance of, key policies and plans, particularly:

- National Planning Framework 4 (NPF4)[14];
- Aberdeen Local Development Plan (LDP); and
- Net Zero Aberdeen[15].

[13] Aberdeen City Council (2023) Aberdeen Local Development Plan (adopted June 2023). Available online: https://www.aberdeencity.gov.uk/services/planning-and-building-standards/local-development-plan/aberdeen-local-development-plan

[14] Scottish Government (2023) National Planning Framework 4. Available online: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2023/02/national-planning-framework-4/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4.pdf

[15] Aberdeen City Council (2022) Net Zero Aberdeen. Available online: https://www.aberdeencity.gov.uk/net-zero-aberdeen

5.5.2. Relevant information on NPF4, the Aberdeen LDP and Net Zero Aberdeen is provided below.

5.5.3. Any specific legislation, policies and guidance is included in the relevant topic sections of the detailed environmental assessment (see Appendix A).

National Planning Framework 4 (NPF4)

5.5.4. NPF4 is the national spatial strategy for Scotland and sets out spatial principles, regional priorities, national developments and national planning policy. The strategy was published in February 2023 and replaces NPF3 and Scottish Planning Policy.

5.5.5. The national framework identifies a number of developments considered to be vital to the delivery of the spatial strategy. One of these national developments is the expansion of Aberdeen Harbour at Nigg Bay. Refer to National Development No. 14 (Aberdeen Harbour) in NPF4 for more information:

Aberdeen Harbour facilitates completion of the South Harbour and access to it as well as a more mixed-use waterfront for Aberdeen on areas of the harbour that will not in future be required for port uses. This will contribute to international and national connectivity, freight and the renewable energy sector.

5.5.6. The study area contains areas of green belt land. Policy 8 of NPF4 is policy on development in, and protection of, Green Belts, which is a key element of achieving ‘Sustainable Places’:

Local Development Plans (LDPs) should consider using green belts, to support their spatial strategy as a settlement management tool to restrict development around towns and cities.

5.5.7. The national position statement is generally against development within designated greenbelts, unless they are for (selection provided only): -

- development associated with agriculture, woodland creation, forestry and existing woodland (including community woodlands);
- outdoor recreation, play and sport or leisure and tourism uses; and developments that provide opportunities for access to the open countryside (including routes for active travel and core paths); and
- essential infrastructure or new cemetery provision.

5.5.8. Although present within the wider study area, no areas of greenbelt land are located within the scheme boundary and therefore the scheme complies with this policy.

Aberdeen Local Development Plan (LDP)

5.5.9. Aberdeen City's LDP was adopted in June 2023. The following policies reinforce the position statements within NPF4 on development within greenbelt land, and other policies relevant to the Scheme.

Green Belt (LDP Policy NE1)

5.5.10. The aim of the Green Belt is to maintain the distinct identity of Aberdeen and the communities within and around the city, by defining their physical boundaries clearly. Safeguarding the Green Belt helps to avoid coalescence of settlements and sprawling development on the edge of the city, maintaining Aberdeen's landscape setting and providing access to open space. The Green Belt directs planned growth to the most appropriate locations and supports regeneration.

5.5.11. Development in areas defined as Green Belt on the Proposals Map will not be supported. Exceptions to this general presumption will only be supported where the proposal [selection provided only]:

- e) *Is directly associated with essential infrastructure such as telecommunications, electricity grid connections, transport proposals identified in the Plan or roads planned through masterplanning of sites, if they cannot be accommodated anywhere other than the Green Belt*

5.5.12. With no greenbelt land mapped on the west or east side of Wellington Road, impacts on existing greenbelt are anticipated to be negligible for all options.

Green and Blue Infrastructure (LDP Policy NE2)

5.5.13. Development proposals will seek to protect, support and enhance the Green Space Network (GSN) (identified on the Proposals Map). This broadly encompasses the wildlife, biodiversity, ecosystem services & functions, access, recreation, landscape and townscape value of the GSN. Development that does not achieve this will not be supported.

5.5.14. Coherence of the Green Space Network should also be maintained when considering any development and infrastructure proposals. Where infrastructure projects or certain developments necessitate crossing the GSN, they should maintain and enhance the coherence and quality of the network. In doing so,

appropriate provision should be made for access across roads for wildlife and outdoor recreation.

5.5.15. With no designated GSN mapped on the west side of Wellington Road to the south of Hareness Roundabout, impacts on the existing network are anticipated to be negligible for all options. However, for Options D and H, which include earthworks off the southbound carriageway to the north of Souterhead Roundabout, there could be potential for minor loss of this GSN resource.

LPD Opportunity Sites

5.5.16. There are six 'Opportunity Sites' in the Aberdeen LDP in or partially within the 1km study area (see Figure D5.2: Aberdeen Local Development Plan (LDP) Constraints) from north (in clockwise direction):

- OP107 – Former East Tullos gas holder and waste recycling centre. Greenwell Road.
- OP58 – A greenfield site at Stationfields, Cove.
- OP60 – Charleston; 20.5ha of employment land.
- OP59 – 11ha of employment land near Lochside Academy.
- OP105 – former Kincorth Academy school, located on Kincorth Circle.
- OP115 – 34 to 40 Abbotswell Road, land suitable for residential use.

5.5.17. At this stage it is assumed that all options could benefit the LDP opportunity sites by providing improved access.

Net Zero Aberdeen

5.5.18. The Net Zero Aberdeen Routemap, approved in February 2022, sets out a pathway towards Aberdeen becoming net zero by 2045. It is built upon six enabling strategies, comprising:

- Mobility Strategy;
- Buildings and Heat Strategy;
- Circular Economy Strategy;
- Energy Supply Strategy;
- Natural Environment Strategy; and
- Empowerment Strategy.

5.5.19. Alongside the Routemap, three other frameworks / initiatives have been set up to help the city meet its net zero target, as follows:

- Aberdeen Adapts – a framework for city-wide climate adaptation, responding to the impacts of climate change.
- H2 Aberdeen – focus on the city's green energy transition, including innovations in hydrogen technology helping to establish Aberdeen as a centre of excellence for hydrogen and fuel cell technology.
- Aberdeen Climate and Nature Pledge – a pledge was launched in November 2022 to give organisations and individuals an opportunity to pledge their commitment to deliver the Net Zero Aberdeen Routemap and Aberdeen Adapts climate adaptation framework.

5.5.20. By aiming to improve journey times and congestion along Wellington Road, particularly to improve bus transport and promote active travel, the scheme is considered to facilitate Aberdeen's ambition to achieving net zero, with a focus on the transport sector. Indirectly, it may contribute towards improving access to greener jobs and infrastructure within the city, including the proposed Energy Transition Zone, proposed to the northeast of the scheme boundary.

5.6. Summary of Environmental Assessment

5.6.1. A high-level review of the Options has been undertaken using existing information and mostly desk-based resources. A range of sensitive environmental constraints and features within the Preferred Corridor have been identified and this has formed the basis for the environmental appraisal to assess if there are likely to be any differentiating factors between the route options (see Appendix A for the detailed environmental assessment).

5.6.2. In summary:

- There are only slight differences in performance between most of the proposed options.
- 'Option A' and 'Option E' are the best performing options from an environmental perspective. Option A has the lower amount of habitat loss and least impact on ecologically sensitive habitats, while Option E would have additional minor loss of woodland at Souterhead roundabout which could have an impact on bats with additional surveys required and associated mitigation. From an air quality perspective, both options are anticipated to have a neutral effect on local air quality.
- 'Option D' and 'Option H' are the worst performing options from an environmental perspective. These options give rise to increased noise levels

at nearby sensitive receptors and also lead to potentially minor adverse impacts on local air quality as they will introduce an additional northbound lane for buses, reducing the distance between the road and sensitive receptors to the west of Wellington Road. There is additional hard surface for all options, however Option D and H, and to a lesser extent Options I, J and K, have the most significant increases which may impact drainage. Options D and H involve earthworks in the semi-natural woodland adjacent to the southbound carriageway, which could have an impact on protected species including bat and badger and could also potentially impact one additional building assessed as having potential to support roosting bats (building B8 on Figure D5.4). The earthworks associated with these options would also be difficult to accommodate for from a landscape and visual perspective, as compensatory tree planting would be required to replace tree loss, which may be difficult considering the limited open space along the road corridor. There is also a strong presumption against woodland loss and a focus on supporting nature recovery in NPF4.

- The high-level whole life carbon appraisal undertaken for the options showed that Option A has the lowest whole life carbon emissions, as well as the lowest carbon emissions through construction. Options B and F have the highest whole life carbon emissions, despite lower emissions at the construction stage than Options D and H. The higher whole life carbon emission totals for Options B and F are the result of significantly higher emissions during operation compared to the other modelled options.

5.6.3. Table 5.2 provides a summary of the results and how the Options compare.

Table 5.2 – Summary of Environmental Constraints and Predicted Impacts of the Options

* Key = 0 (no impact); 1 (relatively minor impact); 2 (relatively moderate impact); 3 (relatively large impact), '-'(adverse), '+' (positive)

Environmental Constraint / Feature	**Option**										
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Air Quality	0	-1	-1	-1	0	-1	-1	-1	0	-1	-1
Noise and Vibration	0	-1	-1	-1	0	-1	-1	-1	-1	-1	-1
Cultural Heritage	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Biodiversity and Habitats	-1	-1	-1	-2	-1	-1	-1	-2	-1	-1	-1
Landscape and Visual Amenity	-1	-1	-1	-2	-1	-1	-1	-2	-1	-1	-1
Geology and Soils	0	0	0	0	0	0	0	0	0	0	0
Water Quality and Flood Defence	0	0	0	-1	0	0	0	-1	0	0	0
Carbon	-1	-3	-3	-2	-2	-3	-3	-2	-2	-1	-1
Score (Lowest = Worst; Highest = Best)	**-4**	**-8**	**-8**	**-10**	**-5**	**-8**	**-8**	**-10**	**-6**	**-6**	**-6**

Mitigation and Enhancement

5.6.4. This environmental assessment has considered mitigation measures where appropriate at this stage, as well as those identified in previous studies.

5.6.5. The DMRB Stage 2 design process has included 'embedded' mitigation interventions where appropriate, i.e., limiting the footprint of the Options to the minimum required in order to construct and operate the scheme.

5.6.6. This will be developed further at DMRB Stage 3, including a range of good practice and specific mitigation measures to avoid, reduce or offset any significant effects identified. For example, good practice may include dust, noise and groundwater pollution control measures during construction, and the implementation of low road noise surfacing and sustainable drainage systems (SuDS) during operation. Construction activities and mitigation measures will be identified and reported in a Construction Environmental Management Plan (CEMP), to be prepared by the contractor prior to construction.

6. Traffic and Economic Assessment

6.1. Introduction

6.1.1. This chapter outlines the traffic modelling undertaken for the project, using the A956 Wellington Road Microsimulation Model. The model was originally developed by AECOM for the Wellington Road Multi-Modal Corridor Study and was subsequently utilised by Stantec for the External Links to Aberdeen South Harbour (ASH) STAG Detailed Options Appraisal. Sweco have adapted the Stantec version of the model for the purposes of this DMRB Stage 2 assessment.

6.1.2. The model has been used to produce performance indicators such as changes to traffic volumes and journey times. Outputs from the model have informed the economic appraisal undertaken using Transport Users Benefit Appraisal (TUBA v1.9.17 and Economics parameter file v1.21, aligned to May 2023 of the TAG Databook) and Cost and Benefit to Accidents – Light Touch (COBALT) software v2.5 (COBALT Parameter file v1.21, aligned to May 2023 of the TAG Databook). Outputs from the model have also been provided for a high-level screening exercise of environmental appraisals.

6.1.3. This chapter contains results relating to the “Do-Minimum” (without scheme) and the “Do-Something” which incorporates the interventions proposed in Options A to K.

6.2. Modelling

Base Model

6.2.1. The Wellington Road Microsimulation Model was originally developed by AECOM using Paramics Discovery software for the Wellington Road Multi-Modal Corridor Study. The Wellington Road Base Model has a base year of 2019 and used a prior matrix from a cordon of the Aberdeen Sub-Area Model (ASAM14). It was calibrated using junction turning counts collected in 2019 and 2020 and validated against TomTom journey time data from 2019. The model was subsequently utilised by Stantec for the External Links to Aberdeen South Harbour (ASH) STAG Detailed Options Appraisal. Stantec produced a rudimentary Inter-Peak model, and independently produced forecast matrices for an assumed 2026 opening year and 2041 appraisal year.

6.2.2. The base model extents are shown in *Figure 6-1*.

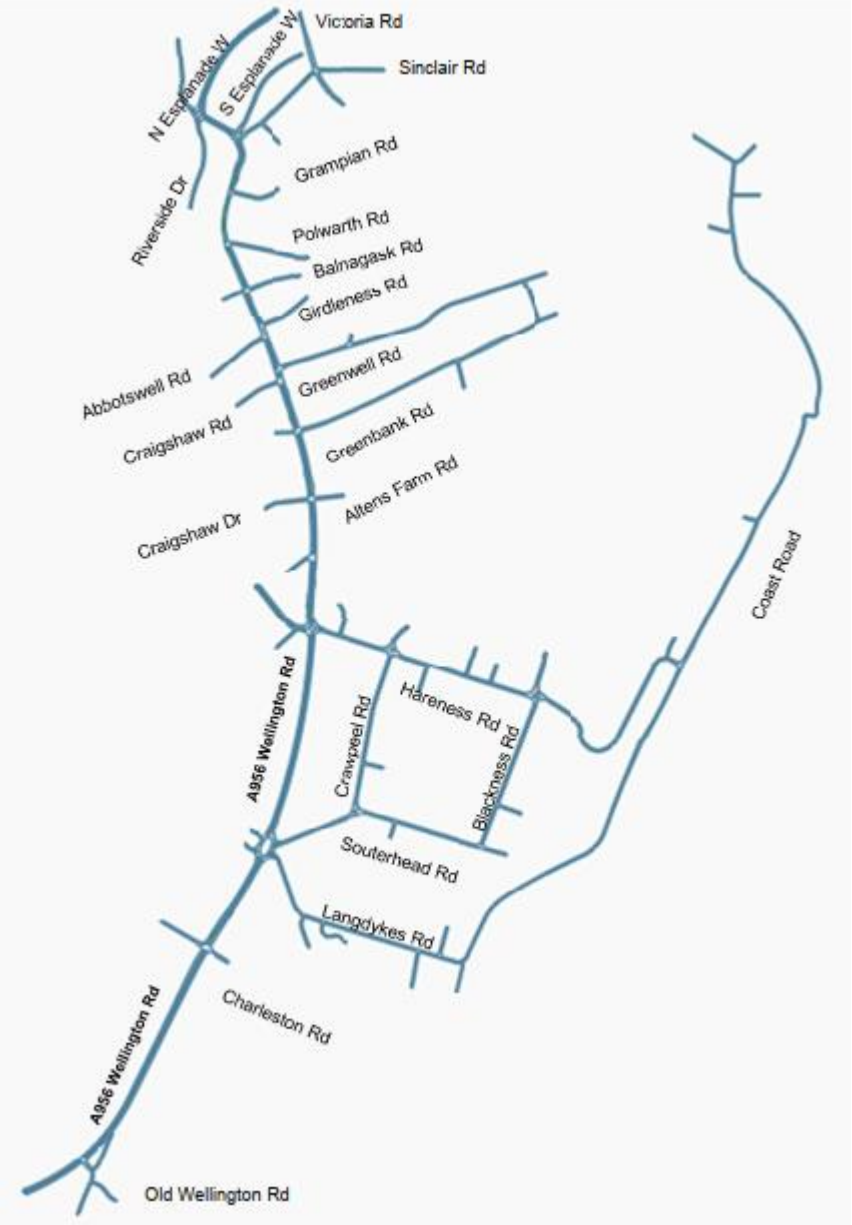


Figure 6-1 - A956 Wellington Road Base Model Network

6.2.3. The 2019 base model includes the following periods:

- AM Peak Period: (0700 – 0900),
- IP Period (0900 – 1600), and
- PM Peak Period (1600 – 1800).

6.2.4. Vehicle types include:

- Lights (Cars and Light Goods Vehicle (LGVs))
- Heavies (Other Goods Vehicles (OGV)1 and OGV2)

6.2.5. Public transport routes in the form of bus services have also been coded in the model across all modelled periods.

6.2.6. Calibration and validation were undertaken on the AM and PM peak period models only.

Model Development Reports

6.2.7. Full details of the development of the Wellington Road base model, including calibration and validation information, can be found in the *Wellington Road Multi-Modal Corridor Study – Detailed Appraisal: Model Development Report*, produced by AECOM for ACC in June 2020.

6.2.8. Details of the development of the Inter-Peak model can be found in the *STAG Detailed Options Appraisal – Appendix C Traffic Modelling* report produced by Stantec.

6.2.9. To determine the impact of the COVID-19 pandemic on traffic volumes in the Preferred Corridor since the 2019 base year, Aberdeen City Council provided Automatic Traffic Count (ATC) data for three locations: -

- Wellington Road: (394302, 804775);
- Lang Stracht: (388682, 806604); and
- North Deeside Road: (390282, 803345).

6.2.10. The ATC data provided included Average Daily Flows (ADF) for the months of February, May and September, for the years 2019, 2020, 2021 and 2022, shown in *Table 6.1*.

Table 6.1 - COVID-19 Traffic Flow Comparison (2019 - 2022)

Location	2019 ADF	2020 ADF	2021 ADF	2022 ADF	2019 to 2020 % Diff	2019 to 2021 % Diff	2019 to 2022 % Diff
February							
Wellington Road	18,100	18,000	12,700	15,100	0%	-30%	-16%
Lang Stracht	15,300	15,100	8,800	11,800	-1%	-43%	-23%
North Deeside Road	11,400	10,900	6,300	10,100	-4%	-44%	-11%
May							

Location	2019 ADF	2020 ADF	2021 ADF	2022 ADF	2019 to 2020 % Diff	2019 to 2021 % Diff	2019 to 2022 % Diff
Wellington Road	20,500	9,100	15,800	15,900	-56%	-23%	-23%
Lang Stracht	16,000	6,800	14,200	14,300	-58%	-12%	-11%
North Deeside Road	11,700	4,500	9,400	10,400	-62%	-20%	-11%
September							
Wellington Road	17,900	15,500	16,600	17,700	-14%	-7%	-1%
Lang Stracht	15,700	13,100	14,900	14,900	-16%	-5%	-5%
North Deeside Road	13,100	8,800	10,100	10,500	-33%	-23%	-20%

6.2.11. *Table 6.1* indicates that traffic volumes fell by up to 62% in 2020 with a gradual rebound towards pre-pandemic flows seen up to September 2022. For the three locations provided and including February, May and September results, there is an average reduction of 13% between 2019 and 2022.

6.2.12. Considering Wellington Road ATC data in isolation also gives an average reduction of 13% between 2019 and 2022. However, comparisons for Wellington Road based on September data gives a reduction of only 1% between 2019 and 2022. Continued monitoring will reveal longer term trends. Interpretation of model results takes these comparisons into account, given all models are derived from a 2019 Base. Post-Covid impacts (including increased homeworking) are incorporated into the forecasts used from ASAM19 in this assessment.

Do-Minimum Network

6.2.13. The Do-Minimum model comprises assumptions around committed infrastructure and traffic forecasts (including those relating to committed development in the area). Two future years are used for undertaking the economic assessment of options: 2026 and 2041.

6.2.14. The linking up of Palmerston Road to North Esplanade West at the northern extent of the model has been included in the 2026 and 2041 Do-Minimum models. This enables vehicles travelling between North Esplanade West and South College Street to route via Palmerston Place instead of the roundabout of North Esplanade West / South College Street / Wellington Road / Riverside Drive. As Palmerston Place is just outside the model extent, for modelling purposes the trips between the two route zones have been removed from all matrices in the Do-Minimum model. This provides an improvement to the roundabout as there is a reduction in the number of right turn movements from North Esplanade Way to South College Street.

6.2.15. Access to Aberdeen South Harbour, located in the eastern extents of the model, is constrained to Hareness Road. HGV restrictions on Langdykes Road, Blackness Road and Crawpeel Road (within Altens Industrial Estate) are in place to maintain this.

6.2.16. A series of 'ghost links' have also been added to the base model network to enable routing between Coast Road, Torry and the northern extents of the network.

6.2.17. The 'ghost links' included:

- St. Fitticks Road – to join up the route between Victoria Road and the Coast Road
- Balnagask Road – to join up Wellington Road with St. Fitticks Road
- Girdleness Road - to join up Wellington Road with Balnagask Road / St. Fitticks Road

6.2.18. The 'ghost links' are constrained to allow only light vehicle traffic to use them, ensuring that HGV traffic accessing the Aberdeen South Harbour maintains its current routing via the defined Aberdeen freight routes.

6.2.19. The Do-Minimum Network is shown in *Figure 6-2*.

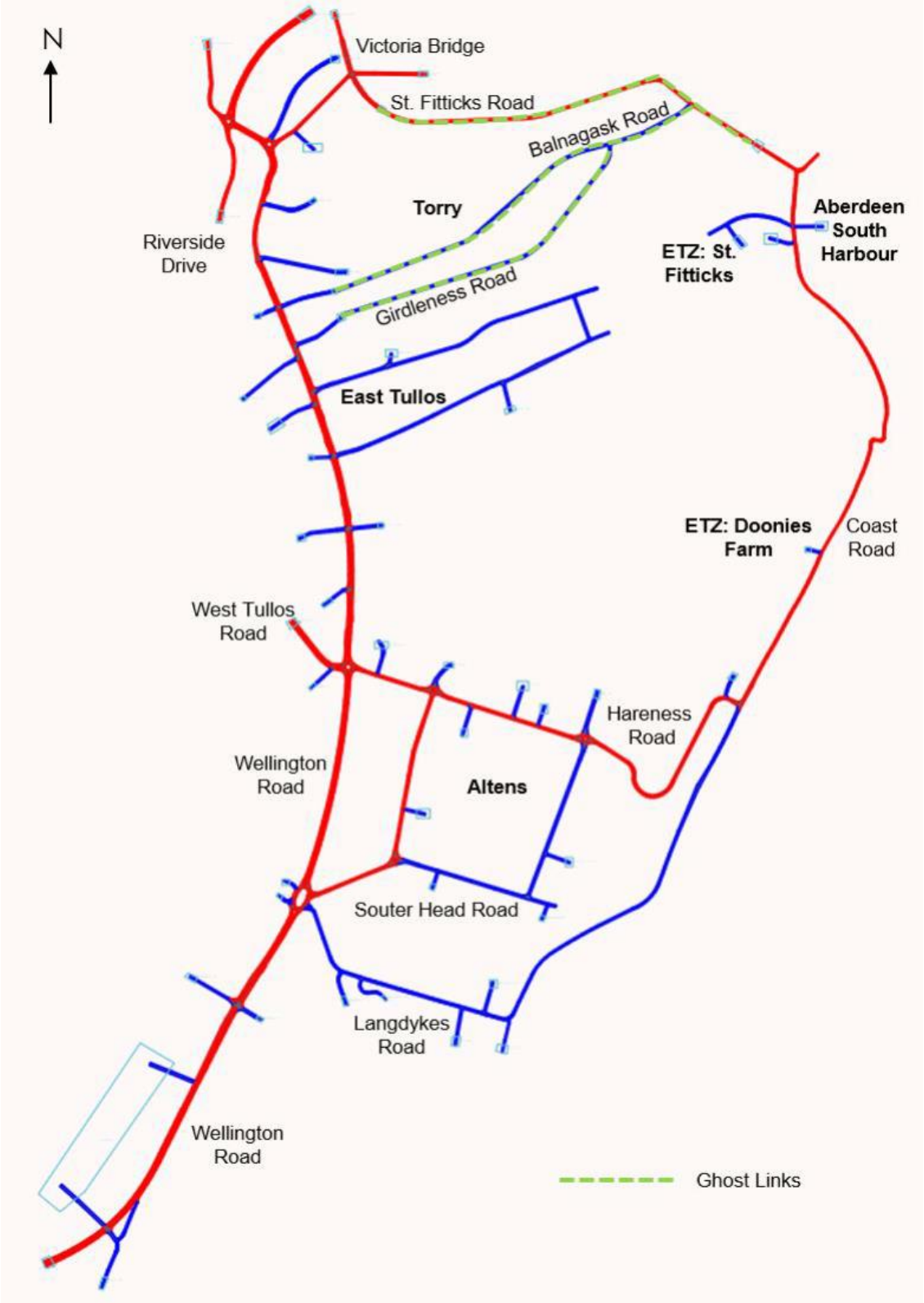


Figure 6-2 - Do-Minimum Network

Do Something - Shortlist Options

6.2.20. The Do-Something network is consistent with the Do-Minimum network with the addition of the interventions proposed in Options A to H.

6.2.21. The 11 shortlist options (A to K) are shown in below in *Figure 6-3*, *Figure 6-4* and *Figure 6-5*.

Figure 6-3 – Shortlist Options A – D

Figure 6-4 - Shortlist Options E – H

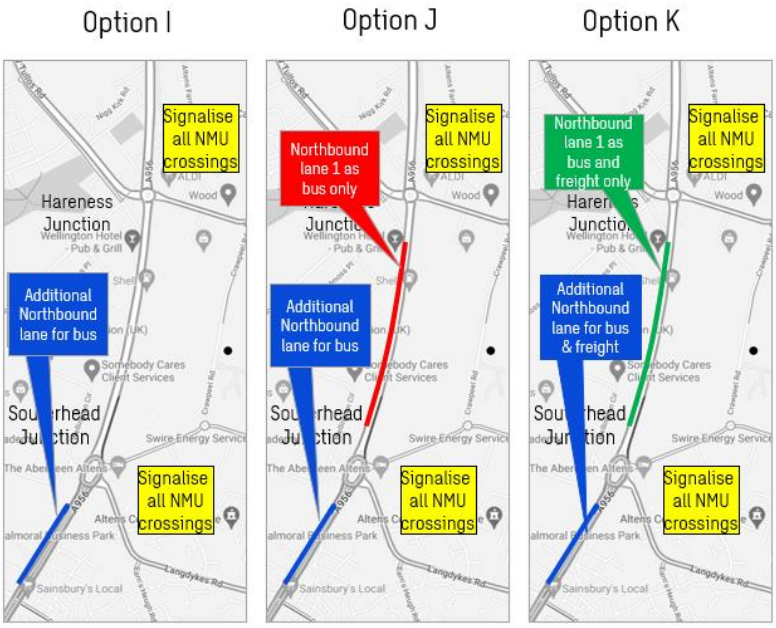


Figure 6-5 - Shortlist Options I – K

6.2.22. Table 6.2 displays an intervention matrix which outlines the proposals associated with each of the 11 options.

Table 6.2 – Intervention Matrix

Intervention	A	B	C	D	E	F	G	H	I	J	K
Segregated two-way flow active travel provision	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hareness Roundabout – Additional Signalised pedestrian crossings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Souterhead Roundabout – Improved signalised crossing facilities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Existing carriageway retained	✓				✓				✓		
Existing carriageway retained – Dedicated northbound lane		✓	✓			✓	✓			✓	✓
Additional northbound bus lane				✓				✓	✓	✓	✓
Souterhead Roundabout – Bus Priority Entry Lanes					✓	✓	✓	✓			

6.3. Forecasting

6.3.1. The Aberdeen Sub-Area Model (ASAM) 19, the strategic multi-modal transport model for the North-East of Scotland, has been used to inform forecasts for the A956 Wellington Road Microsimulation Model used in this assessment. ASAM was recently updated to a base year of 2019, which incorporates the opening of the Aberdeen Western Peripheral Route (AWPR).

6.3.2. Forecasts include a 2026 opening year and a 2041 design year. Traffic cordon matrices from ASAM19 covering the extents of microsimulation model network have been created by Nestrans' consultants Systra for this purpose.

6.3.3. Matrices were provided for the AM, IP and PM peak hours covering the 2019 Baseline year and forecast scenarios for 2025, 2030, 2040, and 2045 – covering both 'With Policy' and 'Without Policy' scenarios. Separate matrices were provided for cars, lights and heavy goods vehicles.

6.3.4. The 'Without Policy' or 'High Traffic' scenarios input assumptions contain a number of future year scheme investment proposals, transport behaviours and policy proposals. This includes the South College Street link to/from the North Esplanade in the northern end of the modelled area. Both the with and without policy scenarios represent the impact of the Aberdeen City Centre Low Emission Zone proposals within the 2025 forecast year.

6.3.5. The 'With Policy' or 'Low Traffic' scenarios contain consistent scheme proposals as the 'Without Policy' scenarios, but also represent wider policy proposals, such as the Government target of reducing car kilometres by 20% by 2030.

6.3.6. In the ASAM outputs provided, there is a considerable reduction in commuting jobs between 2019 and 2025, as the forecasting takes account of behavioural responses with a higher proportion of people working at home post-Covid.

6.3.7. Zone equivalence was determined between the Paramics zone system and that of the ASAM cordon. In some cases, several ASAM zones have been aggregated to one Paramics zone and conversely there are cases where multiple Paramics zones have been matched to one ASAM zone. For the latter, differences in forecast trips have been spread evenly across the Paramics zones.

6.3.8. To apply the forecasts to the A956 Wellington Road Model and create demands for 2026 and 2041, absolute differences in forecast trips for ASAM zone origins have been applied to the Paramics 2019 base year demands. This preserves the trip patterns from the locally validated microsimulation model. To create forecasts for the 2026 opening year and 2041 design year, interpolation was applied to the available ASAM forecast years of 2025 and 2030 for 2026 and 2040 and 2045 for 2041.

6.3.9. Based on planning data provided with the forecasts, it is assumed that ASAM has not accounted for trips associated with the opening of ASH or the ETZ. As such, trip generations have been determined for these separately and added to the forecasts. The Loirston development situated to the west of Wellington Road, north of Charleston junction is accounted for in the ASAM forecasts. It is assumed

that other smaller local developments in the area are included within aggregate trip differences predicted by the ASAM forecasts.

Aberdeen South Harbour (ASH) Trip Generation

6.3.10. To determine the vehicle trip generation for ASH, the methodology applied in the External Transportation Links to Aberdeen South Harbour STAG Detailed Options Appraisal Report was applied with more recent freight data. ASH tonnage was estimated based on the relationship between quay length and cargo tonnage recorded at comparator UK ports. Data on cargo tonnage was sourced from the Department for Transport's (DfT's) Port and Domestic Waterborne Freight statistics. For the purposes of this study, an average was taken of freight from the dataset for 2017-2021. The process is as follows: -

- Estimation of annual cargo tonnage at ASH based on the relationship between quay length and cargo tonnage seen at comparator UK ports;
- Estimation of annual trip generation influenced by the anticipated cargo to be handled by the port and freight types seen at comparator UK ports; and
- Profiling trips across an average day, based on profiles from the 2015 Transport Assessment developed for ASH.

6.3.11. Estimated tonnage was calculated using the equation for the line of best fit from the comparator port data. It is estimated that with a 1400m quay ASH might handle approximately 900,000 tonnes of freight per year. It was assumed that ASH will not handle crude oil, coal or Ro-Ro traffic.

6.3.12. To convert freight tonnages into vehicular movements, high level vehicle capacity estimates were made on a consistent basis with the ASH STAG Appraisal. HGVs were assumed to carry 2/3 of maximum payload on average.

6.3.13. Most large ports are in continual operation, so daily trip generation was calculated by dividing annual trip generation by 365.

6.3.14. It was assumed that HGVs would make up 40% of total ASH traffic in accordance with the 2015 Transport Assessment.

6.3.15. The resultant trip generation for Aberdeen South Harbour is shown in Table 6.3.

Table 6.3 - Aberdeen South Harbour Daily Trip Generation

	Arrivals			Departures		
	Car/LGV	HGV	Total	Car/LGV	HGV	Total
0700-0800	21	5	26	4	8	12
0800-0900	14	5	19	7	6	14

0900-1000	14	7	21	11	6	17
1000-1100	14	10	24	14	9	23
1100-1200	17	11	28	24	9	33
1200-1300	17	7	24	16	8	24
1300-1400	13	9	22	13	7	19
1400-1500	13	18	31	13	14	27
1500-1600	9	14	23	11	15	26
1600-1700	8	11	18	11	9	19
1700-1800	1	6	8	18	9	27
1800-0700	40	16	56	39	20	59
Daily	**180**	**120**	**300**	**180**	**120**	**300**

6.3.16. The trip distribution for ASH was taken from the 2015 Transport Assessment as shown in Table 6.4.

Table 6.4 - ASH Trip Distribution

To/from	Car/LGV Proportion	HGV Proportion
A956 South	37%	60%
West Tullos Road	8%	10%
Market Street	55%	0%
N Esplanade West	0%	30%

6.3.17. The above trip generation has been included in the Do-Minimum trip matrices.

Energy Transition Zone (ETZ) Trip Generation

6.3.18. The following ETZ trip methodology was developed and applied to option testing prior to publication of a new Transport Assessment in support of a Planning Permission in Principle application on behalf of ETZ Ltd. dated October 2023. There is an opportunity to revisit ETZ trip generation and distribution in Stage 3.

6.3.19. The proposed ETZ development is expected to open in 2026. The site will support businesses associated with the generation of renewable energy and green technologies.

6.3.20. As part of the External Links to Aberdeen South Harbour STAG Detailed Options Appraisal, Stantec developed a methodology for vehicle trip generation associated with the ETZ site. This is based on a Transport Assessment produced for the Siemens Green Port Hull (SGPH) development in Hull, a site assumed to be comparable in form to the ETZ. Sweco have applied consistent assumptions in this assessment.

6.3.21. The methodology uses trip generation estimates for the SGPH site for Light and Heavy vehicle trips gathered from the Transport Assessment, with a scaling factor of 41% applied to account for the relative difference in scale of the two sites. It is assumed the ETZ will have a 'developable' area of 23 hectares.

6.3.22. Trip distribution was calculated differently for Light and Heavy vehicles. For Light vehicles, the trip distribution was based on the home origins of those working in the Cove North Intermediate Zone taken from Travel to Work data from the 2011 Census. For Heavy vehicles, the trip distribution was assumed to be consistent with the trip distribution for Aberdeen South Harbour.

6.3.23. It is assumed the proposed ETZ will be split across the St Fitticks and Doonies Farm development sites which are estimated to have 12.1 and 10.9 hectares of developable area, respectively. On this basis, it was assumed that 53% of proposed ETZ traffic volumes would be associated with the St Fitticks site and 47% with the Doonies Farm site.

6.3.24. Trip generation associated with ETZ for the Opening Phase and Operational Phase is respectively shown in Table 6.5 and Table 6.6. The trip generation seen has been included in the Do-Minimum trip matrices.

Table 6.5 - ETZ Trip Generation 2026 (Opening Phase)

	Arrivals			Departures		
	Car/LGV	HGV	Total	Car/LGV	HGV	Total
0700-0800	4	0	4	30	0	30
0800-0900	89	9	98	19	9	28
0900-1000	10	0	10	10	0	10
1000-1100	10	0	10	10	0	10
1100-1200	10	0	10	10	0	10
1200-1300	10	0	10	10	0	10
1300-1400	10	0	10	10	0	10
1400-1500	10	0	10	10	0	10
1500-1600	23	0	23	35	0	35
1600-1700	13	0	13	93	0	93
1700-1800	0	0	0	0	0	0
1800-0700	61	0	61	13	0	13
Daily	250	9	259	250	9	259

Table 6.6 - ETZ Trip Generation 2041 (Operational Phase)

	Arrivals			Departures		
	Car/LGV	HGV	Total	Car/LGV	HGV	Total
0700-0800	6	0	6	45	0	45

0800-0900	120	12	132	20	12	33
0900-1000	16	0	16	16	0	16
1000-1100	16	0	16	16	0	16
1100-1200	16	0	16	16	0	16
1200-1300	16	0	16	16	0	16
1300-1400	16	0	16	16	0	16
1400-1500	16	0	16	16	0	16
1500-1600	37	0	37	54	0	54
1600-1700	13	0	13	125	0	125
1700-1800	0	0	0	0	0	0
1800-0700	90	0	90	21	0	21
Daily	360	12	373	360	12	373

6.4. Options Testing

6.4.1. This section of the report provides a summary of the options testing undertaken for Options A to K. The results presented are for the AM and PM peak hours for the Design Year of 2041, using the 'Without Policy' demand sets, which represents a worst-case traffic operational scenario.

6.4.2. Based on the forecasting derived from the ASAM strategic model, vehicle totals for the 2041 scenarios modelled for this report equate to a net increase of 2% total traffic in the AM Peak and a 0.4% increase in the PM Peak compared to the 2019 base model.

6.4.3. These tests do not take account of potential traffic rerouting effects on parts of the road network outwith the Paramics model extents or peak spreading whereby people adjust the times of their journeys. The results are based on a level of traffic entering the Wellington Road corridor consistent with the Do Minimum, regardless of capacity reduction in the simulation tests.

6.4.4. Results are based on the following peak hours:

- 07:30 – 08:30; and
- 16:30 – 17:30

6.4.5. The results shown are in comparison to the Do-Minimum scenario and encompass:

- Average Network Speed (mph),
- Average Trip Duration (mm:ss),
- Completed Trips, and

- Journey Times (mm:ss).

6.4.6. Average network speed, average trip duration, and completed trips use statistics from the full modelled network. Journey times are specific to Wellington Road, from the junction with Old Wellington Road in the south, to Garthdee Roundabout in the north. **Error! Reference source not found.** illustrates journey time start and end points.

Figure 6-6 – Journey Time Extents

6.4.7. The full results are for the AM and PM peak hours are respectively shown in *Table 6.7* and *Table 6.8* and graphically in Appendix E and Appendix F.

Table 6.7 – Operational Performance: 2041 AM "Without Policy"

AM Peak 2041 Without Policy 07:30 – 08:30	Do Minimum	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Average Network Speed (mph)	15	-3	-5	-5	-3	-3	-5	-5	-3	-4	-4	-4
Average Trip Duration	05:10	01:30	02:50	02:30	01:30	01:40	03:10	02:40	01:30	01:40	02:00	01:50
Completed Trips	10534	6	14	14	3	-9	7	2	1	2	-5	-2
Northbound Journey Time - Bus	12:30	00:20	-02:10	-02:10	-02:10	-01:50	-02:00	-02:00	-01:50	-02:10	-02:00	-02:00
Southbound Journey Time - Bus	06:50	00:20	00:40	00:40	00:20	00:10	00:30	00:40	00:30	00:20	00:50	00:40
Northbound Journey Time - HGV	11:20	03:20	06:00	04:30	03:10	03:30	06:30	05:20	03:00	03:30	03:40	02:40
Southbound Journey Time - HGV	10:10	00:50	00:50	01:00	00:30	00:20	00:50	00:50	00:40	00:30	00:50	00:50
Northbound Journey Time - Car	11:20	03:00	06:10	05:20	02:40	03:00	06:40	05:50	02:40	03:00	03:30	03:20
Southbound Journey Time - Car	09:10	00:50	01:00	01:00	00:30	00:20	00:50	01:00	00:40	00:20	01:00	01:00

Table 6.8 - Operational Performance: 2041 PM "Without Policy"

PM Peak 2041 Without Policy 16:30 – 17:30	Do Minimum	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Average Network Speed (mph)	16	-2	-3	-2	-2	-2	-3	-3	-2	-2	-3	-2
Average Trip Duration	04:50	00:40	01:00	00:50	00:40	00:40	01:00	01:00	00:40	00:40	01:00	00:50
Completed Trips	10074	-4	-5	-11	8	6	-9	-3	-11	1	-4	-4
Northbound Journey Time - Bus	11:50	-00:20	-00:30	-00:30	-00:30	-00:20	00:00	-00:10	-00:10	-00:30	-00:40	-00:40
Southbound Journey Time - Bus	07:50	02:10	03:50	03:10	01:40	01:30	04:10	03:30	01:40	01:50	03:50	03:50
Northbound Journey Time - HGV	09:00	-00:10	00:10	00:00	00:00	00:10	00:10	00:00	00:00	00:10	00:00	00:00
Southbound Journey Time - HGV	11:10	01:50	03:00	02:30	01:20	01:20	03:10	02:50	01:20	01:20	02:50	03:00
Northbound Journey Time - Car	08:30	00:00	00:10	00:10	00:00	00:10	00:10	00:10	00:10	00:00	00:10	00:10
Southbound Journey Time - Car	10:40	02:40	04:10	03:50	02:10	02:00	04:40	04:10	02:00	02:00	04:20	04:20

Option A

6.4.8. **AM Peak:** Compared to the Do Minimum model, Option A has an increase in network-wide average trip durations of 1 minute 30 seconds, with a corresponding decrease in average network-wide speeds. There is an increase in journey times on the Wellington Road corridor in both directions for all vehicle classes, notably in the northbound direction for HGVs and Cars, with journey times increasing by three minutes or more.

6.4.9. **PM Peak:** In the PM peak, there is an increase in average network-wide average trip duration of 40 seconds, with average network speeds falling by 2 miles per hour. There are slight reductions in northbound bus and HGV journey times, with a little change in northbound car journey times. Southbound journeys are extended by approximately two to three minutes for all modes.

Option B

6.4.10. **AM Peak:** For Option B, average trip durations across the network are extended by just under three minutes, with a five miles per hour reduction in network speeds. Northbound journey times for bus are improved by over two minutes as a result of the northbound bus lane. Northbound journey times for HGVs and cars are extended by approximately six minutes. There are increases in southbound journey times of a minute or less across the three modelled modes.

6.4.11. **PM Peak:** There is a 1 minute increase to average network trip durations with speeds reducing by three miles per hour. Northbound bus journey times are improved by 30 seconds with slight increases in journey times for HGVs and cars. In the southbound direction, there is an increase in journeys times of three minutes for HGVs, and approximately four minutes for both buses and cars.

Option C

6.4.12. **AM Peak:** With a combined bus and freight only northbound lane, Option C sees improvements to northbound journey times for buses of just over two minutes. This is not replicated for freight movements, with journey times increasing by four and a half minutes. Similarly, northbound car journey times are also increased, by over five minutes. Southbound journey times are lengthened for all modes, by between 40 and 60 seconds. Average network trip durations are extended by two and a half minutes, with network speeds reduced by five miles per hour.

6.4.13. **PM Peak:** For the PM peak, there is a slight reduction in average network speeds, with average trip durations extending by 50 seconds. There is a 30 second

improvement to northbound bus journey times with minimal changes to northbound HGV and car journey times. In the southbound direction, journey times are increased by between two and half and four minutes across the three modes.

Option D

6.4.14. **AM Peak:** With the additional northbound bus lane, Option D sees a reduction of over two minutes for bus journey times when compared to the Do Minimum. There is a negative impact on northbound HGV and car journey times with journey time increases around three minutes. Southbound, there is a small increase to journey times up to 30 seconds. Average network speeds fall by three miles per hour, with average trip durations increasing by 1 minute 30 seconds.

6.4.15. **PM Peak:** Modelled northbound journey times for buses improve by 30 seconds for Option D, with a negligible change in journey times for HGVs and cars. Southbound journey times are increased by 80, 100 and 130 seconds for HGVs, buses and cars respectively. There is a two miles per hour reduction in average network speeds with trip durations lengthening by 40 seconds.

Option E

6.4.16. **AM Peak:** In the AM peak, average trip durations are increased by 100 seconds as a result of the proposed interventions. Modelled network speeds are reduced by three miles per hour. There is an improvement to northbound bus journey times of 110 seconds, with HGV and car journey times increasing by three to three and a half minutes. In the southbound direction, there are minor increases in journey times across the three classes.

6.4.17. **PM Peak:** Northbound journey times for buses have an improvement of 20 seconds during the PM peak, with slight increases recorded for HGVs and cars. Southbound journey times are increased by 80 seconds for HGVs, 90 seconds for buses, and 120 seconds for cars. Average trip durations are lengthened by 40 seconds with modelled network speeds falling by two miles per hour.

Option F

6.4.18. **AM Peak:** Option F, which incorporates a northbound bus lane, and bus pre-signals sees improvements to northbound bus journey times of approximately two minutes. There is a substantial increase to northbound HGV and car journey times as a result of the proposed interventions, with increases in journey times of over six and half minutes recorded. In the southbound direction, journey time increase of between 30 seconds and one minute recorded across the three modelled

modes. Average trip durations increase by over three minutes compared to the Do Minimum, with network speeds falling by five miles per hour on average.

6.4.19. **PM Peak:** Northbound journey times on Wellington Road remain similar to the Do Minimum during the PM peak, with a minor increase to HGVs and cars. In the southbound direction, HGV journey times are lengthened by over three minutes; by over four minutes for buses; and by just under five minutes for cars. An increase of one minute is recorded for average trip durations with network speeds reducing by 3 miles per hour.

Option G

6.4.20. **AM Peak:** Average network speeds for Option G reduce by five miles per hours compared to the Do Minimum as a result of the proposed intervention, with average network-wide trip durations increasing by 160 seconds. Northbound bus journey times are predicted to improve by two minutes on the corridor, with both HGV and car northbound journey times increasing by five to six minutes. Southbound journey times are extended by up to one minute across the three modes.

6.4.21. **PM Peak:** There are minor changes seen for northbound journey times, with all modes recording changes of 10 seconds or less when compared to the Do Minimum. Southbound journey times are lengthened by approximately three to four minutes, with car journey times seeing the largest increase. Average trip lengths are increased by 60 seconds across the network, with speeds falling by 3 miles per hour.

Option H

6.4.22. **AM Peak:** For Option H, average trip durations are extended by approximately 90 seconds, with speeds falling by three miles per hour. Northbound bus journey times improve by just under two minutes, with an increase of up to three minutes recorded for HGV and car trips. Southbound journey times are lengthened by 30, 40 and 40 seconds for buses, HGVs and cars respectively.

6.4.23. **PM Peak:** In the evening peak, there is an increase of 40 seconds recorded for the average trip duration. Average network speeds fall by two miles per hour. There is slight improvement recorded for northbound bus journey times (10 seconds), with similar small increases to journey times recorded for HGVs and cars. Southbound journey times on Wellington Road are increased by between 80 and 120 seconds for the three modelled modes.

Option I

6.4.24. **AM Peak:** For Hybrid Option I, a 130 second improvement to northbound bus journey times has been recorded. Northbound HGV and car journey times have increased by over three minutes. In the southbound direction, journey times are increased by 20 to 30 seconds. Trip durations across the network have increased by 100 seconds and average network speeds have reduced by four miles per hour.

6.4.25. **PM Peak:** Network speeds during the PM peak have reduced by two miles per hour compared to the Do Minimum. Trip durations have increase by 40 seconds. A 30 second improvement to northbound bus journey times has been modelled with minor increases seen for HGV and car trips. Southbound journey times are extended by 80 seconds for HGVs, 110 seconds for buses and 120 seconds for cars.

Option J

6.4.26. **AM Peak:** For Option J, there is reduction in performance across the network, with average network speeds reducing and average trip duration lengthening. Northbound bus journey times improve by approximately two minutes. HGV and car journey times in the northbound increase by approximately three and a half minutes. Southbound journey times are increased by between 50 and 60 seconds.

6.4.27. **PM Peak:** An improvement of 40 seconds is recorded for northbound bus journey times with nominal changes seen for HGVs and cars. For southbound journeys, HGV journeys are lengthened by just under three minutes. Bus journey times are increased by just under four minutes and car journey times by approximately four and a half minutes. Average network speeds fall by three mph and average trip duration is extended by just under one minute.

Option K

6.4.28. **AM Peak:** Option K records an increase to average trip durations of 110 seconds, with a four miles per hour reduction in network speeds. Northbound bus journey times improve by two minutes, while around three-minute increases are seen for HGVs and cars. Southbound journey times are increased by between 40 and 60 seconds.

PM Peak: In the PM peak, there are large increases to southbound journey times seen, with three minutes recorded for HGVs, and around four minutes for buses and cars. Bus journey times in the northbound direction improve by 40 seconds with small increases recorded for cars and HGVs. There is a slight reduction in overall network performance with network speeds falling and trip durations lengthening.

6.4.29. The operational results of the Paramics modelling indicate that all options are predicted to lead to increases in average trip durations and decreases to average speeds (network-wide).

6.4.30. Additional delays to general traffic are predicted to occur at the northbound approach to Souter Head Roundabout and the southbound approach to Hareness Roundabout.

6.4.31. Northbound buses have journey time savings of around two minutes in Options B – K in the AM peak.

6.4.32. Under current assumptions, the pre-signals have not provided any additional benefit to buses.

6.4.33. Options incorporating bus or bus / freight lane using existing the carriageway (Options B, C, F, G, J and K) increase delays on the southbound approach to Hareness Roundabout. This is due to fewer gap opportunities for southbound traffic giving way at the roundabout.

6.4.34. Heatmaps indicating average link speeds and key statistics for each option are provided in Appendix E.

Impact Scoring (AM and PM)

6.4.35. The results from the option testing have been translated to the seven-point scale assessment used as part of Scottish Transport Appraisal Guidance (STAG). The STAG scale is as follows:

- +++ : Major Positive Benefit
- ++ : Moderate Positive Benefit
- + : Minor Positive Benefit
- 0 : No Benefit / Impact
- - : Minor Negative Impact
- - - : Moderate Negative Impact
- - - - : Major Negative Impact

6.4.36. The seven-point scale has been applied to modelling outputs as follows, with all options compared to the Do Minimum scenario:

Average Network Speeds

- 0: Less than 1 mph change

- +/- : 1 to 3 mph change
- ++/- - : 3 to 5 mph change
- +++/- - - : 5+ mph change

Trip Duration

- 0: Less than 1 minute change
- +/- : 1 minute to 2 minute change
- ++/- - : 2 minute to 3 minute change
- +++/- - - : 3 minute + change

HGV and Car Journey Time

- 0: Less than 2 minutes change
- +/- : 2 minute to 4 minute change
- ++/- - : 4 minute to 6 minute change
- +++/- - - : 6 minute + change

Bus Journey Time

- 0: Less than 30 seconds change
- +/- : 30 seconds to 1 minute change
- ++/- - : 1 minute to 2 minute change
- +++/- - - : 2 minutes + change

6.4.37. This scoring is based on quantitative metrics that can be extracted from the microsimulation model so reflect impacts to vehicle trips for each test. Potential benefits to active travel in the tests are not represented within this scoring.

6.4.38. The impact scoring for the AM peak is shown in Table 6.9 and for the PM peak in Table 6.10.

AM Peak 2041 Without Policy 07:30 – 08:30	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Average Network Speed (mph)	- -	- - -	- -	- -	- -	- - -	- -	- -	- -	- -	- -
Average Trip Duration	-	- -	- -	-	-	- - -	- -	-	-	- -	-
Completed Trips	0	0	0	0	0	0	0	0	0	0	0
Northbound Journey Time - Bus	0	+++	+++	+++	++	+++	+++	++	+++	+++	+++
Southbound Journey Time - Bus	0	-	-	0	0	-	-	-	0	-	-
Northbound Journey Time - HGV	-	- - -	- -	-	-	- - -	- -	-	-	-	-
Southbound Journey Time - HGV	0	0	0	0	0	0	0	0	0	0	0
Northbound Journey Time - Car	-	- - -	- -	-	-	- - -	- -	-	-	-	-
Southbound Journey Time - Car	0	0	0	0	0	0	0	0	0	0	0

Table 6.9 - Operational Impact Scoring: 2041 AM "Without Policy"

PM Peak 2041 Without Policy 16:30 – 17:30	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Average Network Speed (mph)	-	-	-	-	-	-	-	-	-	-	-
Average Trip Duration	0	-	0	0	0	-	-	0	0	-	0
Completed Trips	0	0	0	0	0	0	0	0	0	0	0
Northbound Journey Time - Bus	0	+	+	+	0	0	0	0	+	+	+
Southbound Journey Time - Bus	- - -	- - -	- - -	- -	- -	- - -	- - -	- -	- -	- - -	- - -
Northbound Journey Time - HGV	0	0	0	0	0	0	0	0	0	0	0
Southbound Journey Time - HGV	0	-	-	0	0	-	-	0	0	-	-
Northbound Journey Time - Car	0	0	0	0	0	0	0	0	0	0	0
Southbound Journey Time - Car	-	- -	-	-	-	- -	- -	-	-	- -	- -

Table 6.10 - Operational Impact Scoring: 2041 PM "Without Policy"

Average Network Speed (mph)

6.4.39. **AM Peak:** All options have been assigned either a Moderate Negative or Major Negative impact score as the proposed interventions all result in a fall in average speed across the modelled network. Options B and F, which both propose to include a northbound only bus lane as part of the existing carriageway, see a greater than 10% change in network speeds, receiving a Major Negative designation.

6.4.40. **PM Peak:** In the PM peak, all Options have been appraised as having a Minor Negative Impact, with a 1 to 5% reduction in network wide average speeds recorded.

Average Trip Duration

6.4.41. **AM Peak:** Options A, D, E, H, I and K are deemed to have Minor Negative Impacts when compared to the Do Minimum scenario, recording increases to average trip lengths of between one to two minutes. Options B, C, G and J see increases to trip lengths of two to three minutes and have been scored as having a Moderate Negative Impact. Option F which implements a northbound bus lane to the existing carriageway and bus pre-signals at the Souterhead Roundabout sees trip lengths increase by in excess of three minutes and has been assigned a Major Negative Impact score.

6.4.42. **PM Peak:** All options, bar Option B, have been assigned a Neutral Impact score, indicating a less than 60 second change to average trip lengths across the network. Option B has been appraised as having a Minor Negative Impact, with average trip lengths increased by 64 seconds.

Bus Journey Times – Northbound

6.4.43. **AM Peak:** In the AM peak, all options except for Option A have been given an impact score of either Moderate Positive or Major Positive, indicating improvements to bus journey times greater than 60 seconds. Options B, C, D, G, I, and K have been assigned a Major Positive score, with improvements of more than two minutes recorded. Option A has been deemed to have a Neutral impact on northbound bus journey times.

6.4.44. **PM Peak:** Options B, C, J, and K have been assigned a Minor Positive Impact score with bus journey times improving by between 30 seconds and one minute. The options all include a dedicated northbound bus lane, either as part of the existing carriageway or additional to the existing carriageway. The remaining options all see improvements to journey times for northbound bus movements,

Bus Journey Times – Southbound

6.4.45. **AM Peak:** Options B, C, F, G, J and K, all of which incorporate additional signals, and northbound bus lanes in some form, record an increase in southbound journey times of between 30 seconds and one minute, and have therefore been assigned a Minor Negative Impact score. All other options record journey time increases of less than 30 seconds, a Neutral impact.

6.4.46. **PM Peak:** The impact of the proposed interventions across all options on southbound journey times is more pronounced in the PM peak than compared to the AM peak hour. All options have been assigned an impact score of Moderate Negative or Major Negative, indicating journey time increases greater than one minute. Options A, B, C, F, G, J and K are seeing journey times increase by more than two minutes and have been appraised as having a Major Negative impact.

HGV Journey Times – Northbound

6.4.47. **AM Peak:** Northbound HGV journeys for all options are lengthened when compared to the Do Minimum scenario. With increases of less than two minutes, Options A, D, E, H, J, and K are deemed to have a Minor Negative impact. Options B, C and G record journey time increases of between two and four minutes, with a Moderate Negative impact score assigned. Option F, which incorporates a northbound bus lane as part of lane one of the existing carriageway, as well as bus pre-signals at the Souterhead Roundabout, see HGV journey times increase by over six minutes. This has been deemed a Major Negative impact.

6.4.48. **PM Peak:** There is deemed to be no significant change in journey times compared to the Do Minimum, so all Options have been assigned a neutral score.

HGV Journey Times – Southbound

6.4.49. **AM Peak:** There is deemed to be no significant change in journey times compared to the Do Minimum, so all Options have been assigned a neutral score.

6.4.50. **PM Peak:** All options see an increase to HGV journeys in the southbound direction during the PM peak hour. Options A, D, E, H, and I all record increases of between two and four minutes, indicating a Minor Negative impact. The remaining options have been scored as Neutral, with journey time increases of less than two minutes.

Car Journey Times – Northbound

6.4.51. **AM Peak:** An increase in northbound car journey times has been modelled for all proposed options, with Options B and F appraised as having a Major Negative impact, with journey times increasing by more than six minutes. Option C and G see increase of between four and six minutes and have been assigned a score of Moderate Negative impact. The remaining options are deemed as having a Minor Negative impact.

6.4.52. **PM Peak:** There is deemed to be no significant change in journey times compared to the Do Minimum, so all Options have been assigned a neutral score.

Car Journey Times – Southbound

6.4.53. **AM Peak:** There is deemed to be no significant change in journey times compared to the Do Minimum, so all Options have been assigned a neutral score.

6.4.54. **PM Peak:** All options have been assigned a negative impact score as a result of the proposed interventions. Options A, C, D, E, H and I have been classed as having a Minor Negative impact. The remaining options have all been assigned a Moderate Negative impact score, with increases to journey times of between two and four minutes.

Impact Scoring (All Modelled Periods)

6.4.55. To determine the impact across the entire modelled period 07:00-19:00 (incorporating the interpeak), journey time ranges used for scoring have been adjusted to account for the proportion of vehicles travelling within each peak:

HGV and Car

- 0: Less than 20 seconds change
- +/- : 20 seconds to 40 seconds change
- ++/- - : 40 seconds to 1 minute 20 seconds change
- +++/- - - : 1 minute 20 seconds + change

Bus

- 0: Less than 5 seconds change
- +/- : 5 seconds to 10 seconds change
- ++/- - : 10 seconds to 15 seconds change
- +++/- - - : 15 seconds + change

	Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
Journey Time - Bus	- - -	- -	0	++	0	- - -	- -	0	++	- -	- -
Journey Time - HGV	- -	- -	- -	- -	- -	- -	- -	-	- -	- -	- -
Journey Time - Car	- -	- - -	- -	- -	- -	- - -	- - -	- -	- -	- -	- -

Table 6.11 - Operational Impact Scoring: 2041 All Modelled Periods "Without Policy"

6.4.56. Northbound and southbound impacts have also been averaged to a single score. This is the scoring applied for TPOs 1, 2 and 3 in the scoring matrix in the next section.

6.5. Economic Performance of Options

6.5.1. As part of the shortlisting process an economic assessment of the proposed options was undertaken. Traffic model outputs, in the form of time, distance and volume matrices between the Do-minimum and Do-something scenario were inputted into the Transport User Benefit Assessment (TUBA) software. The TUBA software monetises changes in travel time and distance between Origin-Destination pairs and calculates the difference between the with and without scheme scenario. Origin-Destination level information is taken at the model level and is reflective of all trips on the network. A 60-year appraisal period has been used in accordance with TAG guidance to appraise the scheme.

6.5.2. The table below presents the user benefits derived from the TUBA assessment across all options A to K. Values presented in the table are in 2010 prices and values unless explicitly stated. The total user benefits are the sum of all benefit streams, inclusive of travel time benefits, fuel and non-fuel vehicle operating costs and indirect taxation changes.

Table 6.12 - TUBA User Benefits

Option	Total User Benefits Highway (£m's)	Total User Benefits Buses (£m's)	Total
Option A	-43.78	-0.63	-44.41
Option B	-73.31	-0.49	-73.8
Option C	-60.32	-0.35	-60.67
Option D	-41.54	-0.25	-41.79

Option E	-40.43	-0.37	-40.8
Option F	-80.55	-0.69	-81.24
Option G	-65.49	-0.50	-65.99
Option H	-34.99	-0.40	-35.39
Option I	-49.00	-0.25	-49.25
Option J	-51.91	-0.48	-52.39
Option K	-39.64	-0.42	-40.06

6.5.3. The largest component of the total user benefits arises from travel time benefits, and these are negative across all options. The bulk of the user time disbenefits occur because of delays being incurred to motorised traffic due to the interventions proposed. Option B is the worst performing option from an economic perspective, resulting in the greatest level of delays for car, HGV and LGV traffic and the associated monetised disbenefit. Comparatively, Option H is better performing with a lower level of disbenefits for car, HGV and LGV users.

6.5.4. The economic appraisal has also been undertaken for bus user classes. Across all options buses experience slight disbenefits, but these are small compared to other user classes. This is primarily driven by changes to traffic flows in the southbound direction.

Economic costs

6.5.5. As part of the shortlisting process and to provide an indicative value for money assessment, the calculation of a high-level Present Value of Costs (PVC) was undertaken to provide help provide an estimated Benefit to Cost Ratio. This was done by reducing the outturn cost estimate by 30% to account for the impact of the discounting and re-basing process (both to 2010 values). The PVB and PVC have been used to inform the BCR and a scoring was assigned based on the indicative BCR.

Active mode economic assessment

6.5.6. As part of the economic case being produced for the outline business case submission, an active mode appraisal assessment has also been undertaken. The active mode appraisal results have not been used to inform any shortlisting of the options and this section has been provided for wider context.

6.5.7. The results of the active mode appraisal are contained in the table below. Given that all options include segregated two-way active travel provision it is not anticipated that the results would vary materially between each option.

6.5.8. The results show that there is an estimated economic benefit of £3.3m to existing and new active travel users because of the improved active travel provision.

Table 6.13: Active mode appraisal results (£m's, 2010 prices and values).

Benefit Type	Benefit	Benefit Value
Health	**Reduced risk of premature death**	£2.21
	Absenteeism	£0.40
	Health benefits total	£2.61
Journey Quality	**Journey ambience**	£0.49
Marginalised External Costs (MEC)	**Congestion benefit**	£0.19
	Infrastructure maintenance	£0.00
	Accidents	£0.03
	Local air quality	£0.00
	Noise	£0.00
	Greenhouse gases	£0.01
	Indirect taxation	£0.00
	MEC benefits total	£0.24
	Total	**£3.34**

Economic assessment results

6.5.9. A full breakdown of economic performance including the Cost-Benefit analysis results for each option is provided within *Table 7.1*.

7. Assessment Summary and Recommendation

7.1. Scoring Matrix - Introduction

7.1.1. The Scoring Matrix has been developed based on Scottish Transport Appraisal Guidance (STAG) criteria:

- Environment;
- Safety;
- Economy;
- Integration; and
- Accessibility and Social Inclusion.

7.1.2. Each criteria was sub-divided into critical components that were used to score the shortlisted options. These components are based on the TPOs previously identified within the WRMMCS and objectives and requirements specified within the Wellington Road Junction Improvements project scope.

7.2. Environmental Scoring

Noise and vibration

7.2.1. A high-level assessment of predicted changes in road traffic noise was undertaken for the options using the basic noise level calculation methodology presented in CRTN and the threshold assessment criteria defined in DMRB LA 111. The predicted changes in road noise level due to the various scheme options have been evaluated.

7.2.2. It is anticipated that Options A and E are not likely to result in any noise changes greater than negligible. Options B, C, F and G are also predicted to result in predominantly negligible changes to road traffic noise levels. The proposed changes to the composition of Wellington Road traffic may result in additional noise changes although these changes are anticipated to be small. Options D and H, and the hybrid options I, J and K, involve the widening of the carriageway adjacent to nearby noise sensitive receptors and so further detailed assessment would be required to ensure that any impacts at the noise sensitive receptors are understood.

Air Quality

7.2.3. A preliminary traffic screening exercise, in addition to a review of baseline air quality conditions and identification of nearby sensitive receptors, has been

undertaken to appraise the potential for air quality impacts associated with the Options.

7.2.4. The appraisal identified the potential for each Option to yield a beneficial impact on local air quality within the nearby AQMAs included within the study area, particularly within the Wellington Road AQMA. Based on the traffic screening exercise, the reduction in flows is considered likely to have a minor beneficial air quality impact within the context of existing air quality conditions, which is not likely to result in a significant effect.

7.2.5. Except for Options A, E and I, which is likely to result in negligible air quality impacts outside of the AQMAs, the appraisal of the other options for roads outside of the AQMAs has indicated the potential for localised minor adverse and beneficial impacts on local air quality. These are particularly focused adjacent to the Scheme alignment, on both the northbound and southbound Wellington Road. Within the context of baseline air quality conditions and proximity of identified sensitive receptors, these potential impacts are not likely to result in a significant effect.

Water Quality and Flood Defence

7.2.6. SEPA's online flood maps show no river or coastal flood risk to the Scheme. Surface water flooding is patchy and localised in the built-up areas on both sides of Wellington Road up to the 1 in 200-year flood event.

7.2.7. There is relatively more land-take associated with Options D and H, and to a lesser extent Options I, J and K, compared to the other options due to the additional northbound lane. This would result in a slight increase in impermeable area compared to the existing conditions and therefore a higher risk of surface runoff and flooding/ponding, although this risk is considered to be minor. For all options it is anticipated that surface water drainage will be adequately dealt with through the scheme drainage strategy, including an appropriate allowance for climate change to ensure scheme resilience (to be developed at DMRB Stage 3 in consultation with SEPA).

Drainage

7.2.8. Scoring for drainage has been based against the level of drainage infrastructure works required over the Do Minimum existing drainage assets.

7.2.9. Additional hard surface area will be introduced for all options with Option D and H having the most significant increases.

Biodiversity and Habitats

7.2.10. A desk study and Preliminary Ecological Appraisal was undertaken in May 2023 to identify and classify the habitats present, assess ecological constraints to the Scheme, and provide recommendations for any further surveys required to inform the assessment and mitigation at future project stages. A qualitative assessment of the impact for each Option against the Do Minimum was used to score this criterion.

7.2.11. It is considered that Options A-C have the least adverse impact on biodiversity, primarily due to having a lower level of habitat loss. Options I-K are considered to have an almost identical impact but include a very small increase in the loss of amenity grassland habitat off the northbound carriageway south of Souterhead Roundabout, compared to options A-C.

7.2.12. Options E-H have additional loss of woodland at Souterhead Roundabout, as well as a small area on Langdykes Road. Options D and H would lose additional woodland habitat on the southbound side of Wellington Road.

7.2.13. The following ecological features need to be considered and, where appropriate, potential impacts mitigated for: designated sites; woodland; birds; bats; badger; pine marten and red squirrel; and invasive non-native species.

Landscape & Visual Amenity

7.2.14. Scoring was based on the impact of each option on the following two criteria: the likely general effect of the options on local landscape character and the ability of the landscape to accommodate the change; and likely visual effects on key receptors such as people in residential areas, at recognised viewpoints, and using key transport routes.

7.2.15. The proposals would be in character with the existing infrastructure and would largely follow the alignment of the existing carriageway. Each of the options would require land acquisition and result in the loss of vegetation to accommodate the route realignment and road widening, with Options D and H requiring additional earthworks and tree loss. Aside from Options D and H, vegetation loss could be mitigated by an appropriate replacement planting design/strategy to be developed at future project stages; there would be limited scope to replace the woodland planting lost from Options D and H in close proximity to the proposals.

7.2.16. At this stage of the project, there are considered to be no differentiating factors between Options A, B, C, E, F, G, I, J, and K in terms of landscape and visual

amenity; however, Options D and H would result in the increased loss of established semi-mature tree cover.

7.2.17. Options A, B, C, E, F, G, I, J, and K are considered to result in direct, long-term, individual, and permanent slight adverse or neutral impacts on the visual amenity of the receptors considered in both Year 1 and Year 15.

7.2.18. Overall, when selecting from Options A, B, C, E, F, G, I, J, and K, it is considered that landscape character and visual amenity is unlikely to be a primary influential factor in the decision-making process. Options D and H result in slightly greater adverse impacts.

Carbon

7.2.19. Scoring was based on an indicative comparison of the whole life carbon emissions associated with each option. A high-level estimation was made based on outline material quantities used for the cost estimate and emissions factors from CESSM4 (2013) for construction emissions and assumptions from the TUBA models for user emissions.

7.2.20. Option A is shown to have the lowest whole life carbon emissions, as well as the joint lowest carbon emissions during construction. Options B and F have the highest whole life carbon emissions, despite lower emissions at the construction stage than Options D and H. The higher whole life carbon emission totals for Options B and F are the result of significantly higher emissions during operation compared to the other modelled options.

7.2.21. Once a preferred option has been selected, and in line with the Carbon Management Plan produced for the Scheme, carbon workshops will be held with the design team to ensure that opportunities to minimise emissions during DMRB Stage 3 and beyond are identified and assessed.

Cultural Heritage

7.2.22. The closest listed building to the proposals is Category B listed Nigg Parish Church, located off Nigg Kirk Road, north of the junction of Wellington Road and West Tullos Road. No other heritage assets are located within 200m of the scheme boundary.

7.2.23. There would be no direct impacts and predicted to be minimal impacts on the setting of Nigg Parish Church as there are no northbound carriageway works in the vicinity. There is potential for some adverse noise and visual impacts on the

setting of the church during construction, however this would be temporary and not significant considering the existing road traffic using Wellington Road.

7.2.24. No impacts are predicted on any other heritage assets due to the distance of the options. With heritage, there is the potential for previously unrecorded archaeological assets to be present within the study area. However due to the existing developed nature of the road infrastructure and relatively small scale of the options, this is considered to be low risk and negligible impact for all options.

7.2.25. Overall, there are considered to be negligible impacts, either directly or on the setting, of heritage assets for all options.

Physical Fitness

7.2.26. Scoring of this criterion has been based on the level of additional infrastructure to promote active travel use and improve physical fitness.

7.2.27. Each option provides extensively improved facilities, promoting and enabling increased NMU movements over the scheme extents.

7.2.28. Options E to H have additional facilities provided on Langdykes Road connecting the “missing link” between existing cycle facilities.

7.2.29. Due to critical constraints on the corridor, Options D and H have sections of sub-standard active travel provision.

7.3. Safety Scoring

Accidents

7.3.1. A qualitative assessment of the interventions and the expected influence each will have on the risk of collisions and accidents against the Do Minimum has been used to score this criterion.

7.3.2. Segregated two-way flow active travel provision and improved signalised NMU crossings help reduce the risk of vehicle and NMU interactions, ultimately reducing the risk of accidents between these users.

7.3.3. Slowing and stopping buses at bus stops on Options A, C, E, G, I and K may cause other vehicles to change lanes, increasing the risk of collisions, as opposed to Options B, D, F, H and J that separate buses from other traffic at the bus stops.

7.3.4. Capacity reductions through the reallocation of a lane may reduce the risk of collisions through the reduction in traffic speeds.

Security

7.3.5. The security criterion has been based on real and perceived security of travellers arising from the interventions, with consideration to different user groups including cyclists, pedestrians and vulnerable users.

7.3.6. Interventions including improved and additional signalised NMU crossings and raised tables at crossings to control the speed of vehicles and highlight priority to NMUs help to provide an increase in comfort for users, particularly for vulnerable users.

7.3.7. Segregating cyclists and pedestrians will similarly provide additional comfort to users and a sense of security.

7.3.8. Departures from Standards have also been considered, and options with lengths of sub-standard provision have been scored lower.

7.3.9. Do Minimum has good existing lighting provision, helping to alleviate security concerns of vulnerable users at night. All of the options will have the lighting provision upscaled commensurate with the level of infrastructure provided.

7.4. Economic Scoring

Facilitate Efficient Movement of Buses

7.4.1. Bus journey times forecast from the Paramics modelling were used to score this criterion. As highlighted in Chapter 6 above, AM peak period “Without Policy” exhibits the most change between the Do Minimum, with impacts to northbound general traffic less pronounced in IP and PM peaks, and southbound journey times less pronounced for all peaks.

7.4.2. Options were scored on this “worst case” scenario, with positive and negative scoring reflective of journey time savings and delays respectively.

Facilitate Efficient Movement of Freight

7.4.3. Freight journey times forecast from the Paramics modelling were used to score this criterion. As highlighted in Chapter 6 above, AM peak period “Without Policy” exhibits the most change between the Do Minimum, with impacts to northbound general traffic less pronounced in IP and PM peaks, and southbound journey times less pronounced for all peaks.

7.4.4. Options were scored on this “worst case” scenario, with positive and negative scoring reflective of journey time savings and delays respectively.

Facilitate Efficient Movement on Car Users

7.4.5. Car journey times forecast from the Paramics modelling were used to score this criterion. As highlighted in Chapter 6 above, AM peak period "Without Policy" exhibits the most change between the Do Minimum, with impacts to northbound general traffic less pronounced in IP and PM peaks, and southbound journey times less pronounced for all peaks.

7.4.6. Options were scored on this "worst case" scenario, with positive and negative scoring reflective of journey time savings and delays respectively.

Value for Money

7.4.7. TUBA runs for the options were undertaken with indicative BCR being used to base the scoring. The score for each option, shown in *Table 7.1*, is reflective of the value of the BCR, with higher BCRs scoring better and lower BCRs scoring lower. All BCRs are negative for the options, and so all scores are negative.

Table 7.1 - BCR Results

Option	Indicative PVC (£m's)	TUBA PVBs (£m's)	Indicative BCR	VfM Scoring
Option A	7.38	-44.4	-6.02	-2
Option B	7.38	-73.8	-10.0	-3
Option C	7.38	-60.67	-8.22	-3
Option D	11.51	-41.8	-3.63	-1
Option E	9.49	-40.8	-4.3	-1
Option F	9.09	-81.24	-8.94	-3
Option G	9.09	-65.99	-7.26	-2
Option H	13.08	-35.39	-2.71	-1
Option I	7.84	-49.24	-6.28	-2
Option J	7.85	-52.39	-6.68	-2
Option K	7.85	-40.06	-5.10	-1

7.5. Integration Scoring

Transport Integration

7.5.1. Scoring for transport integration has been based upon integration between different modes of transport. Within the options, the significant interactions are between active travel users and public transport users.

7.5.2. All options improve connectivity between the modes through the improved active travel facilities.

7.5.3. Bus stops with bypasses for cyclists are recommended to remove conflict between active travel users and public transport users. There are a number of instances

within all options where space cannot be formed to meet the requirements of a bus stop bypass. Options D and H have more of these instances and so do not perform as well.

Land Use Integration

7.5.4. Scoring of this criterion has been based upon how each intervention fits with existing and planned land use.

7.5.5. The active travel interventions are predominantly upgrades to the existing active travel infrastructure and so have been scored as having no benefit.

7.5.6. Options with freight priority score better since these will support developments at the ETZ and ASH.

7.5.7. Options with bus priority score better since these are reallocating existing or adding infrastructure to promote a modal shift to public transport.

Impact on Utilities

7.5.8. The level of impact on utilities is significant for all options, with the SSEN 132kV underground asset having a substantial impact. Options with the additional bus lane or the signalised bus priority entry lanes score worse due to the increased impact on utilities.

Constructability

7.5.9. Constructability scoring has been based on the level of infrastructure work required and the complexity for each option, factoring the required traffic management and any disruption or delays to traffic.

7.5.10. Options that can be constructed with minimal traffic management (i.e. no change to carriageway have been scored more favourably than options which require lane or full carriageway closures to construct (i.e. additional lanes and bus priority entry lanes).

7.5.11. All options require a length of retaining wall to be constructed adjacent to existing commercial and residential property.

Integration with Aberdeen Rapid Transit Proposal

7.5.12. The Aberdeen Rapid Transit (ART) route has been confirmed along Wellington Road and onto West Tullos Road. The options have been scored based on how well they would integrate with any future ART interventions along the route.

7.5.13. Anticipated delays on northbound buses leaving the A92 at Charlestown Junction resulting from the options have a negative impact on the scoring, with more significant delays accounting for a larger negative score.

7.5.14. Additional infrastructure from the dedication of an existing lane, provision of an additional lane, or provision of the signalised bus priority entry lanes would be of benefit to a possible ART route, and interventions that help promote bus use provide a positive score.

Policy Integration

7.5.15. All options promote local, regional and national strategic transport policies. Since all options include segregated active travel, they align with key policies such as Scotland's Net Zero ambition, decarbonisation of transport and Scotland's long term vision for active travel.

7.5.16. Options with freight interventions have a stronger alignment with economic policies, supporting economic development and improving employment opportunities, particularly facilitating freight movements to and from the harbour.

7.6. Accessibility and Social Inclusion Scoring

Improve Accessibility Across all Modes

7.6.1. Accessibility between communities and destinations were considered, scoring for the infrastructure and proposed improvements or impact on each mode of transport for each option.

7.6.2. Communities included within the assessment were:

- Cove & Altens;
- Torry;
- Kincorth; and
- Nigg.

7.6.3. Destinations included within the assessment were:

- Langside Academy;
- Wellington Circle Retail Park;
- Aberdeen South Harbour;
- Altens Industrial Estate;

- East Tullos Industrial Estate;
- West Tullos Industrial Estate;
- Balmoral Stadium; and
- Aberdeen city centre.

7.6.4. All options provide improved quality of active travel provision and NMU crossing facilities, with option E to H providing an additional section of segregated two-way active travel provision on Langdykes Road. Options D and H have a length of sub-standard active travel provision which does not provide the same level of improvement as options that have standard active travel provision.

7.6.5. Options B to K implement measures to improve bus movements over varying extents of the study area, with re-allocation of carriageway space for bus and bus and freight priority showing the greatest gain for bus journey times.

7.6.6. Car journey times increase in all options, with a negative correlation between delays on cars relative to improved bus journey times.

7.7. Deliverability Scoring

7.7.1. An additional criterion outwith the aforementioned STAG criteria for the deliverability of the options was included within the scoring matrix. These are detailed below.

Public Acceptability

7.7.2. Public consultation and engagement through online feedback was undertaken between November and December 2020 and then again between April and May 2021 for the WRMMCS.

7.7.3. Key feedback on the options relative to the WRJI shortlisted options were:

- Improved feelings of safety for active travel users / encourage increased walking and cycling;
- Supporting a modal shift / improved opportunities for those without a car; and
- Concerns about delays to general traffic, particularly freight.

7.7.4. Options were scored relative to this feedback to anticipate how each intervention and option would be perceived.

7.7.5. Delays on traffic were scored negatively, whilst supporting bus use and improved active travel facilities and crossings scored positively.

Affordability (Cost of Delivery)

7.7.6. The cost of each option may impact deliverability of the scheme and how and where funding can be granted, so the cost of the options has been used to score the affordability.

7.7.7. All costs are influenced by the impact on utilities as assessed above. The less expensive options have been scored positively with the more expensive options being scored negatively.

7.8. Scoring Matrix

7.8.1. *Table 7.2* below shows the Scoring Matrix with the scores for each criterion of the options as well as the final aggregate score. It should be noted that a negative value aggregate score does not indicate on overall adverse impact, as the scoring follows an adjusted scale for each factor as described previously.

7.8.2. *Table 7.3* below shows the Scoring Criteria used based on the seven-point scale assessment in line with STAG Criteria.

Table 7.2: Scoring Matrix

		Option A	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K
ECONOMY	Facilitate efficient movement of buses (TPO1)	-3	-1	0	1	0	-3	-2	0	1	-1	-1
	Facilitate efficient movement of freight (TPO2)	-1	-2	-2	-1	-1	-2	-2	-1	-1	-2	-2
	Facilitate efficient movement on car users (TPO3)	-2	-2	-2	-1	-1	-3	-2	-1	-1	-2	-2
	Value for Money (BCR)	-2	-3	-3	-1	-1	-3	-2	-1	-2	-2	-1
INTEGRATION	Transport Integration	2	2	2	1	2	2	2	1	2	2	2
	Land Use Integration	0	1	2	1	0	1	2	1	1	1	2
	Impact on Utilities	-2	-2	-2	-3	-3	-3	-3	-3	-2	-2	-2
	Constructability	-1	-1	-1	-3	-2	-2	-2	-3	-2	-2	-2
	Integration with Aberdeen Rapid Transit proposal	0	-1	0	1	0	0	1	2	0	1	1
	Policy Integration	1	1	2	1	1	1	2	1	1	1	2
ACCESSIBILITY & SOCIAL INCLUSION	Improve accessibility across all modes (TPO4)	1	3	3	2	1	3	3	2	3	3	3
SAFETY	Accidents (TPO5)	1	2	1	1	1	2	1	1	2	1	2
	Security (TPO5)	3	3	3	2	3	3	3	2	3	3	3
ENVIRONMENT	Noise & Vibration	0	-1	-1	-1	0	-1	-1	-1	-1	-1	-1
	Air Quality (TPO6)	0	-1	-1	-1	0	-1	-1	-1	0	-1	-1
	Water Quality & Flood Defence	0	0	0	-1	0	0	0	-1	0	0	0
	Drainage	-1	-1	-1	-2	-1	-1	-1	-2	-1	-1	-1
	Biodiversity & Habitats	-1	-1	-1	-2	-1	-1	-1	-2	-1	-1	-1
	Landscape & Visual Amenity	-1	-1	-1	-2	-1	-1	-1	-2	-1	-1	-1
	Carbon	-1	-3	-3	-2	-2	-3	-3	-2	-2	-1	-1
	Cultural Heritage	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

	Physical Fitness	3	3	3	2	3	3	3	3	3	3	3
Deliverability	**Public acceptability**	2	1	1	0	1	1	1	0	2	1	1
	Affordability (Cost of delivery)	1	1	1	-1	0	0	0	-1	1	1	1
	AGGREGATE SCORE	**-2**	**-4**	**-1**	**-10**	**-2**	**-9**	**-4**	**-9**	**4**	**-1**	**3**

Table 7.3: Scoring Criteria

Score	Description
3	Major benefit - these are benefits or positive impacts which, depending on the scale of benefit or severity of impact, the practitioner feels should be a principal consideration when assessing an option's eligibility for funding;
2	Moderate benefit - the option is anticipated to have only a moderate benefit or positive impact. Moderate benefits and impacts are those which taken in isolation may not determine an option's eligibility for funding, but taken together do so;
1	Minor benefit - the option is anticipated to have only a small benefit or positive impact. Small benefits or impacts are those which are worth noting, but the practitioner believes are not likely to contribute materially to determining whether an option is funded or otherwise;
0	No benefit or impact - the option is anticipated to have no or negligible benefit or negative impact;
-1	Minor cost or negative impact - the option is anticipated to have only a minor cost or negative impact. Minor costs/negative impacts are those which are worth noting, but the practitioner believes are not likely to contribute materially to determining whether an option is funded or otherwise;
-2	Moderate cost or negative impact - the option is anticipated to have only a moderate cost or negative impact. Moderate costs/negative impacts are those which taken in isolation may not determine an option's eligibility for funding, but taken together could do so;
-3	Major cost or negative impacts - these are costs or negative impacts which, depending on the scale of cost or severity of impact, the practitioner should take into consideration when assessing an option's eligibility for funding.

7.9. Preferred Option

7.9.1. Following the option appraisal work outlined above, Options I and K are the best performing options. Whilst Option I scores negligibly higher, it is important to take cognisance of the criterion contributing to these scores.

7.9.2. Reallocation of existing northbound lanes for buses and / or freight causes a secondary negative traffic impact on southbound traffic, likely due to fewer gap opportunities for southbound traffic giving way at Hareness Roundabout. Option K subsequently scores lower for facilitating efficient traffic movements, however Option K better accommodates for the Integration with Aberdeen Rapid Transit.

7.9.3. The Aberdeen Rapid Transit (ART) route has been confirmed along Wellington Road and onto West Tullos Road. Should future ART interventions along the route involve reallocation of existing lanes within this section of Wellington Road, Option I would show similar increases in journey times and lower scores for facilitating efficient traffic movements.

7.9.4. There is opportunity at DMRB Stage 3 for more refined traffic modelling and optimisation of pedestrian crossing timing to improve journey times. Option K better promotes the modal shift towards sustainable transport use and supports ART in its aim to improve and enhance public transport in Aberdeen.

7.9.5. It is therefore recommended Option K is progressed as the preferred option, with further traffic modelling and optimisation of pedestrian crossing timing undertaken at DMRB Stage 3.

7.9.6. As the preferred option, Option K is recognised to:

- Prioritises facilities for sustainable transport modes along the corridor;
- Provides improved, safer active travel facilities;
- Recognises the strategic importance of freight on the corridor;
- Involves minimum disruption to traffic and the existing carriageway through the construction phase;
- Has the potential for relatively low impact on utilities; and
- Provides a cost-effective solution.

Appendix A.

Environmental Assessment

A.1. Introduction

A.1.1. This appendix provides detailed environmental topic-based information for the options appraisal, which is summarised in Chapter 5 of the main report. Information on the following topics is presented in the sections below:

- Section A.2 – Air Quality
- Section A.3 – Noise and Vibration
- Section A.4 – Cultural Heritage
- Section A.5 – Biodiversity and Habitats
- Section A.6 – Landscape and Visual Amenity
- Section A.7 – Geology and Soils
- Section A.8 – Water Quality and Flood Defence

A.2. Air Quality

Introduction

A.2.2. This section presents the appraisal of each of the shortlisted options within the context of potential impacts on local air quality, accounting for changes to traffic flows on the local road network, changes in road alignment, the presence of potentially sensitive receptors, and existing baseline air quality conditions.

A.2.3. The outcomes of this appraisal has been used to inform a judgement on the likelihood of each option to generate a potentially significant effect in terms of air quality, which would either require further detailed assessment or provide justification to scope out any further assessment.

Approach and Methods

A.2.4. Traffic data were supplied by the appointed transport consultant for each option, comprising two scenarios; 'without scheme' (Do Minimum) and 'with scheme' (Do Something) scenarios for the assumed Scheme opening year (2026). The traffic data were provided as Annual Average Daily Traffic (AADT) flows, with percentage breakdown of heavy-duty vehicles (HDV) and average link speeds (km/h) across the transport model domain.

A.2.5. A high-level traffic screening exercise of this traffic data was undertaken in accordance with two key guidance documents:

- Design Manual for Roads and Bridges (DMRB) Air Quality (LA 105)[16], and
- Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) (2017) Land-use Planning & Development Control: Planning for Air Quality v1.2[17].

A.2.6. Both guidance documents include traffic screening criteria that, if met, indicate the need for further assessment of potential air quality impacts and likely significant effects. The screening criteria in the DMRB LA 105 guidance is specifically intended for strategic highways schemes, whereas the relatively more stringent IAQM & EPUK criteria are more applicable to urban roads and/or those within a designated Air Quality Management Area (AQMA).

A.2.7. All changes in AADT across the road network included in each option were screened to be below an increase/decrease (+/-) of 1,000 AADT compared do the Do Minimum, which is a principal screening criterion stipulated by DMRB LA 105 criteria in scoping the need for further detailed air quality assessment. Given that all changes in vehicle flows are below this criterion, this indicated that there is likely to be a minimal impact on air quality attributed to each option.

A.2.8. The options are in proximity to two AQMAs, as shown on Figure D5.1, which are likely to be more sensitive to relatively smaller changes in traffic flows. Therefore, the more stringent IAQM & EPUK criteria have been adopted to provide a conservative screening appraisal of link roads with the potential to experience local air quality impacts. The respective screening criteria used within this appraisal to form the air quality affected road network (ARN) are provided below, based on the difference between the Do Minimum and Do Something scenarios for each option:

- Changes in Light Duty Vehicles (LDV) AADT >+/-100 for links inside and within 200m of an AQMA, and >+/-500 LDV AADT elsewhere.
- Changes in Heavy Duty Vehicles (HDV) AADT >+/-25 for links inside and within 200m of an AQMA, and >+/-100 HDV AADT elsewhere.
- Changes in speed >+/-10km/h.
- Changes in road alignment >+/-5m.

[16] DMRB (2019) Design Manual for Roads and Bridges (DMRB) Air Quality (LA 105) Available from: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk)
[17] IAQM/EPUK (2017) Land-use Planning & Development Control: Planning for Air Quality v1.2. Available from: air-quality-planning-guidance.pdf (iaqm.co.uk)

A.2.9. Screening of the traffic data for each option against the above criteria enabled all affected road links to be identified. A subsequent review of potentially sensitive receptors (human and designated ecological sites) was undertaken within 200m of an ARN link, in addition to a review of existing air quality conditions, to determine the potential for each option to have an adverse local air quality impact.

A.2.10. The ARNs for each option are presented on Figures A.2a to A.2k.

Assumptions and Limitations

A.2.11. The following assumptions and limitations are inherent to this high-level appraisal:

- The traffic data used to inform this assessment has been provided by project traffic consultants and is considered to be correct.
- Locating human health receptors has been reviewed using publicly available base mapping. Detailed Mastermap data has not been used to identify potential air quality receptors.
- No detailed modelling of air quality impacts has been undertaken within this assessment.
- To provide a comprehensive review of affected road links, traffic data for dual carriageways was not paired with the opposite side of the carriageway. This ensured that the changes in traffic on each side of the carriageway were captured independently to facilitate the appraisal of potential local air quality impacts at sensitive receptors adjacent to the respective carriageway (i.e. northbound or southbound side).
- The adoption of the stringent IAQM/EPUK traffic screening criteria for all road links within 200m of an AQMA is considered to represent a conservative approach, ensuring that potential impacts on air quality associated with the options have not been underplayed.

Baseline

Local Air Quality

A.2.12. The options are not located within an AQMA, however the Wellington Road AQMA is located within 900m to the north and is part of the same road as the proposals. Aberdeen City Centre AQMA is located 1.6km to the north of the Scheme boundary. Both AQMAs were declared due to elevated levels of nitrogen dioxide (NO_2) and particulate matter with a mean aerodynamic diameter smaller than 10 µm (PM_{10}) caused primarily by road traffic emissions[18].

[18] Aberdeen City Council (2011) Air Quality Action Plan 2011. Available from: Final Air Quality Action Plan 2011 (aberdeencity.gov.uk)

A.2.13. ACC monitored air pollution using six continuous monitors and 67 passive monitoring sites (diffusion tubes) across the city during 2022. Of these, two continuous monitors and 10 diffusion tubes are located near to the scheme along Wellington Road, including inside the Wellington Road AQMA. All NO_2, PM_{10} and Particulate Matter with a mean aerodynamic diameter smaller than 2.5 µm ($PM_{2.5}$) monitoring data within the vicinity of the scheme and in proximity to the AQMA has been extracted from the 2023 Annual Progress Report[19] and are outlined in Tables A.1 to A.3.

[19] [19] Source: Aberdeen City Council (2023). 2023 Air Quality Annual Progress Report APR_2023_v1.0_1.pdf (aberdeencity.gov.uk)

Table A.1 - Aberdeen City Council Annual Mean NO_2 Concentration Monitoring Results ($\mu g/m^3$)

ID	SITE NAME	X	Y	Z	SITE TYPE	IN AQMA? [1,2]	APPROXIMATE DISTANCE TO SCHEME BOUNDARY	ANNUAL MEAN NO_2 MONITORING RESULTS ($\mu G/M^3$)[3]				
								2018	2019	2020	2021	2022
CM2	Market Street	394560	805677	1.5	Roadside	Yes[1]	2km	31	33	22	27	23.4
CM4	Wellington Road	394395	804779	1.5	Roadside	Yes[2]	1.2km	39	39	25	28	24.5
DT6	86 Victoria Rd Torry	394764	805197	2.3	Roadside	No	1.5km	28	30	21	21	20
DT7	Wellington Rd/Kerloch Place	394411	804407	2.4	Roadside	Yes[2]	830m	32	31	22	23	21
DT10	184 Market St	394530	805708	2.6	Roadside	Yes[1]	2.1km	**47**	**47**	33	37	35
DT36	115 Menzies Rd/Wellington Rd	394403	804799	2.4	Roadside	Yes[2]	1.2km	**43**	39	29	30	29
DT37	137 Wellington Road	394697	803735	1.6	Roadside	No	150m	23	22	17	17	15
DT70	Kirkhill Place Tullos Primary	395476	804452	2.4	Urban Background	No	1.1km	14	13	10	12	11
DT71	Tullos Hill	395431	803410	2.6	Urban Background	No	750m	10	9	7	8	7
DT72	North Loirston Souter Head	394988	801940	2.5	Urban Background	No	200m	8	9	5	6	5

	Road Cove Allotments											
DT75	Pentland Close	395964	805132	2.6	Urban Background	No	2km	16	15	12	15	13
DT85	Tullos Place	395216	804724	2.4	Urban Background	No	1.2km	13	13	11	13	10

[1] WITHIN CITY CENTRE AQMA

[2] WITHIN WELLINGTON ROAD AQMA

[3] NUMBER IN **BOLD** DENOTES EXCEEDANCE OF ANNUAL MEAN AIR QUALITY OBJECTIVE (**40 µG/M^3**)

Table A.2 - Aberdeen City Council Annual Mean PM_{10} Concentration Monitoring Results (µg/m^3)

ID	SITE NAME	X	Y	Z	SITE TYPE	IN AQMA? [1,2]	APPROXIMATE DISTANCE TO SCHEME BOUNDARY	ANNUAL MEAN PM_{10} MONITORING RESULTS (µG/M^3)[3,4]				
								2018	2019	2020	2021	2022
CM2	Market Street	394560	805677	1.5	Roadside	Yes[1]	2km	17 (5)	13 (4)	10 (0)	11 (0)	12.7 (4)
CM4	Wellington Road	394395	804779	1.5	Roadside	Yes[2]	1.2km	17 (3)	14 (4)	14 (0)	12 (0)	10.6 (0)

[1] WITHIN CITY CENTRE AQMA

[2] WITHIN WELLINGTON ROAD AQMA

[3] SCOTTISH ANNUAL MEAN AIR QUALITY OBJECTIVE = **18 µG/M^3**

[4] NUMBER IN BRACKETS DENOTES THE NUMBER OF EXCEEDANCES OF PM_{10} 24-HOUR MEAN AIR QUALITY OBJECTIVE (**50 µG/M^3** NOT TO BE EXCEEDED MORE THAN 7 TIMES PER YEAR)

Table A.3 - Aberdeen City Council Annual Mean $PM_{2.5}$ Concentration Monitoring Results (µg/m^3)

ID	SITE NAME	X	Y	Z	SITE TYPE	IN AQMA? [1,2]	APPROXIMATE DISTANCE TO SCHEME BOUNDARY	ANNUAL MEAN $PM_{2.5}$ MONITORING RESULTS (µG/M^3)[3]				
								2018	2019	2020	2021	2022
CM2	Market Street	394560	805677	1.5	Roadside	Yes[1]	2km	8	7	5	5	6.4
CM4	Wellington Road	394395	804779	1.5	Roadside	Yes[2]	1.2km	8	9	6	6	5.2

[1] WITHIN CITY CENTRE AQMA

[2] WITHIN WELLINGTON ROAD AQMA

[3] SCOTTISH ANNUAL MEAN OBJECTIVE = **10 µG/M^3**

A.2.14. As shown in Tables A.1 to A.3, levels of monitored air pollution in the vicinity of the Scheme, both within and outside the AQMA, were reported by ACC to be well below the respective health-based national air quality objectives for NO_2, PM_{10}, and $PM_{2.5}$ in 2022. The nearest roadside monitoring site to the Scheme is located adjacent to Wellington Road (DT37), outside the AQMA, and recorded an annual mean NO_2 concentration of 15 µg/m^3 in 2022, equating to 38% of the objective (40 ug/m^3).

A.2.15. All modelled pollutant concentrations within the Wellington AQMA have been decreasing over the past five years, particularly in terms of annual mean NO_2. The period reported includes results for 2020 and 2021, which should be treated with caution as concentrations were influenced by travel restrictions imposed throughout the Covid-19 pandemic.

Nearby Human Health Receptors

A.2.16. The most sensitive receptors to changes in local air quality, including residential properties, are set back from the A956 Wellington Road by a minimum distance of 5m, thus levels of pollution would be expected to be similar or lower to those reported at roadside monitoring sites (≤5m from kerb) adjacent to Wellington Road (see Tables A.1 to A.3).

A.2.17. The closest receptors to the roadside (approximate distance measured from the kerb to the nearest façade of the building) include:

- Little Clouds Nursery (7m away from kerbside)
- 7 Wellington Road (6m away from kerbside)
- Property near to Kirkton Cottage (7m away from kerbside)
- 250 Wellington Road (11m away from kerbside)
- 2 Nigg Kirk Road (5m away from kerbside)
- Row of houses including 55 Wellington Road (5m away from kerbside)
- Houses on Polwarth Road (6m away from kerbside)

A.2.18. Therefore, based on the above review of recently monitored roadside levels of air pollution, which are all well below their respective objectives for each pollutant, existing air quality at sensitive receptors within proximity to the options is expected to be good.

Nearby Ecological Receptors

A.2.19. The following designated ecological sites have been identified within 500m of the traffic road network provided by the project traffic consultants, that could be potentially sensitive to changes in air quality, specifically ambient concentrations of oxides of nitrogen (NO_x) and nutrient nitrogen deposition:

- River Dee Special Area of Conservation (SAC)
- Nigg Bay Site of Significant Scientific Interest (SSSI)
- Kincorth Hill Local Nature Reserve (LNR)
- Tullos Hill LNR, which also encompasses an area of ancient woodland

A.2.20. The locations of the above ecological sites are shown on Figure D5.1: Environmental Constraints.

Appraisal

Summary of Options

A.2.21. The results of the high-level appraisal demonstrated that there are several road links that meet the traffic screening criteria when comparing the 'Do Something' with the 'Do Minimum' scenario traffic data for each option. The number of links which exceed the IAQM/EPUK screening criteria are summarised within Table A.4. The spatial variation between the ARNs in each option is depicted in Figures A.2a to A.2k.

Table A.4 - Summary of Affected Road Network (ARN) for each Option

OPTION REF	CHANGE INSIDE AQMA[1]		CHANGE OUTSIDE AQMA		>+/- 10 KM/H	>+/- 5M ALIGNMENT CHANGE	TOTAL NO. LINKS WITHIN ARN
	>+/- 100 LDV AADT	>+/- 25 HDV AADT	>+/- 500 LDV AADT	>+/- 100 HDV AADT			
OPTION A	25	6	37	3	3	4	69
OPTION B	61	28	12	1	7	10	88
OPTION C	63	21	10	4	6	10	90
OPTION D	51	22	1	1	7	10	67
OPTION E	61	28	11	1	6	20	95
OPTION F	61	14	10	3	7	20	97
OPTION G	63	28	10	2	7	20	99
OPTION H	61	21	11	4	7	20	99
OPTION I	63	21	12	1	6	10	88
OPTION J	63	21	12	2	6	10	89
OPTION K	61	21	9	1	6	10	83

A.2.22. In all eleven options (Option A-K), there is a large proportion of links that are screened into the ARN due to a change in LDV flows (+/- 100 LDVs) within or near to the AQMAs. However, all the affected road links represent a reduction of greater than 100 LDV vehicles in the Do Something compared to the Do Minimum scenario, thereby representing a potential improvement in air quality within both Wellington Road AQMA and, to a lesser extent, Aberdeen City Centre AQMA.

A.2.23. Similarly, there are a number of links in each option within 200m of Wellington Road AQMA that also meet the HDV criterion (+/- 25 HDVs). Although most links meeting this criterion experience a reduction in HDV flows (-25 to -52 HDVs) in the Do Something scenario, there are a number of links in all options which experience an increase in HDV flows (+29 to +71 HDVs) inside the Wellington Road AQMA. However, all links that exceed the HDV criterion also experience a relatively higher decrease in LDV flows (-112 to -558) within Wellington Road AQMA, which is likely to outweigh any potential increase in vehicle emissions associated with the HDV flow increase.

A.2.24. The extent of the ARN within the Wellington Road AQMA remains consistent throughout all options, with one link inside the Aberdeen City Centre AQMA (North Esplanade Way) also included for a reduction in LDVs. In addition, all of the ARNs except for Options A and E to K incorporate sections of Victoria Road/Victoria Bridge that are within the Aberdeen City Centre AQMA and/or within 200m of it, due to a reduction in LDV flows in the Do Something scenario. A small section of Girdleness Road is also triggered for Options C and I due to a reduction in LDV flows that marginally exceeds the relevant screening criterion (-100 to -108 LDV).

A.2.25. The overall reduction in vehicle flows within both the Wellington Road AQMA and the Aberdeen City Centre AQMA is likely to equate to an improvement (reduction) in vehicle emissions and thus a potential improvement in local air quality at nearby receptors. However, given the magnitude of reduction in vehicle flows[20], and given that existing air quality monitoring within and near to the AQMAs indicates levels below the respective health-based air quality objectives, the corresponding benefit to local air quality within each AQMA is likely to be negligible to minor beneficial.

A.2.26. The River Dee SAC is within 200m of the ARN in these locations and may experience an air quality benefit resulting from a reduction in vehicle emissions. However, any beneficial air quality impact at the SAC is likely to be negligible.

[20] Maximum LDV flow reduction across all Options = -588 AADT. Maximum HDV flow reduction across all Options = -51 AADT.

A.2.27. Further away from the AQMAs and within the Scheme boundary, there are relatively larger changes in the ARN extent between options. However, as seen in Figures A.2a to A.2k, there are consistent changes between the Do Minimum and Do Something scenarios in each option on Souterhead Roundabout, with Wellington Circle having a minor change in alignment due to changes on the roundabout. These changes are expected to lead to a reduction in LDV flows of between -465 to -694 on the southbound side of the roundabout. The nearest sensitive receptors to these ARN links are the residential properties on Craigmaroinn Gardens, located over 120m to the southeast. As such, the change in vehicle flows and road alignment in this area of the network within each option are expected to have no material impact on local air quality.

A.2.28. In addition, a large reduction in LDV flow is expected at Hareness Roundabout in each option, specifically on the southbound link of the roundabout (a reduction between -809 to -1018 in LDV flows depending on the option). Both Kincorth Hill LNR and residential properties along Abbotswell Crescent, Wellington Road, and other residential properties within Nigg are located within 200m of these ARN links, including some within 50m. Therefore, the reductions in vehicle movements and associated emissions have the potential to result in local air quality improvements adjacent to these ARN links. Given the existing good air quality within this area, any potential improvement in local air quality is likely to be negligible to minor beneficial.

A.2.29. In all options, other than Options A, E and I, the northbound Wellington Road between Hareness Roundabout and Souterhead Roundabout is proposed to undergo alignment change due to the introduction of a bus/freight priority lane on the existing carriageway (Options D and H proposed to include an extension of the highway alignment to accommodate a new lane for bus traffic only). As a result, the average speeds on the northbound link approaching Hareness Roundabout are expected to experience a reduction above the screening criterion for the northbound link, which is likely to yield an increase in vehicle emissions in proximity to receptors adjacent to the west of Wellington Road on Abbotswell Crescent. In addition, for Options D and H, the separation distance between the northbound link and receptors to the west of Wellington Road would be reduced due to the additional lane, which could result in relatively higher concentrations of air pollution at those receptors on Abbotswell Crescent, Redmoss Avenue, and Redmoss Park. Given the existing levels of roadside air pollution monitored nearby, the increase in vehicle emissions and reduced separation distance is likely to have a negligible to, at worst, minor adverse local air quality impact.

A.2.30. All options except for Option D are expected to yield reductions in LDV flows above the criterion on the southbound Wellington Road between Hareness and

Souterhead roundabouts. A reduction of 431 LDV movements on this link is predicted in Option D, which is just below the respective criterion (+/-500 LDVs). Given the proximity of residential receptors to the east of this link, within 8m of the carriageway, the reduction in vehicle emissions is likely to have a minor beneficial impact on local air quality at these properties.

A.2.31. A summary of the key outcomes of the appraisal of each option is presented in Table A.5.

Table A.5 - Summary of key outcomes of the Options Appraisal

OPTION	SUMMARY OF APPRAISAL	POTENTIAL LOCAL AIR QUALITY IMPACTS
OPTION A, E AND I	- Reduction in LDV flows (reduced emissions) within AQMAs - No alignment changes between Hareness roundabout and Souterhead roundabout. - Reduction in LDV flows on southbound carriageway between Hareness roundabout and Souterhead Road roundabout, with sensitive residential receptors within 10m of carriageway. - For Option A, the southbound carriageway from the Souterhead roundabout sees an increase in LDV flows (increase in emissions). The combined carriageways (north and south) show an overall increase in LDV flows but remains below the screening criterion. - For Option I, the northbound approach to Hareness roundabout experiences a reduction in speed from 64 km/h to 39 km/h, which is likely to result in a localised increase in emissions, with sensitive residential receptors within 20m of carriageway.	Impacts within AQMAs likely to be negligible to minor beneficial. Impacts outside of AQMAs likely to be negligible.
OPTIONS B AND C	- Reduction in LDV flows within AQMAs. - Predominant decrease in HDV flows within Wellington Road AQMA. - Reduction in LDV flows on southbound carriageway between Hareness roundabout and Souterhead Road roundabout, with sensitive residential receptors within 10m of carriageway. - Northbound approach to Hareness roundabout experiences reduction in speed (increased emissions) with sensitive residential receptors within 20m of carriageway. - Hareness Road adjacent to Hareness roundabout sees a reduction in LDVs in Option B, whereas Option C sees a reduction in HDVs.	Impacts within AQMAs likely to be negligible to minor beneficial. Impacts outside of AQMAs likely to be negligible overall, with potential for localised minor beneficial / adverse impacts.
OPTIONS D AND H	- As per Options B and C, plus additional lane on northbound Wellington Road before and after Souterhead roundabout up to Hareness roundabout. This will move traffic closer to sensitive residential receptors adjacent to carriageway. - Option H shows that the Hareness Road adjacent to Hareness roundabout will experience a reduction in HDVs.	Impacts within AQMAs likely to be negligible to minor beneficial. Impacts adjacent to northbound Wellington Road likely to be minor adverse due to realignment of carriageway.

OPTIONS F AND G	- Reduction in LDV flows within AQMAs. - Predominant decrease in HDV flows within Wellington Road AQMA in Option G, and a smaller decrease in Option F. - Northbound approach to Hareness roundabout experiences reduction in speed (increased emissions) with sensitive residential receptors within 20m of carriageway.	Impacts within AQMAs likely to be negligible to minor beneficial. Impacts outside of AQMAs likely to be negligible overall, with potential for localised minor beneficial / adverse impacts.
OPTIONS J AND K	- Reduction in LDV flows within AQMAs. - Predominant decrease in HDV flows within Wellington Road AQMA, similar to Options B and C. - Northbound approach to Hareness roundabout experiences reduction in speed (increased emissions) with sensitive residential receptors within 20m of carriageway.	Impacts within AQMAs likely to be negligible to minor beneficial. Impacts outside of AQMAs likely to be negligible overall, with potential for localised minor beneficial / adverse impacts.

Figure A.2a: Affected Road Network (ARN) for Option A

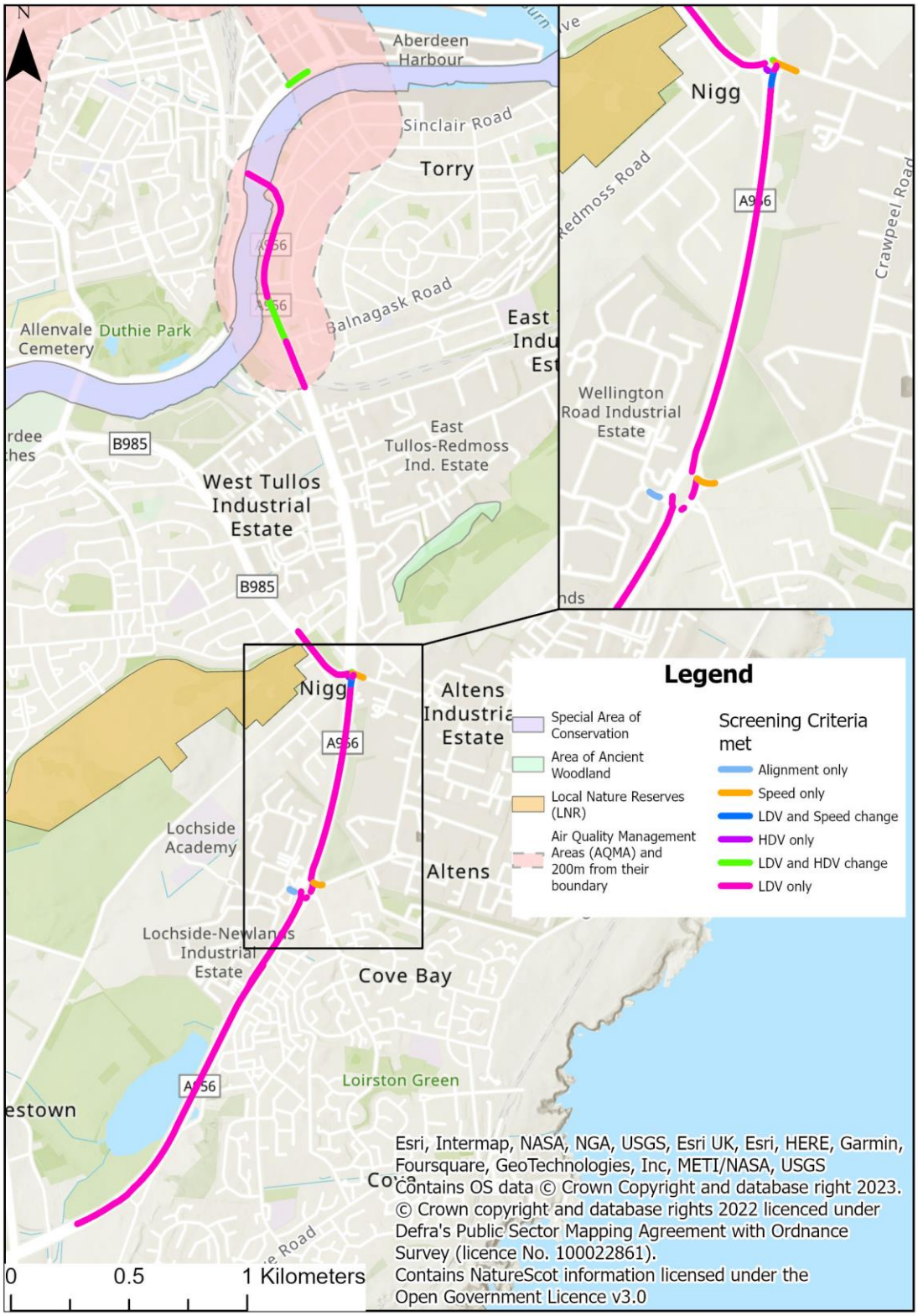


Figure A.2b: Affected Road Network (ARN) for Option B

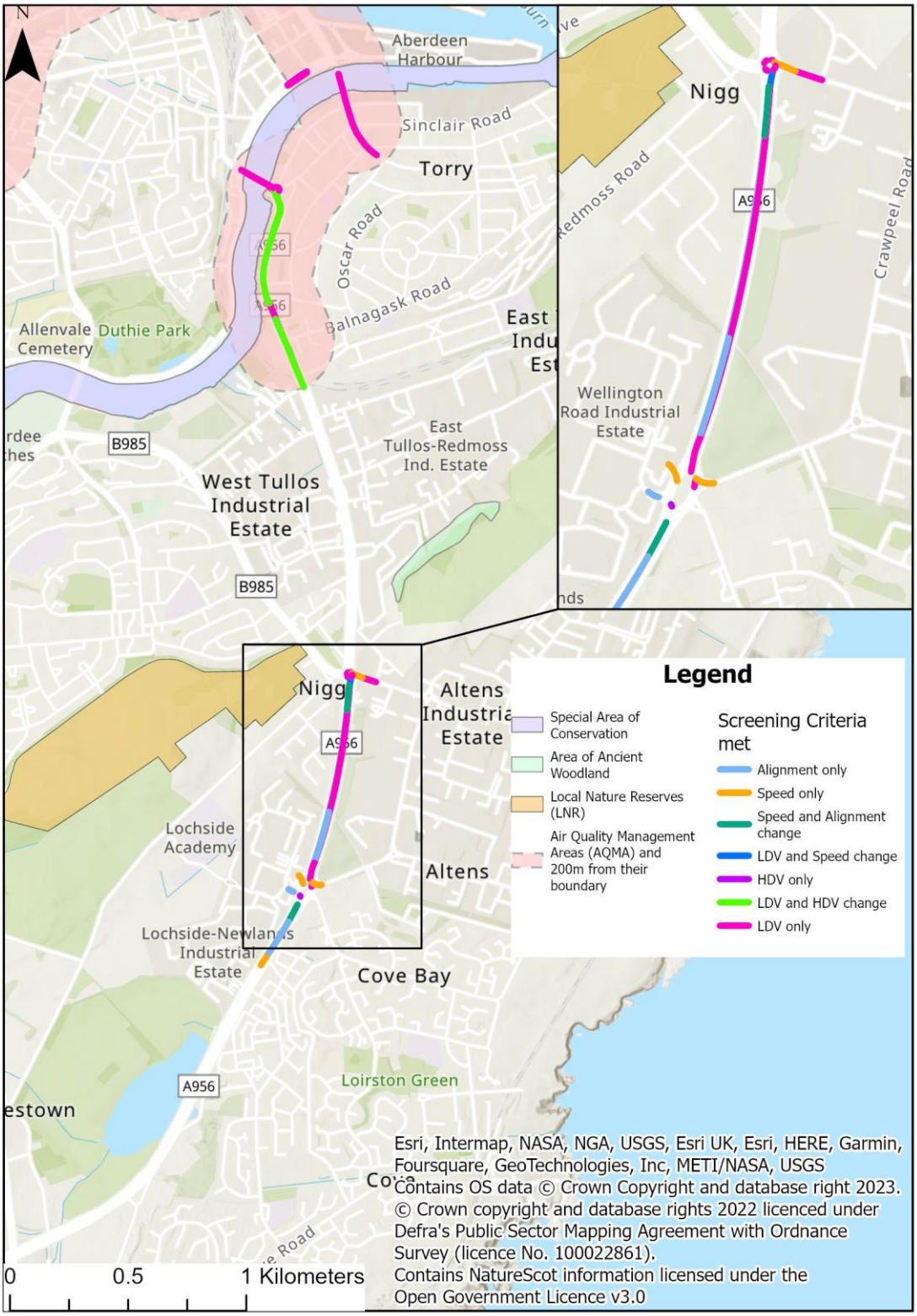


Figure A.2c: Road Network (ARN) for Option C

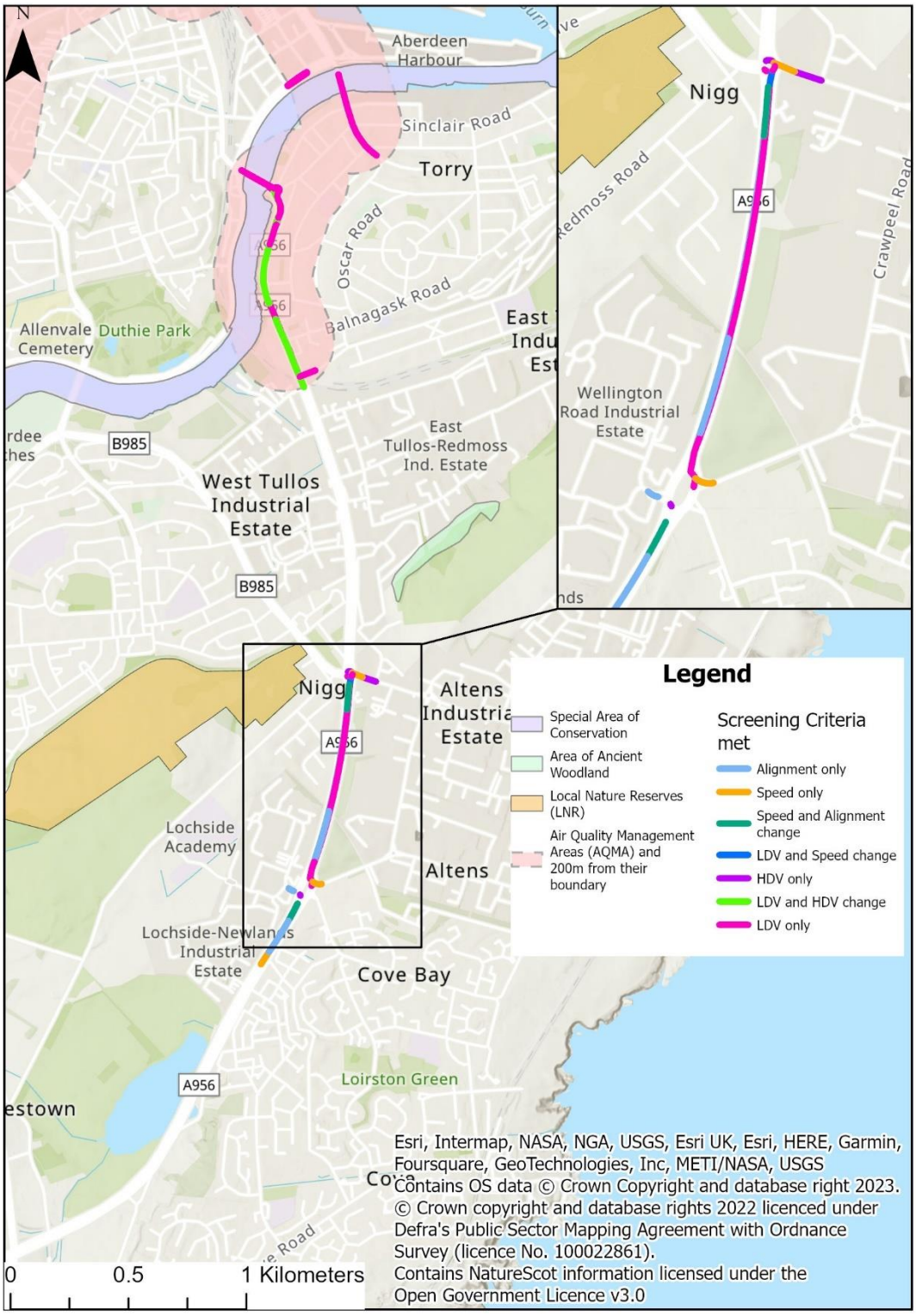


Figure A.2d: Affected Road Network (ARN) for Option D

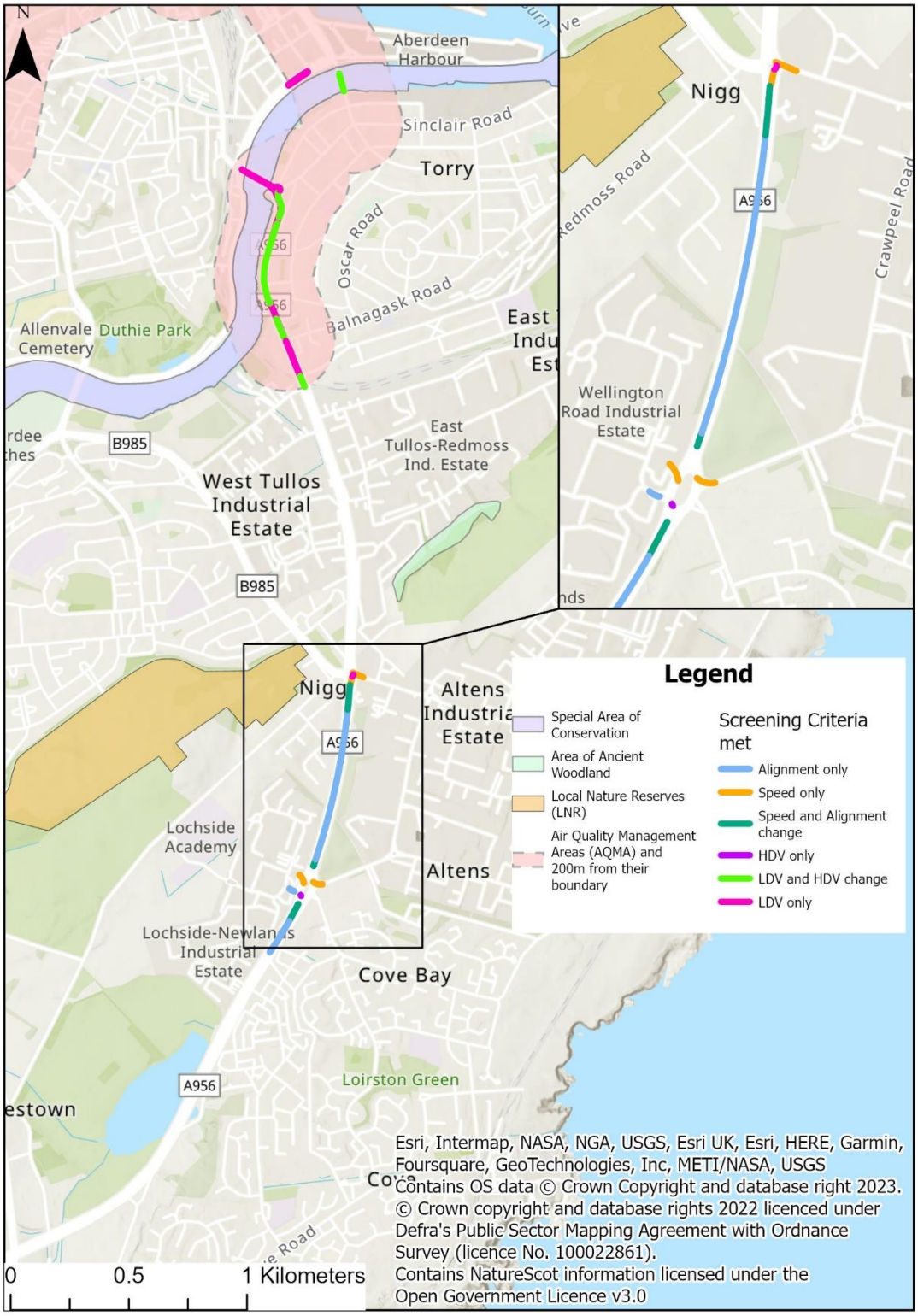


Figure A.2e: Affected Road Network (ARN) for Option E

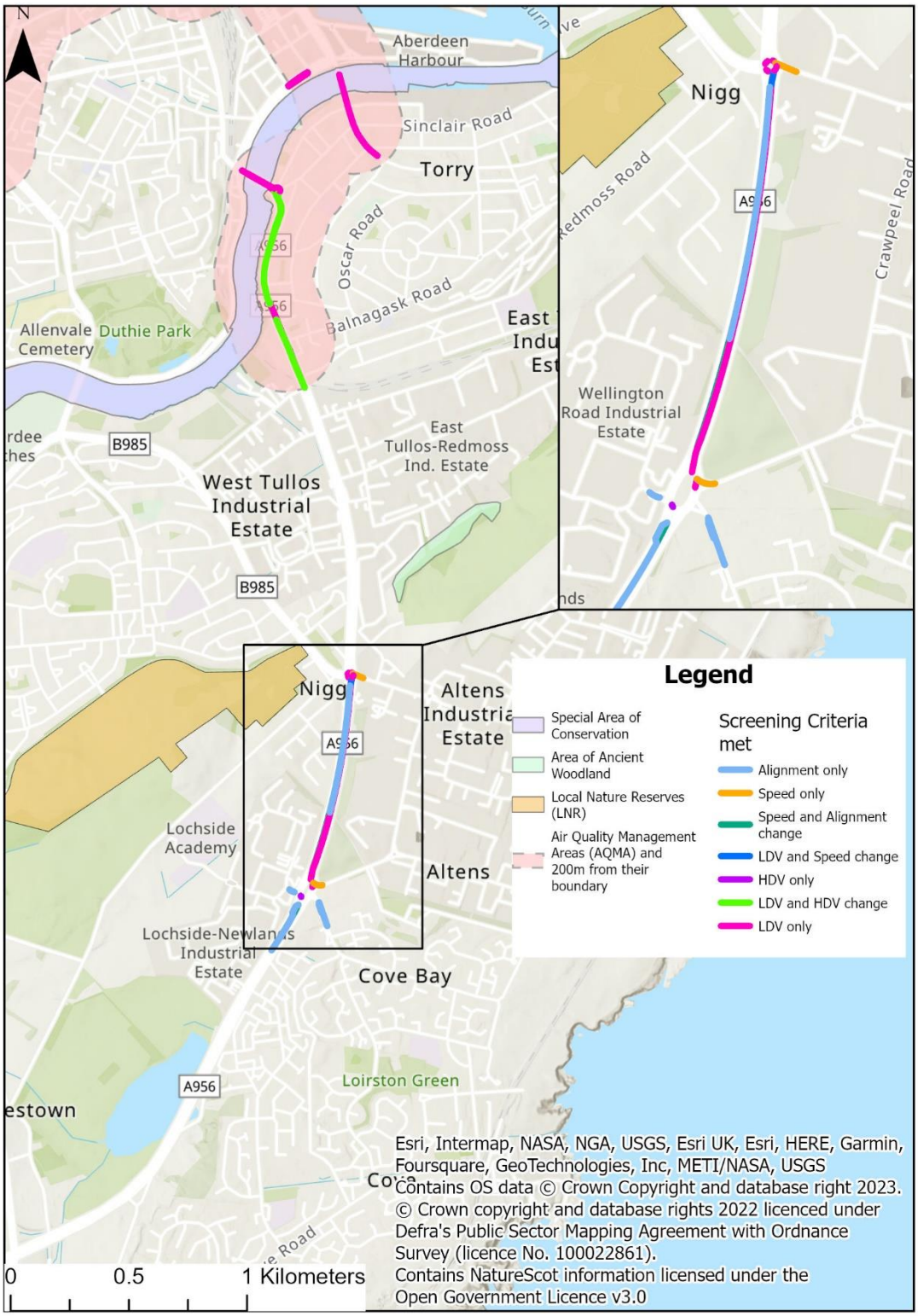


Figure A.2f: Affected Road Network (ARN) for Option F

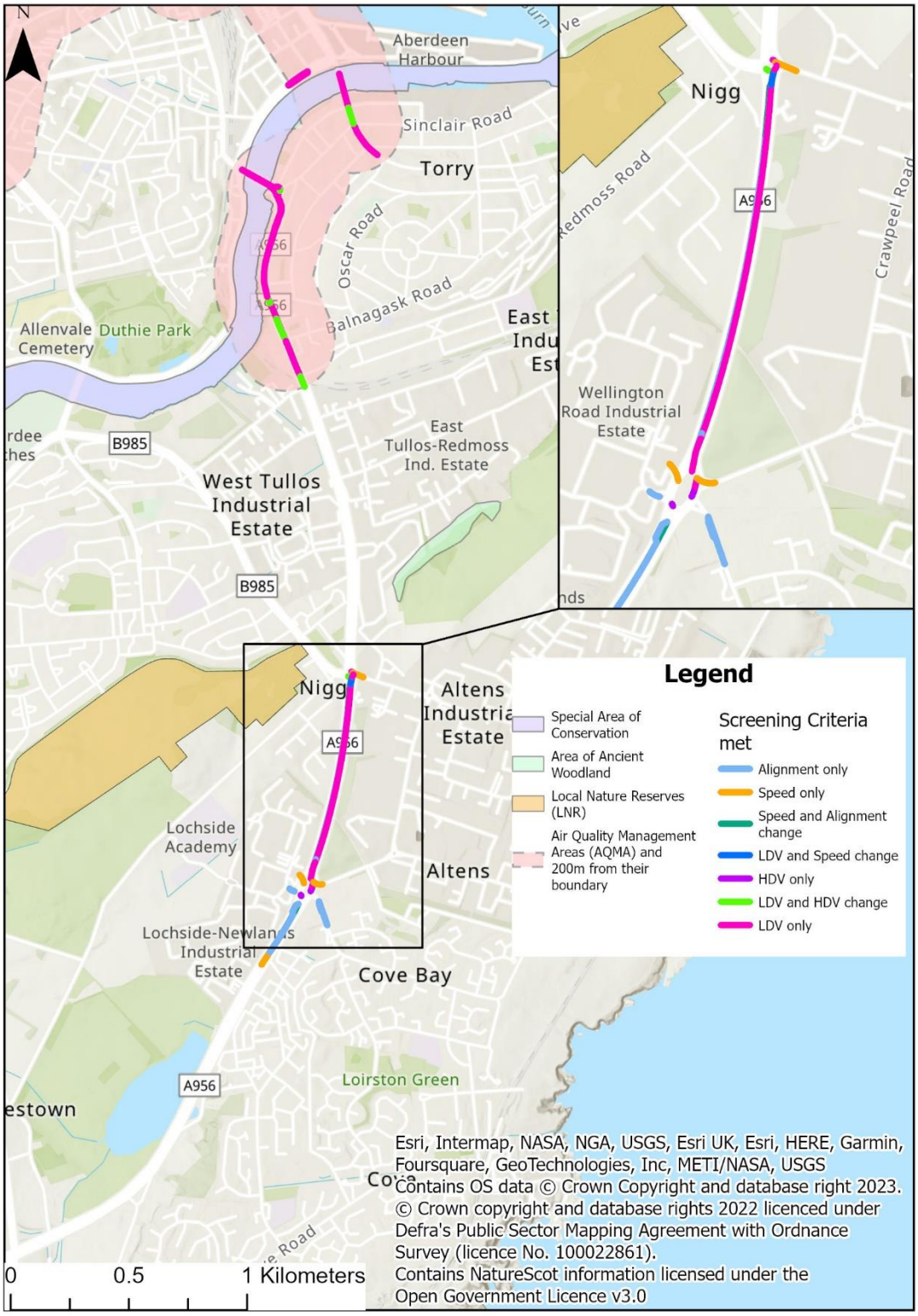


Figure A.2g: Affected Road Network (ARN) for Option G

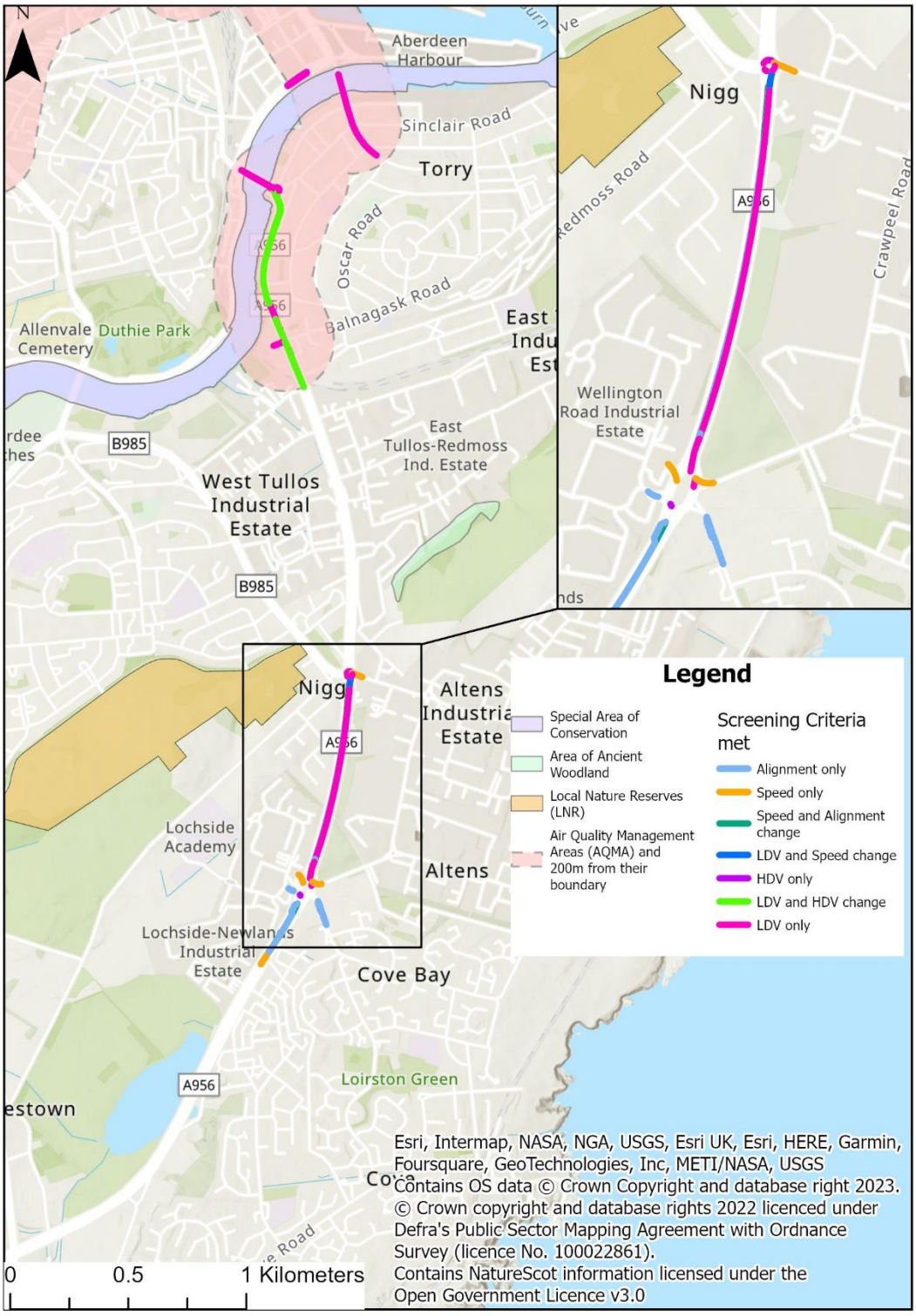


Figure A.2h: Affected Road Network (ARN) for Option H

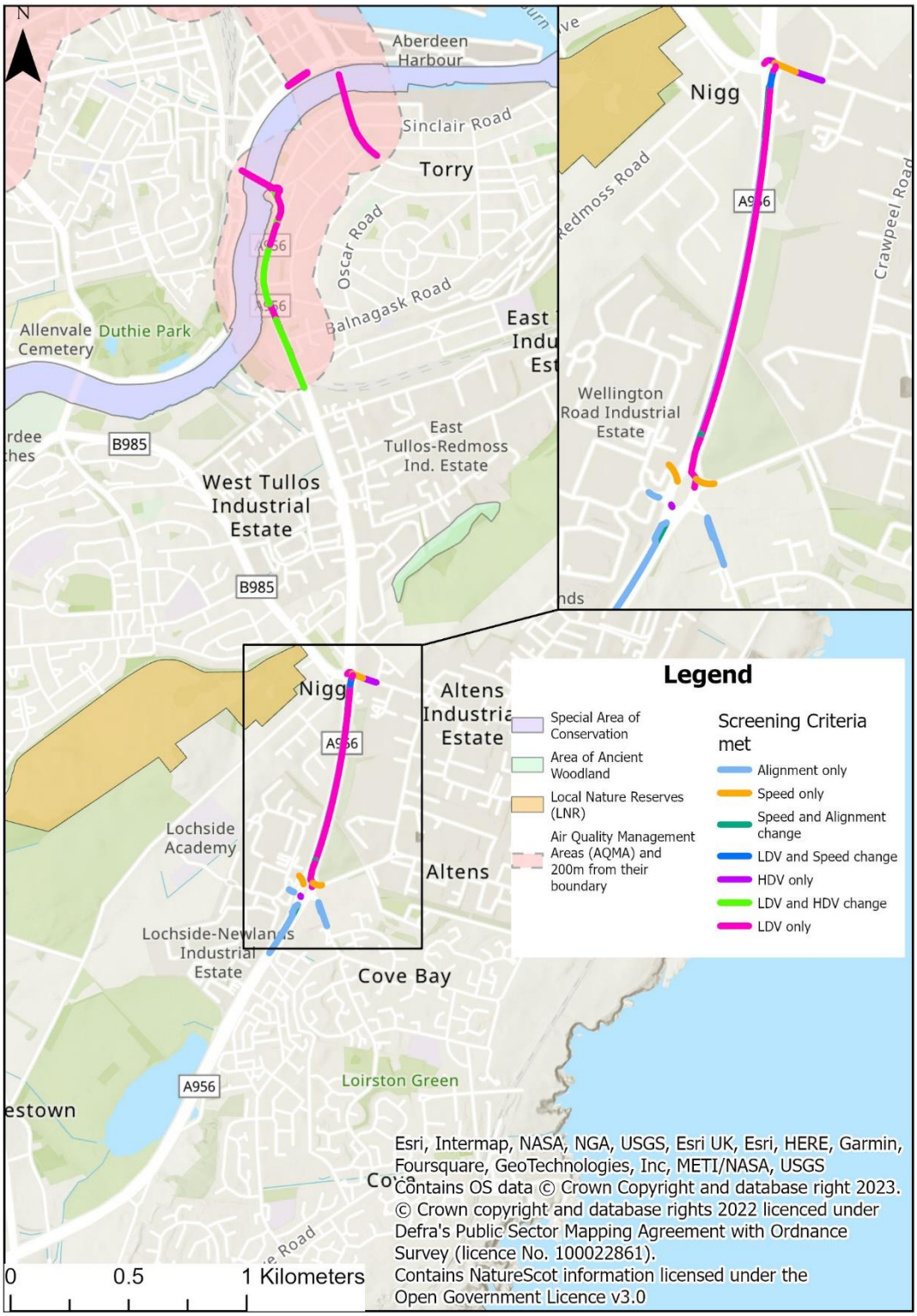


Figure A.2i: Affected Road Network (ARN) for Option I

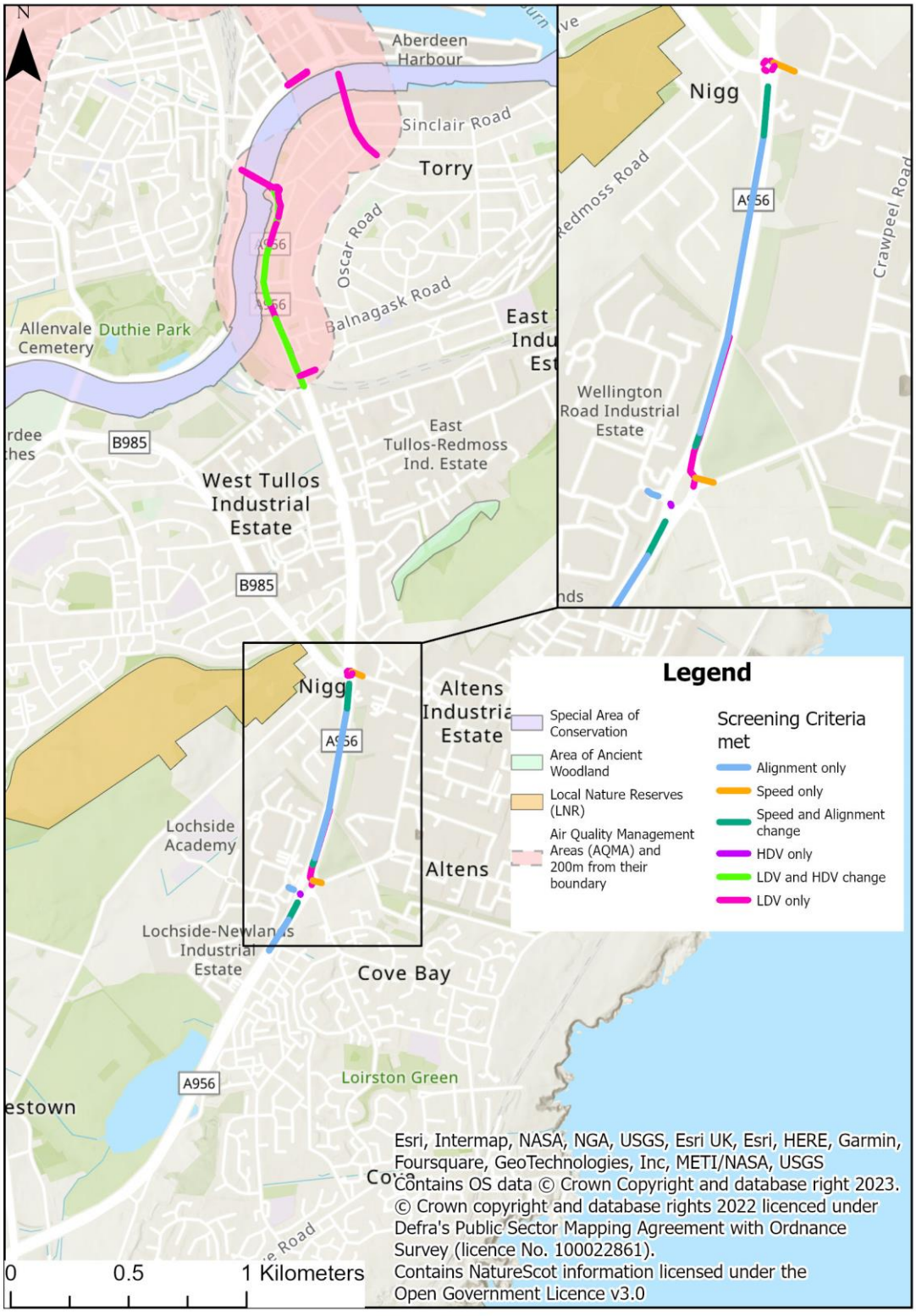


Figure A.2j: Affected Road Network (ARN) for Option J

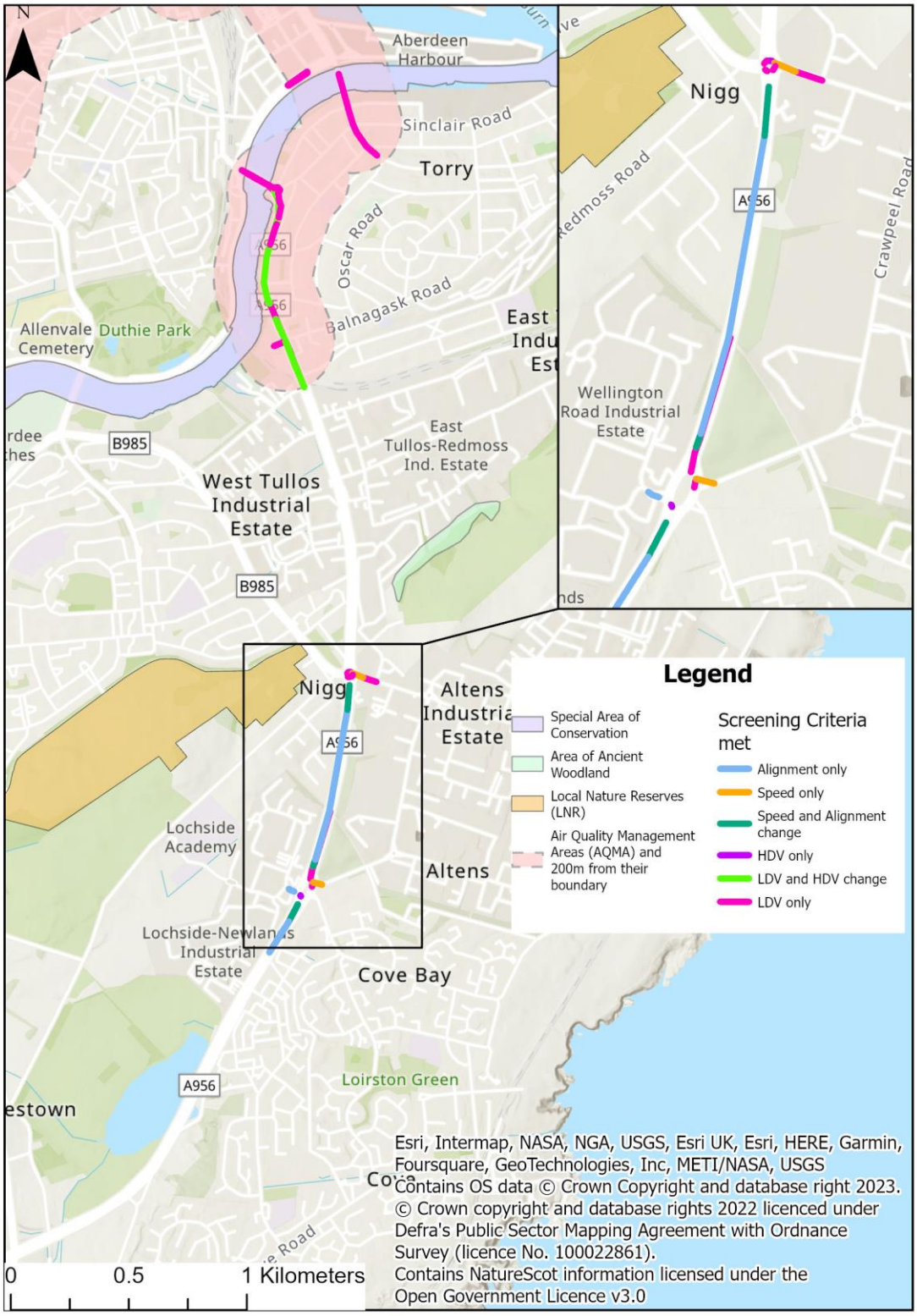
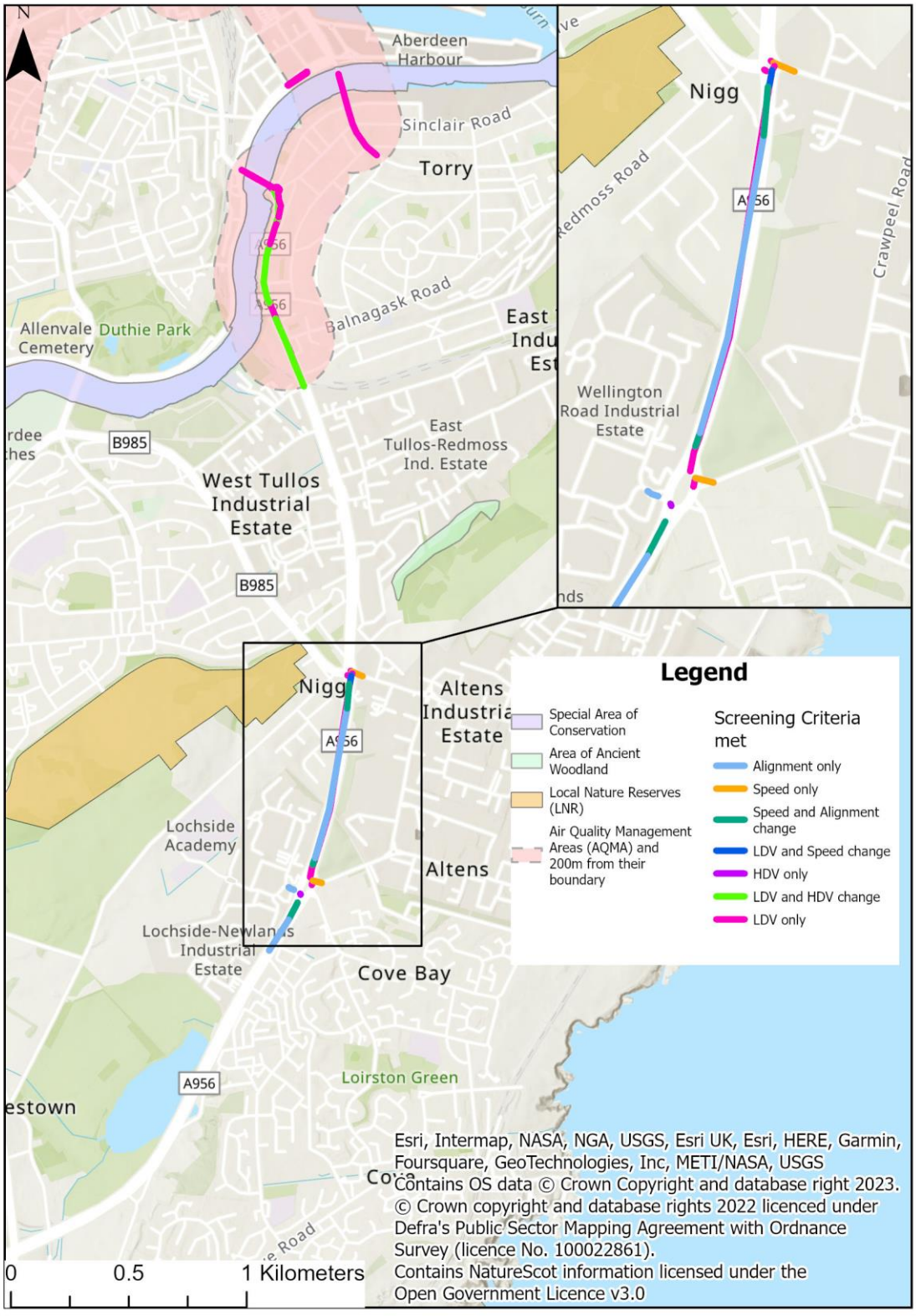


Figure A.2k: Affected Road Network (ARN) for Option K



Summary and Next Steps

A.2.32. A preliminary traffic screening exercise, in addition to a review of baseline air quality conditions and identification of nearby sensitive receptors, has been undertaken to appraise the potential for air quality impacts associated with the options.

A.2.33. A summary of the appraisal outcomes with respect to potential local air quality impacts for each option is provided in Table A.6.

Table A.6 - Summary of Potential Impacts for each Option

SUMMARY OF POTENTIAL IMPACTS BASED ON APPRAISAL	OPTION A	OPTION B	OPTION C	OPTION D	OPTION E	OPTION F	OPTION G	OPTION H	OPTION I	OPTION J	OPTION K
Potential for *beneficial* impacts within AQMAs	X	X	X	X	X	X	X	X	X	X	X
Potential for *negligible* impacts outside of AQMAs, including adjacent to Option alignment	X				X				X		
Potential for localised *minor beneficial* impacts outside of AQMAs, including adjacent to Option alignment		X	X	X		X	X	X		X	X
Potential for localised *minor adverse* impacts outside of AQMAs, including adjacent to Option alignment		X	X	X		X	X	X		X	X
Are impacts (adverse/beneficial) likely to be significant within context of baseline air quality?	No	No	No	No	No	No	No	No	No	No	No

A.2.34. The appraisal has identified the potential for each Option to yield a beneficial impact on local air quality within the AQMAs included within the study area, particularly within the Wellington Road AQMA. Based on the traffic screening exercise, the reduction in flows is considered likely to have a minor beneficial air quality impact within the context of existing air quality conditions, which is not likely to result in a significant effect.

A.2.35. Except for Options A, E and I, which is likely to result in negligible air quality impacts outside of AQMAs, the appraisal of the other options for roads outside of the AQMAs has indicated the potential for localised minor adverse and beneficial impacts on local air quality. These are particularly focused adjacent to the Scheme alignment, on both the northbound and southbound Wellington Road. Within the context of baseline air quality conditions and proximity of identified sensitive receptors, these potential impacts are not likely to result in a significant effect.

A.2.36. Whilst none of the Options are likely to yield a significant effect on local air quality, further assessment of the selected Preferred Option at DMRB Stage 3 is recommended to confirm the outcomes of this appraisal and specifically to quantify the potential local air quality improvements at identified sensitive receptors within the AQMAs.

A.2.37. The scope and methodology of the air quality assessment at DMRB Stage 3 should be agreed with ACC and, if necessary, Transport Scotland.

A.3. Noise and Vibration

Introduction

A.3.1. This section of the report sets out the findings of the noise and vibration assessment of the shortlisted options. The shortlisted options proposed would result in changes to the local road network that could influence existing road traffic flows and therefore the noise levels in the immediate area.

A.3.2. The purpose of this assessment was to identify the differences between the options with regards to the potential for noise impacts compared to the existing (baseline) conditions, and to determine if there were any changes to the road network that could be considered large enough to require a more detailed assessment and/or be potentially significant with regards to noise.

Approach and Methods

A.3.3. The appraisal undertaken utilised the calculation methodology set out in the Department for Transport's (DfT) guidance document 'Calculation of Road Traffic Noise' (CRTN)[21] and the threshold assessment criteria identified in the Design Manual for Roads and Bridges (DMRB) 'LA 111 Noise and Vibration'[22].

A.3.4. The first exercise comprised a review of the provided data and identifying where physical/geographical changes occurred. This fell into three categories, namely:

- identification of road realignment;
- identification of new or amended junctions; and
- identification of new road sections.

A.3.5. An initial 'scoping' exercise was then undertaken to remove all road links identified as having less than 1,000 vehicles over an 18 hour day (0600 – 0000) in all traffic

[21] Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)
[22] DMRB (2020) LA 111 – Noise and vibration, Revision 2. Available online: https://www.standardsforhighways.co.uk/search/cc8cfcf7-c235-4052-8d32-d5398796b364

modelled scenarios. This is the threshold in traffic flow below which the CRTN methodology cannot be relied upon.

A.3.6. Following this alignment and 'scoping' of the data, four basic noise levels ('BNL') were calculated for each unique road link in the Do Something options using the provided one-way traffic flows; Do Minimum Opening (2026) and Design Years (2041) and Do Something Opening and Design Years. The BNL is the predicted road traffic noise level at 10m from the road. The calculated BNLs included a correction for speed and percentage of heavy goods vehicles on that link.

A.3.7. These BNLs were compared in the appropriate scenarios to determine if any potentially significant changes were likely to occur. The scenarios considered in this appraisal for each option were:

- Do Minimum (without scheme) Opening Year[23] against Do Something (with scheme) Opening Year, referred to as short-term change.
- Do Minimum (without scheme) Opening Year against Do Something (with scheme) Design Year[24], referred to as long-term change.

A.3.8. The Do-Something road network for each option was then reproduced in the ArcGIS mapping software package to determine the geographic location in relation to the proposals. The short-term and long-term BNL change for each link was then appraised by using a coloured scale aligning with the DMRB LA 111 'magnitude of change' thresholds.

A.3.9. The DMRB identifies a change of 1dB $L_{A10,18h}$ as being the threshold for full assessment in the short-term (scenario 1) and 3dB $L_{A10,18h}$ in the long-term (scenario 2). Changes below these thresholds are considered to be of a negligible magnitude.

A.3.10. For reference, the magnitude of change thresholds defined in DMRB LA 111, and the colours which had been assigned to the mapping in this initial appraisal, are presented in Table A.7.

[23] Opening year was defined as 2026
[24] Design year defined as the year with the highest flow of traffic within 15 years of the opening year (defined for this assessment as 2041)

Table A.7 – DMRB LA 111 Magnitude of Change Definitions and Colour Grading for Figures

Magnitude	Colour Grading for Figures	Change in Noise Level, dB $L_{A10,18hr}$	
		Short-Term	Long-Term
Major Beneficial		Less than or equal to -5.0	Less than or equal to -10.0
Moderate Beneficial		-3.0 to -4.9	-5.0 to -9.9
Minor Beneficial		-1.0 to -2.9	-3.0 to -4.9
Negligible Beneficial		Greater than -1.0	Greater than -3.0
Negligible Adverse		Less than 1.0	Less than 3.0
Minor Adverse		1.0 to 2.9	3.0 to 4.9
Moderate Adverse		3.0 to 4.9	35.0 to 9.9
Major Adverse		Greater than or equal to 5.0	Greater than or equal to 10.0

Assumptions and Limitations

A.3.11. The following assumptions and limitations were considered in this high-level appraisal:

- The calculation of BNL change makes no allowance for changes in the physical composition or alignment of a road link. A qualitative review of the impact of alignment and composition changes has been undertaken in this assessment.
- The BNL calculation presents a noise level at 10m from the road edge and does not account for any propagation losses or effects with regards to specific receivers, or cumulative contributions from adjacent road links.
- The traffic model data used in this analysis accounted for changes in traffic associated with the nearby Aberdeen South Harbour (ASH) and Energy Transition Zone (ETZ) committed developments.
- No assessment of potential impacts due to construction has been undertaken as part of this comparative options assessment.

Baseline

A.3.12. The scheme proposals are immediately surrounded by a mix of commercial, industrial and residential premises. Noise sensitive premises in close proximity to the scheme boundary include:

- the residential streets off Redmoss Road, located to the west;
- Wellington Hotel, to the west;
- private dwellings along Wellington Road, to the east;

- Aberdeen Altens Hotel, to the east; and
- the residential area of Cove Bay to the east and south.

A.3.13. Additional noise sensitive receptors in the area that may be affected by changes to noise as a result of changes to the flow of traffic due to the scheme (distributional effects) include:

- residential area of Torry;
- Balnagask Golf Course;
- St Fitticks Community Park;
- residential areas of Burnbanks Village and Cove (to the south);
- six primary schools (Walker Road School, Tullos School, Abbotswell Primary School, Kirkhill Primary School, Loirston School and Charleston School);
- one secondary school (Lochside Academy);
- three Candidate Noise Management Areas (CNMAs):
- Rail CNMA ID 1 ‘Near North Esplanade West’ which is at the western end of Queen Elizabeth Bridge (QEB);
- Rail CNMA ID 2 ‘Near Riverside Drive’ which is between Riverside Drive and Deemount Gardens; and
- Road CNMA ID 2 ‘Victoria Road’ which is to the east of QEB.
- The identified Candidate Quiet Areas (CQAs) in close proximity to the options comprise:
- CQA ID 1 ‘Loirston Country Park’; and
- CQA ID 18 ‘Kincorth Hill’.

A.3.14. The primary environmental noise sources in the vicinity of the options are expected to include traffic along the existing Wellington Road, the A92 road to the west, and the local road network. A railway line also exists to the north and east, at approximately 1.0km from the options at its closest extent, and as such this is not expected to be a dominant contributing factor to the existing acoustic environment in the vicinity of the proposals.

A.3.15. No environmental noise monitoring has been undertaken in the vicinity of the works. The baseline noise environment has been quantified at this stage using

publicly available resources including Scotland's Noise Map[25], produced in response to the Environmental Noise Directive 2002/49/EC.

A.3.16. Using Scotland's Noise Map, the ambient noise levels from road sources at the closest noise sensitive receptors to the options have been reviewed. Receptors directly off Wellington Road (i.e. Wellington Hotel and private dwellings) are shown as being subject to noise levels of 65-70 dB L_{den}. Receptors adjacent to, but not immediately off, Wellington Road (Aberdeen Altens Hotel, dwellings off Redmoss Road and dwellings within Cove Bay) are shown as being subject to worst-case noise levels of 65 dB L_{den}, reducing to <55 dB L_{den} at distances greater than approximately 60m from the scheme boundary. Contributions from the railway line to the north and east are indicated as being significantly below 55 dB L_{den} at these closest noise sensitive receptors to the options.

A.3.17. There are no sources of environmental vibration identified in the vicinity of the proposals. The railway line is not expected to be a contributing factor to the environmental vibration levels in the vicinity of the options (located 1km away at its closest extent).

Appraisal

A.3.18. The results of the high-level appraisal for each option are summarised below along with commentary on the likely impacts of the alignment and composition changes not accounted for in the BNL calculation method.

A.3.19. Figures A.3a to A.3k illustrate the predicted long-term and short-term noise level changes on the local road network around the scheme boundary. The colours used in the figures are explained in Table A.7[26].

[25] Scottish Government (2023) Scottish Noise Maps and Action Plans, Map | Scotland's Noise Map (environment.gov.scot).

[26] Note that the links indicated as a thin black line are those with traffic flows below the threshold of 1,000 vehicles over an 18-hour period, which is in line with the CRTN methodology and are thus scoped out of the BNL calculations (as indicated in the 'Approach and Methods' section)

Options A - D

A.3.20. **Option A:** negligible changes in noise level are expected in both the short-term and long-term for all road links with valid flows. In line with the types of works that would be anticipated to cause changes in noise level (as indicated in Table A.7 and the section above) there are no identified elements of this option that could generate additional noise level changes.

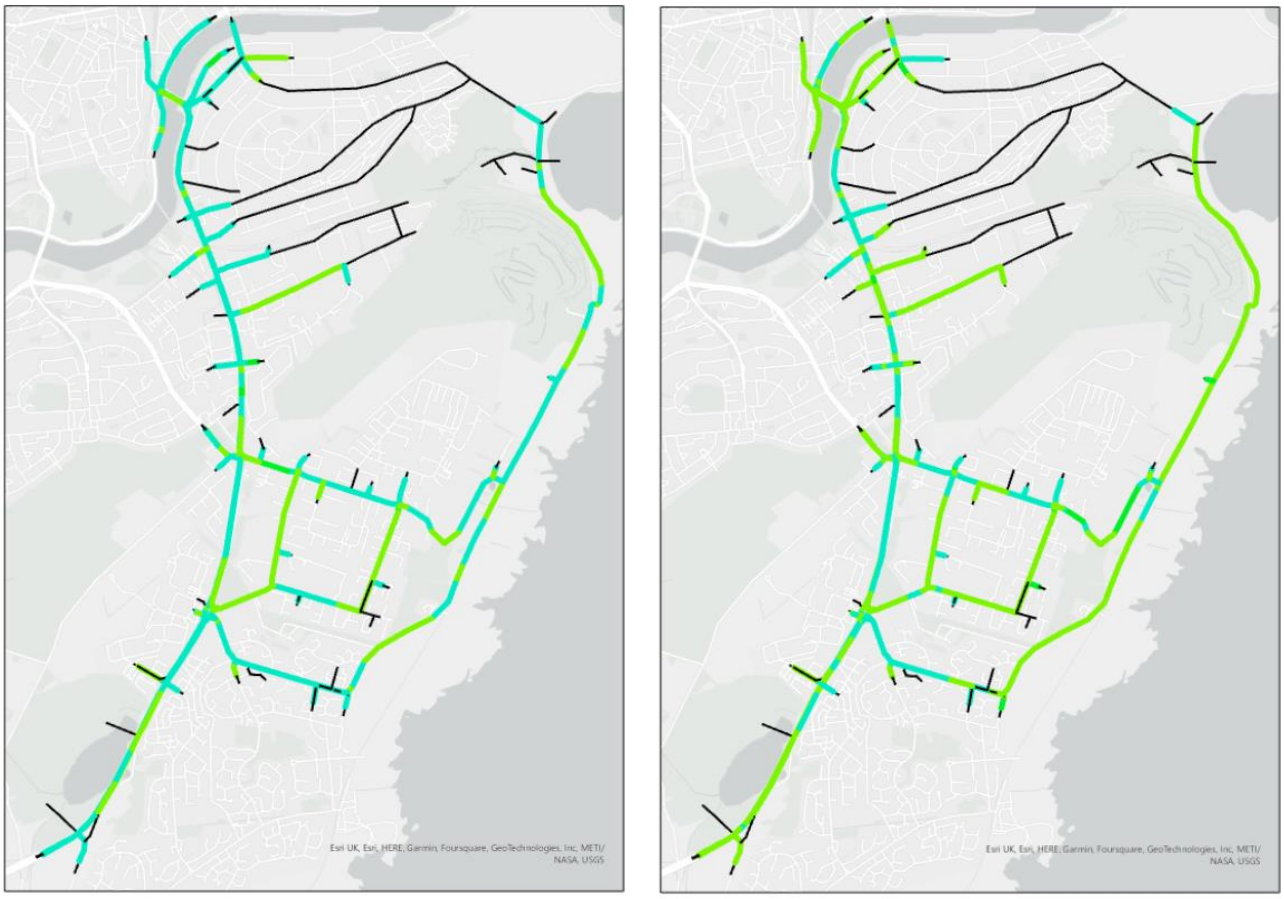


Figure A.3a – Option A; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.21. **Option B:** negligible changes in noise in the short-term and long-term are expected for the majority of road links with valid flows. However, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The reclassification of the northbound lane as a dedicated bus lane may result in a shift of the source line with the potential for localised changes in noise level, the magnitude of this change is not identified in this initial appraisal.

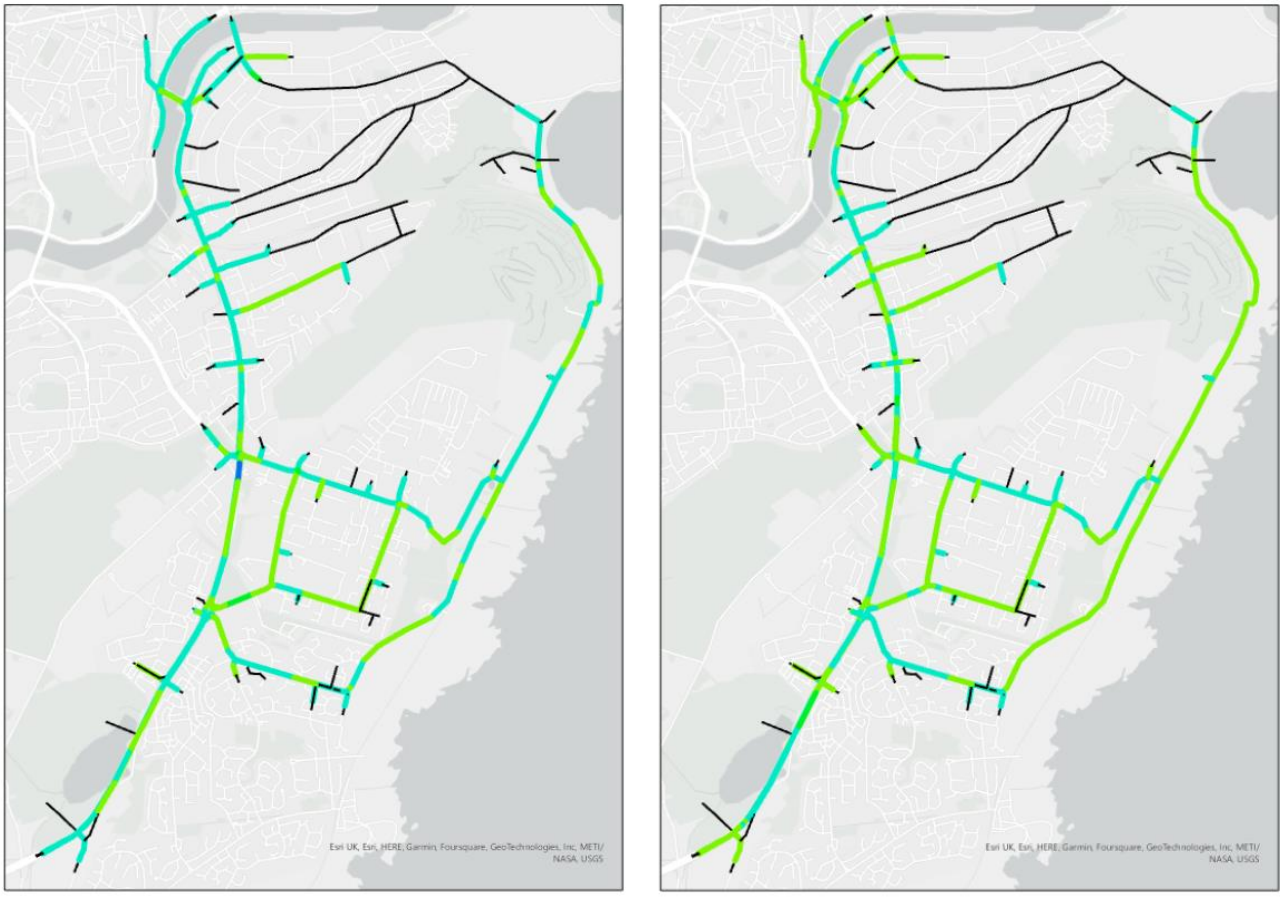


Figure A.3b – Option B; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.22. **Option C:** there are anticipated to be negligible changes in noise in the short-term and long-term for the majority of road links with valid flows. However similar for option B, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The reclassification of the northbound lane as a dedicated bus and freight (HGV) lane may result in a shift of the source line with the potential for localised changes in noise level, the magnitude of this change is not identified in this initial appraisal.

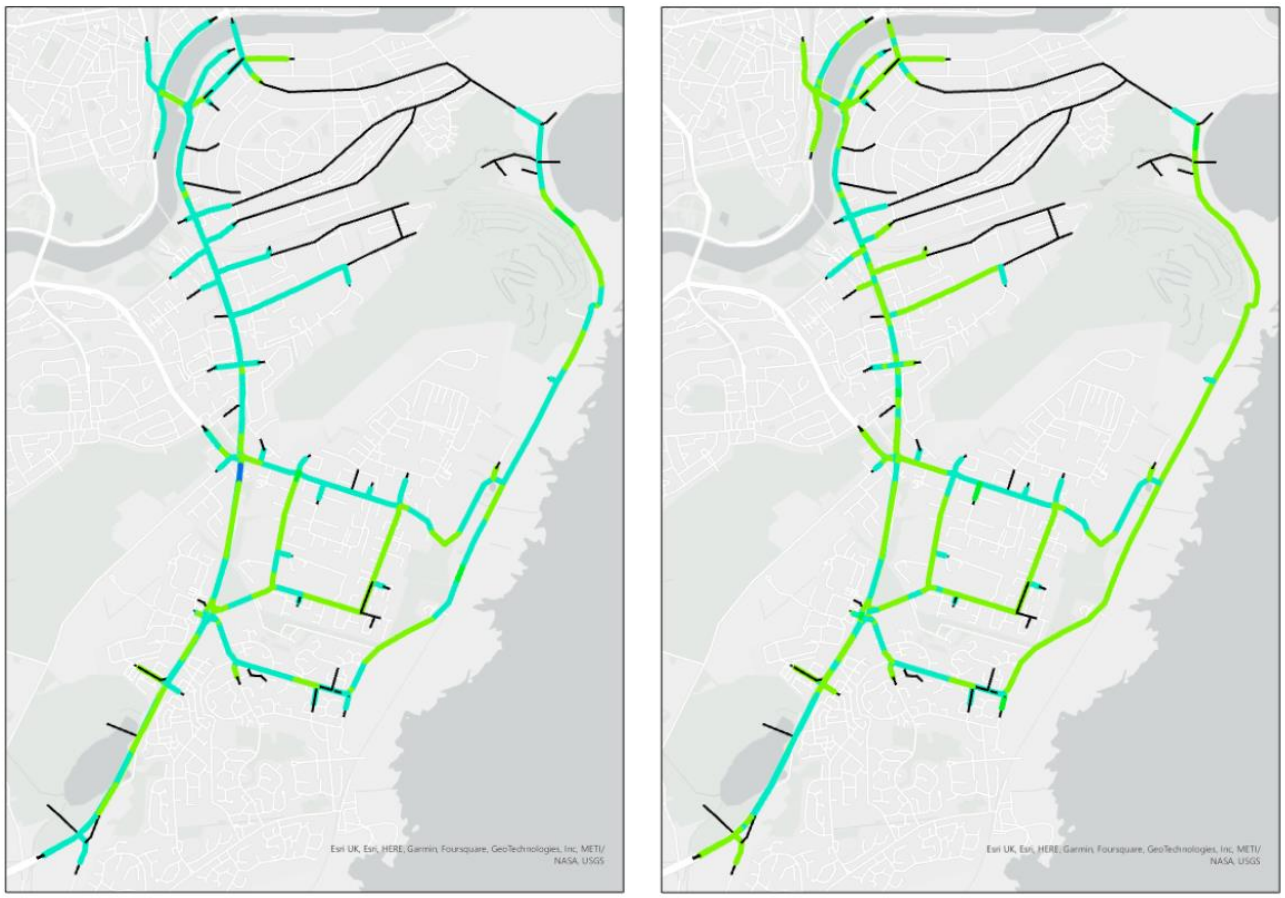


Figure A.3c – Option C; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.23. **Option D:** negligible changes in noise are anticipated in the short-term and long-term for the majority of road links with valid flows. However, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The proposed change in alignment of the northbound carriageway (creation of an additional lane and widening of the road) has the potential for localised changes in noise level, the magnitude of this change is not identified in this initial appraisal.

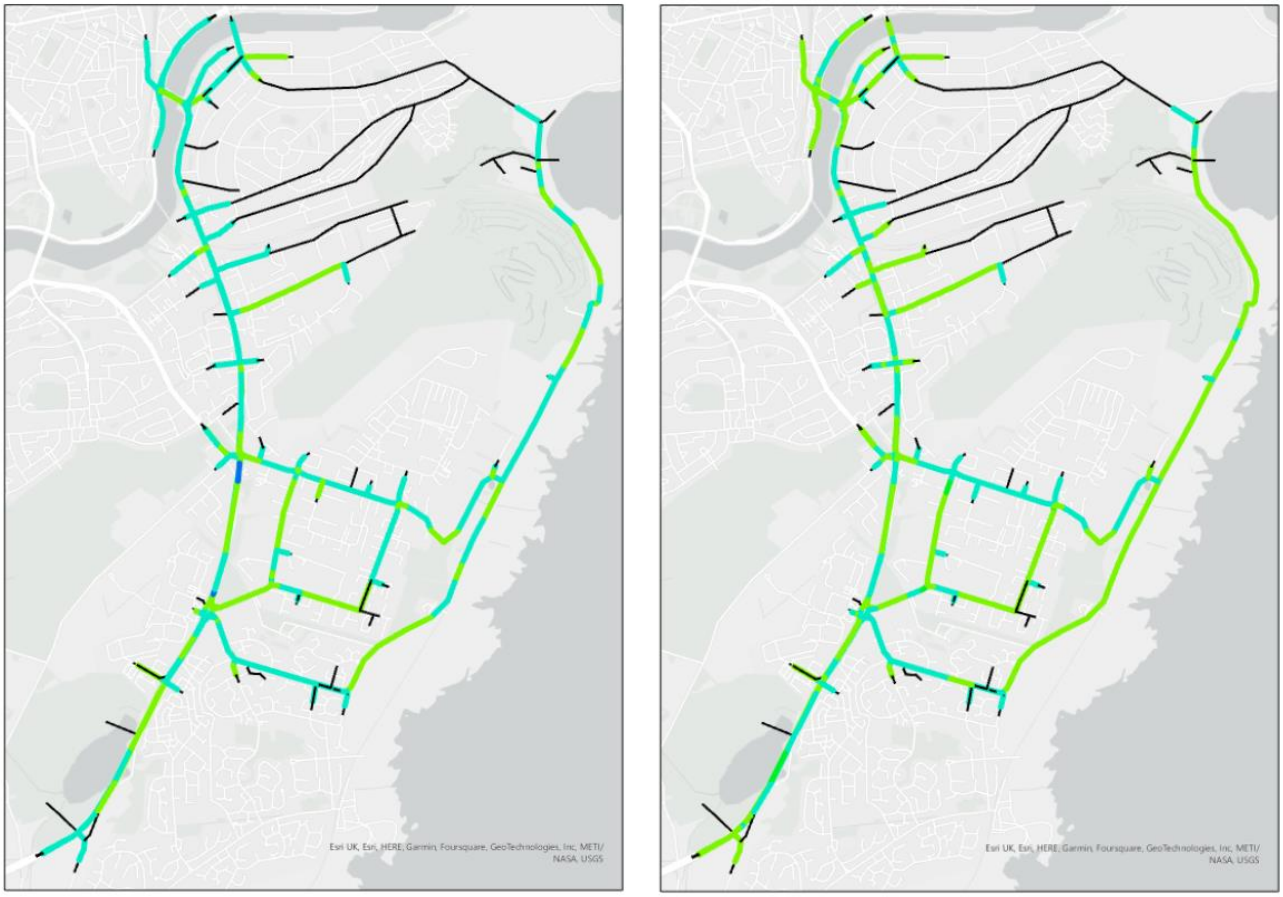


Figure A.3d – Option D; Short-term change magnitude (left), Long-term change magnitude (right)

Options E - H

A.3.24. Options E – H are identical in design to options A – D as described above. With the only difference between them being the incorporation of bus pre-signalisation. In all four options (E-H) the short lengths of widened road that are proposed for the bus pre-signalisation are anticipated to be low flow. Based upon this it is anticipated that their effect on the overall noise levels will have negligible effect.

A.3.25. **Option E:** As Option A.

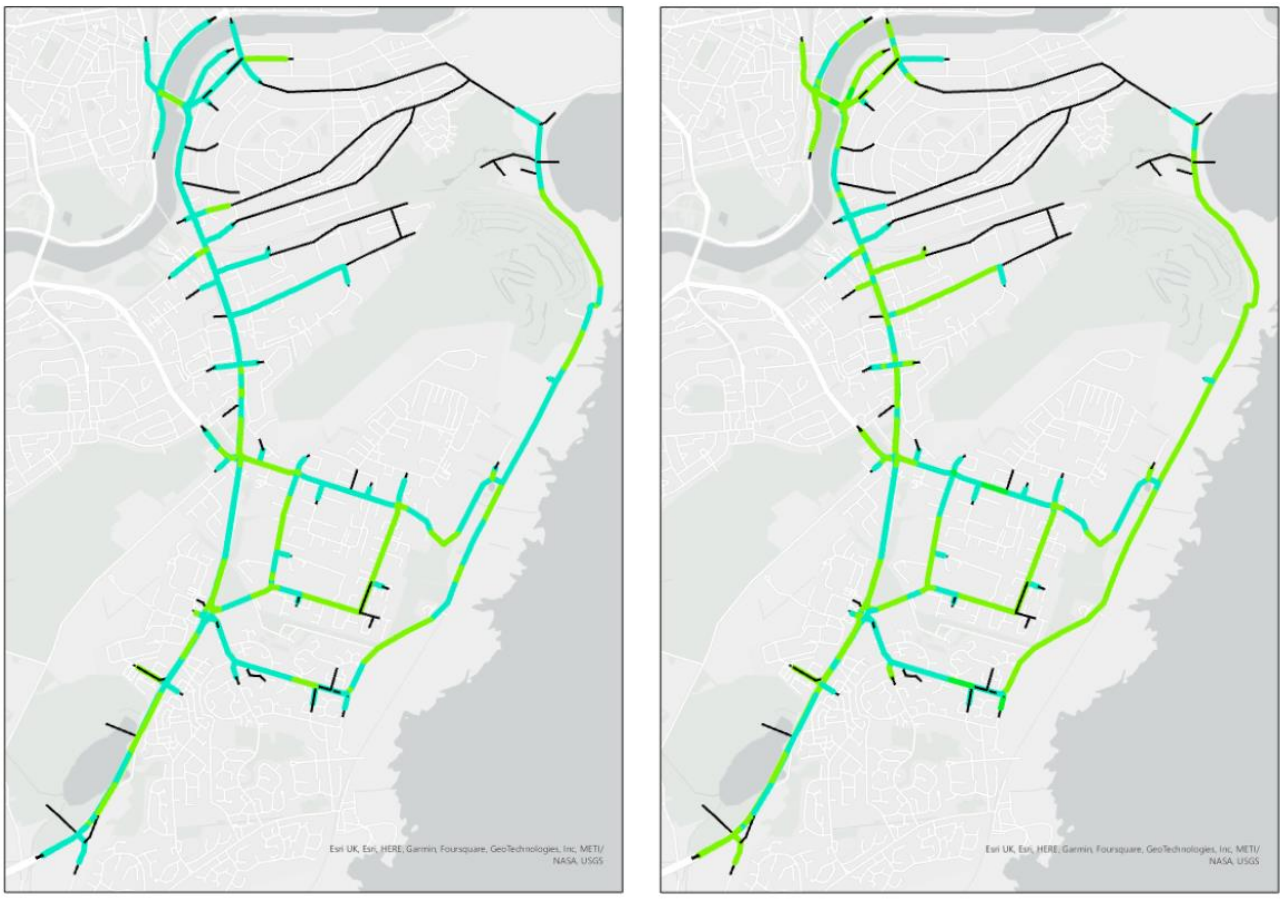


Figure A.3e – Option E; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.26. **Option F:** As Option B.

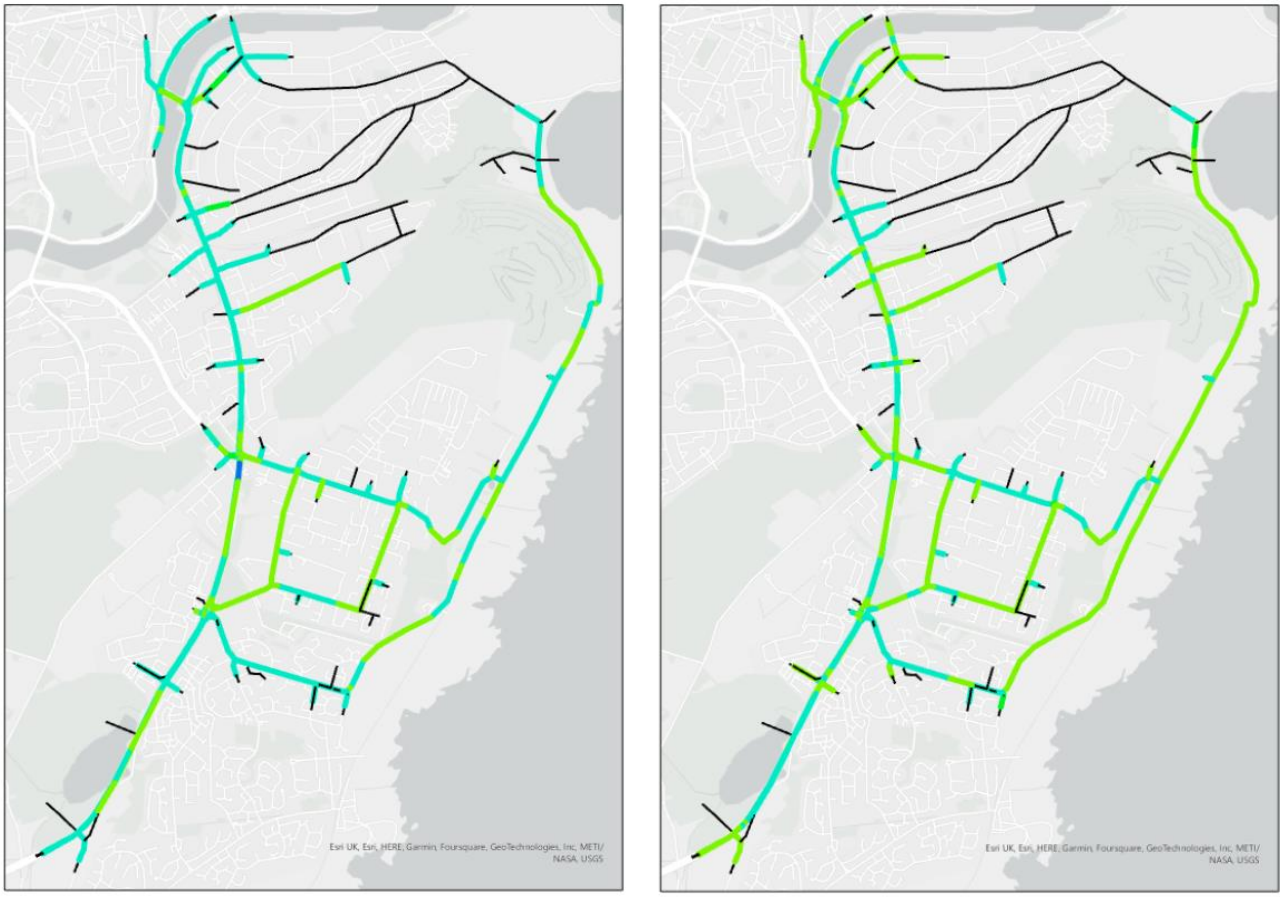


Figure A.3f – Option F; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.27. **Option G:** As Option C.

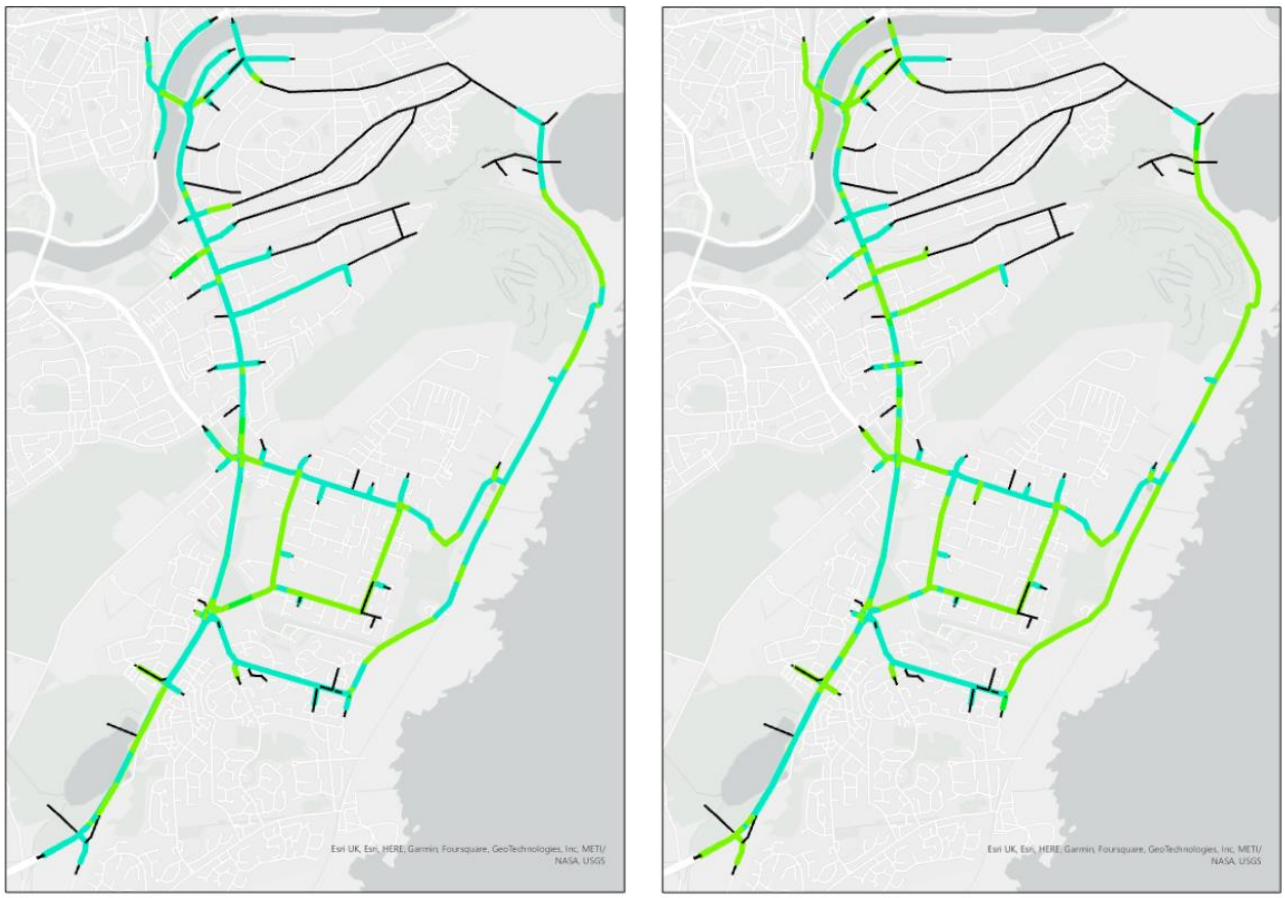


Figure A.3g – Option G; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.28. **Option H:** As Option D.

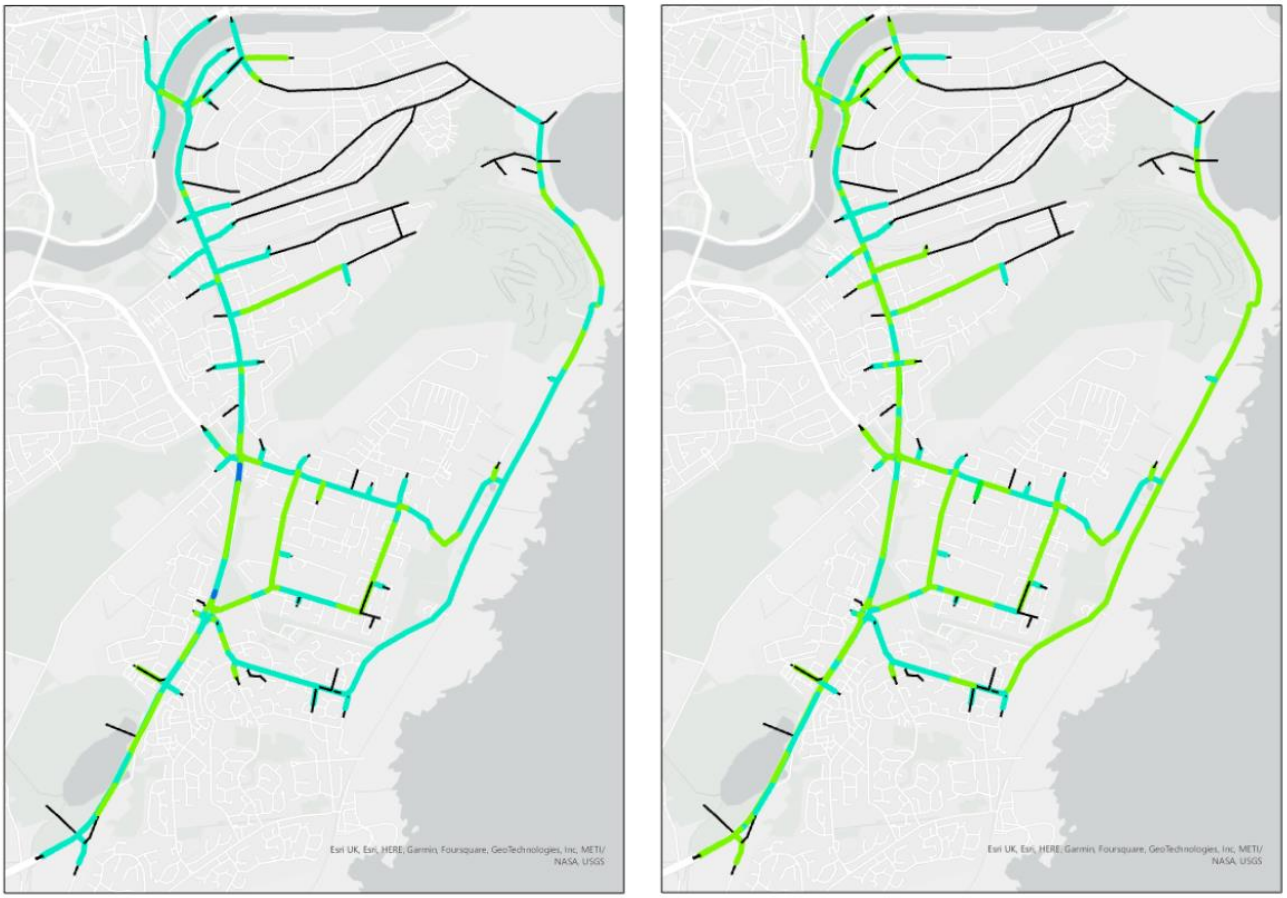


Figure A.3h – Option H; Short-term change magnitude (left), Long-term change magnitude (right)

Hybrid Options I - K

A.3.29. Options I to K have been proposed as 'hybrid' options, combining the additional bus lane of Option D (reduced in scope to Wellington Road south of Souterhead Roundabout only) with the lane reassignment of Options A to C respectively between Souterhead and Hareness Roundabouts.

A.3.30. As with Option D above, Options I, J and K incorporate a change in alignment of the northbound carriageway (creation of an additional lane and widening of the road) which has the potential for localised changes in noise level, the magnitude of which is not identified in this initial appraisal.

A.3.31. **Option I:** Negligible changes in noise level are anticipated in the short-term and long-term for the majority of road links with valid flows. However, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The proposed change in alignment of the northbound carriageway (creation of an additional lane and widening of the road) has the potential for localised changes in noise level, the magnitude of this change is not identified in this initial appraisal.

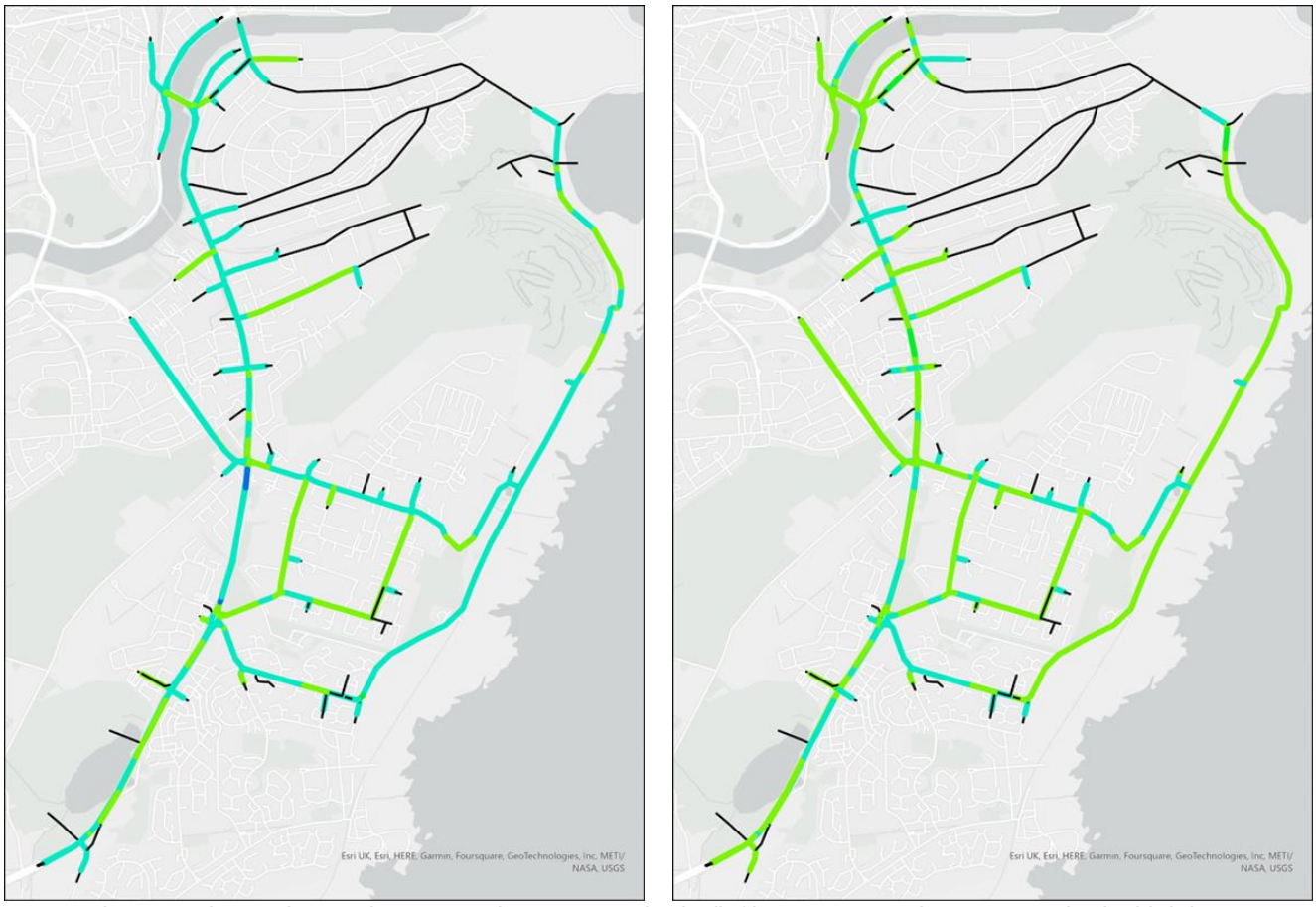


Figure A.3i – Option I; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.32. **Option J:** Negligible changes in noise level are anticipated in the short-term and long-term for the majority of road links with valid flows. However, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The proposed change in alignment of the northbound carriageway, and reclassification of the north-bound lane as bus lane may result in a shift of the source line with the potential for localised changes in noise level, the magnitude of this change is not identified in this initial appraisal.

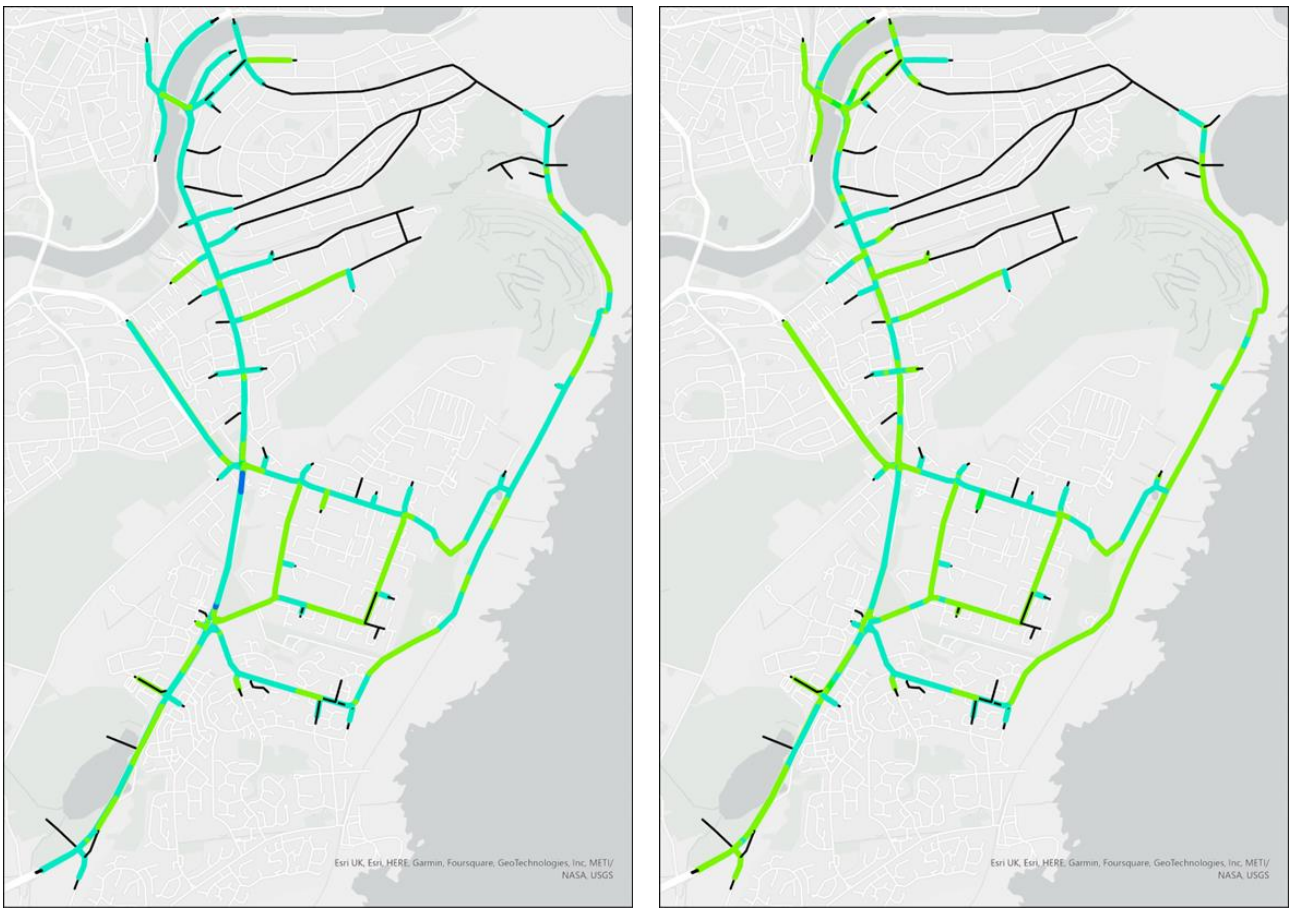


Figure A.3j – Option J; Short-term change magnitude (left), Long-term change magnitude (right)

A.3.33. **Option K:** Negligible changes in noise level are anticipated in the short-term and long-term for the majority of road links with valid flows. However, some localised changes greater than negligible appear to occur around areas where the traffic data indicates a change in link speed between the scenarios. The proposed change in alignment of the northbound carriageway, and reclassification of the north-bound lane as bus & HGV lane may result in a shift of the source line with the potential for localised changes in noise level (as with Option J), the magnitude of this change is not identified in this initial appraisal.

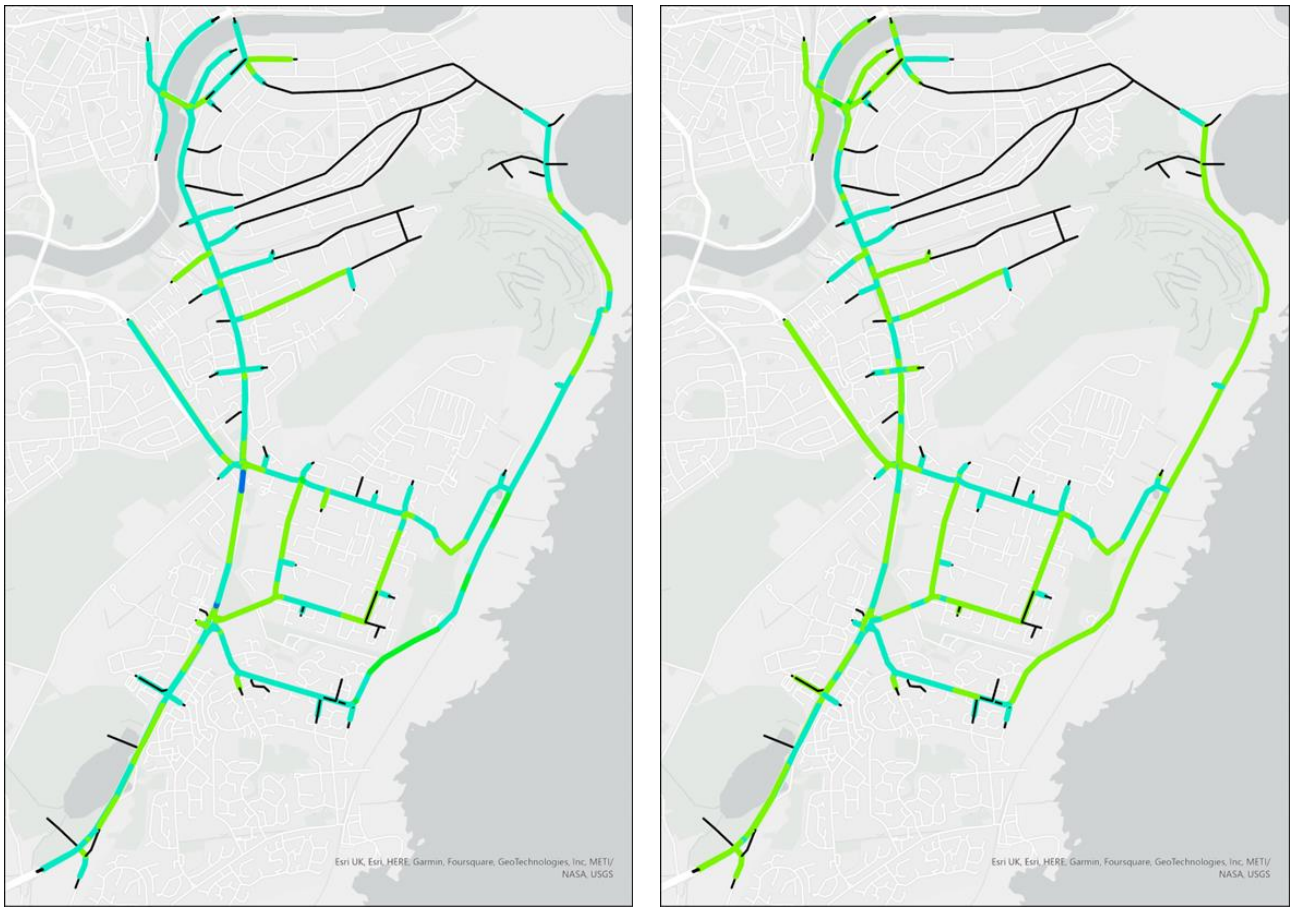


Figure A.3k – Option K; Short-term change magnitude (left), Long-term change magnitude (right)

Summary and Next Steps

A.3.34. A high-level assessment of predicted changes in road traffic noise was undertaken for the options using the basic noise level calculation methodology presented in CRTN and the threshold assessment criteria defined in DMRB LA 111. The predicted changes in road noise level due to the various scheme options have been evaluated along with a qualitative commentary on the impacts of proposed changes to the road alignments and compositions for each option.

A.3.35. As a result of this assessment, it is anticipated that Options A and E are not likely to result in any noise changes greater than negligible. Options B, C, F and G are also predicted to result in predominantly negligible changes to road traffic noise levels. The proposed changes to the composition of Wellington Road may result in additional noise changes although these changes are anticipated to be small. Options D and H, and the hybrid options I, J and K, involve the widening of the carriageway adjacent to nearby noise sensitive receptors and so further detailed assessment would be required to ensure that any impacts at the noise sensitive receptors are understood.

A.3.36. Should Options A or E be selected as the preferred option to progress to further project stages, it is expected that a detailed noise assessment could be scoped out. In order to fully understand and evaluate the potential impacts from the remaining options, and to identify the requirement for any mitigation, further assessment would be required at DMRB Stage 3.

A.4. Cultural Heritage

Introduction

A.4.1. This section provides an overview of the heritage assets within a 1km study area of the scheme boundary and a high-level appraisal to inform the impact assessment on these heritage assets resulting from the shortlisted options.

A.4.2. Heritage assets in the context of this scheme include:

- listed buildings;
- scheduled monuments;
- gardens and designed landscapes (GDL); and
- conservation areas.

A.4.3. Impacts on the cultural heritage resource can either be direct (e.g. complete or partial permanent loss due to the footprint of a scheme) or indirect (e.g. impacts on peoples' views, amenity and/or enjoyment of the asset due to visual or other disturbances, thereby affecting its 'setting').

Approach and Methods

A.4.4. A desk-based assessment was undertaken based on the guidance provided by DMRB Volume 11 Section 3 Part 2 (HA 208/07). In addition to HA208/07 guidance, other policy documents and published guidelines taken into account in the preparation of this chapter included:

- Scottish Historic Environment Policy (Historic Scotland, 2011);
- Planning Advice Note 2/2011: Planning and Archaeology (Scottish Government 2011) (hereafter referred to as PAN 2/2011);
- Managing Change in the Historic Environment: Setting (Historic Environment Scotland, 2016a); and
- Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2014).

Assumptions and Limitations

A.4.5. No assumptions or limitations were noted for the high level options appraisal at this stage.

Baseline

A.4.6. Heritage assets within the study area include (refer to Figure D5.1: Environmental Constraints):

- Listed buildings – the closest listed building to the proposals is Category B listed Nigg Parish Church, located off Nigg Kirk Road, north of the junction of Wellington Road and West Tullos Road. The church is approximately 70m west of the existing carriageway, although the grounds and graveyard are closer. There are other Category B and C listed buildings at the edge of the 1km study area in Cove to the southeast and further afield in Torry residential area and Duthie Park (other side of the River Dee) to the north.
- Scheduled monuments – there are a handful of scheduled monuments within and surrounding Loirston Country Park and Tullos Wood to the northeast, but none within 200m of the scheme boundary. The closest is Cat Cairn (SM4125) which is located approximately 450m from the scheme boundary at its closest point.
- Conservation areas – there are no conservation areas within close proximity to the proposals; the closest being located in Cove to the southeast, approximately 1km from the scheme boundary.
- Beyond the River Dee, Aberdeen City contains a number of listed buildings and conservation areas, as well as Duthie Park which is a designated GDL, all located at least 1km from the scheme boundary.

Appraisal

A.4.7. There would be no direct impacts and predicted to be minimal impacts on the setting of Category B listed Nigg Parish Church as there are no northbound carriageway works in the vicinity.

A.4.8. All works on the northbound carriageway are limited to south of Hareness Roundabout, as well as active travel provision off the southbound carriageway. There is potential for some adverse noise and visual impacts on the setting of the church during construction, however this would be temporary and not significant considering the existing road traffic using Wellington Road.

A.4.9. No impacts are predicted on any other heritage assets due to the distance of the options. With heritage, there is the potential for previously unrecorded archaeological assets to be present within the study area. However due to the existing developed nature of the road infrastructure and relatively small scale of the options, this is considered to be low risk and negligible impact for all options.

A.4.10. There are considered to be negligible impacts, either directly or on the setting, of heritage assets for all Options A to K.

Summary and Next Steps

A.4.11. Overall, there are considered to be no significant effects or differentiating factors between any of the options, either directly or on the setting, of the nearest heritage assets (Category B listed Nigg Parish Church).

A.4.12. There is the potential for previously unrecorded archaeological assets to be present within the study area. However, due to the previously developed nature of the road infrastructure and relatively small scale of the options, this is considered to be low risk and negligible impact for all Options A to K.

A.5. Biodiversity and Habitats

Introduction

A.5.1. This section provides an assessment of the potential impacts upon ecological features, which could arise from the shortlisted options, and reports upon the potential adverse or beneficial effects on ecology within the scheme boundary and surrounding area.

Approach and Methods

A.5.2. A qualitative ecological assessment was undertaken based upon the following documents:

- DMRB LA 108 Biodiversity[27]

[27] Design Manual for Roads and Bridges LA 108 Biodiversity. 2020. (Online) Available: file:///C:/Users/gbliwa/Downloads/LA%20108%20revision%201%20Biodiversity-web%20(3).pdf [Accessed 30/08/2023]

- DMRB LA 104 Environmental assessment and monitoring[28]
- DMRB LD 118 Biodiversity design[29]
- The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment for the UK and Ireland (2019)[30]

A.5.3. A Preliminary Ecological Appraisal (PEA) including a Phase 1 habitat survey was carried out in May 2023 following standard guidance[31]. The survey included the area within the scheme boundary and its immediate surroundings. A Phase 1 habitat survey is a standardised method of recording and mapping characteristic vegetation and habitat types in accordance with JNCC guidelines[32]. Phase 1 habitat types were recorded along with an indication of the plant species present, together with the structure, condition, and extent of the habitat. The survey was extended to include an ecological constraints survey of the scheme, whereby the locations of any evidence of, or habitats with potential for, protected or notable species were noted (see Figure D5.4: Extended Phase 1 Habitat Map Sheets A-D, Appendix D).

A.5.4. All structures and trees within 30m of the scheme were assessed for their bat roosting potential as per the current Bat Conservation Trust (BCT) guidelines[33]. Signs of badger (*Meles meles*), including setts (defined by law as "any structure or place which displays signs indicating current use by badger"), badger paths, latrines/dung and hair were searched for within 100m of the scheme following standard guidance[34]. As no watercourses were present within the site, surveys for the signs for otter (*Lutra lutra*) and water vole (*Arvicola amphibius*) were not undertaken. Evidence of, and suitability for, other protected species and Invasive Non-Native Species (INNS) were assessed within 30m of the scheme.

Assumptions and Limitations

A.5.5. This qualitative appraisal was carried out using ecological records obtained from the Preliminary Ecological Appraisal Report (PEAR) and a desk study including purchase of data from the North-East Scotland Biological Records Centre

[28] Design Manual for Roads and Bridges LA 104 Environmental assessment and monitoring, 2020. (Online) Available: https://standardsforhighways.co.uk/tses/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true [Accessed 30/08/203]
[29] Design Manual for Roads and Bridges LD 118 Biodiversity design,2020. (Online) Available file:///C:/Users/gbliwa/Downloads/LD%20118%20Biodiversity%20design-web%20(2).pdf [Accessed 30/08/2023]
[30] The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment for the UK and Ireland, 2019. (Online) Available: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf [Accessed 30/08/2023]
[31] Chartered Institute of Ecology and Environmental Management (CIEEM) (2017) Guidelines for Preliminary Ecological Appraisal (2nd Edition), Winchester
[32] JNCC (2010) Handbook for Phase 1 Habitat Survey – a Technique for Environmental Audit. Joint Nature Conservation Committee, Peterborough
[33] Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd ed., London: The Bat Conservation Trust
[34] Harris, S., Creswell, P. and Jefferies, D. (1989) Surveying Badgers, *Mammal Society*

(NESBReC) and designated site information from NatureScot Sitelink[35]. The qualitative appraisal undertaken was considered appropriate for the scale of the proposals at this stage. Should the options and/or the scheme boundary change, an assessment would be made regarding the need for further ecological surveys.

A.5.6. Options E-H have an additional area along Langdykes Road which would be impacted, which was not included in the PEA survey boundary and may require a minor survey update. However, potential impacts to ecology in this area are considered unlikely based on the existing habitat type (amenity grassland).

Baseline

Statutory Designated Sites

A.5.7. Five statutory designated sites are located within 5km of the scheme boundary. These are described in Table A.8 and are shown on Figure D5.1 (Environmental Constraints) and Figure D5.5 (Designates Sites and Protected Woodland) in Appendix D. As Nigg Bay SSSI is designated for geological interest only, it has not been considered further in this assessment.

Table A.8 - **Statutory designated sites within 5km of the Scheme Boundary**

Site Name	Distance and direction from scheme (at closest extent)	Description/Reason for designation
River Dee Special Area of Conservation (SAC)	0.8km northwest	The site has been designated as it supports populations of the following Annex II species: • Freshwater pearl mussel (*Margaritifera margaritifera*) • Atlantic salmon (*Salmo salar*) • Otter (*Lutra lutra*)
Cove SSSI	1.4km southeast	The site supports a colony of the rare plant Dickie's bladder-fern (*Cystopteris dickieana*).
Nigg Bay SSSI	2km northeast	The site is designated for its geological interest only.
Ythan Estuary, Sands of Forvie and Meikle Loch Special Protection Area (SPA)	2.8km northeast	The site qualifies under Article 4.1 as it supports internationally important populations of Sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sterna albifrons*). The site further qualifies under Article 4.2 as it supports internationally important populations of the migratory species pink-footed goose (*Anser brachyrhynchus*) and regularly supports an excess of 20,000 individual waterfowl.
Findon Moor SSSI	3.6km south	The site comprises a mosaic of habitats from rocky shore to heathland. The coastal heathland is one of the largest areas remaining in South Aberdeenshire.

[35] NatureScot (2021) SiteLink. Available online: https://sitelink.nature.scot/home

Non-Statutory Designated Sites

A.5.8. Six non-statutory designated sites are located within 2km of the scheme. These are described in Table A.9 and are shown on Figure D5.1 (Environment Constraints) in Appendix D.

Table A.9 - Non-statutory designated sites within 2km of the site

Site Name	Distance and direction from site	Description/Reason for designation
Kincorth Hill Local Nature Conservation Site (LNCS)	<0.1km west	The site comprises scrub, woodland, neutral grassland and dry heath habitats.
Tullos Hill LNCS	0.2km east	The site comprises a mosaic of broadleaved woodland, neutral grassland, scrub, bracken, acid grassland and dry heath.
Loirston Loch LNCS	0.2km southwest	The site comprises a mosaic of open water, reed beds and marshy grassland which is important for overwintering wildfowl.
River Dee Corridor LNCS	0.6km northwest	The river supports a diverse range of fauna and flora.
Balnagask to Cove LNCS	1.1km east	The site comprises a mosaic of herb rich grasslands, wet flushes, coastal heathland, rocky cliffs and rock pools. The site supports populations of nesting seabirds.
Deeside Old Railway LNCS	1.4km northwest	A valuable green corridor comprising of grassland, tall ruderal, small pockets of woodland, scattered trees and shrubs.

Ancient Woodland and Native Woodland Survey of Scotland (NWSS) Sites

A.5.9. There are four parcels listed on the Ancient Woodland Inventory (AWI), Long-Established (of plantation origin) found within 2km of the scheme. The closest is located approximately 0.2km east within Tullos Hill LNCS. The next closest is approximately 1.8km west. All are shown on Figure D5.5.

A.5.10. There are eight parcels of Native Woodland Survey of Scotland (NWSS) within 2km on the scheme, the closest of which is approximately 250m east.

Habitats

A.5.11. The results of the Phase 1 habitat survey undertaken during the PEA are presented below and detailed on Figure D5.3 (Extended Phase 1 Habitat Map Overview) and Figure D5.4 (Extended Phase 1 Habitat Map Sheets A-D) (Appendix D). For detailed descriptions of each habitat type, please refer to the PEAR[36] (Appendix C).

[36] Sweco (2023). Wellington Road Junction Improvements, Wellington Road PEAR. 65209389-SWE-LE-00-T-J-00001

A.5.12. The following Phase 1 habitat types are present on site:

- Broadleaved woodland – plantation (A1.1.2)
- Coniferous woodland- plantation (A1.2.2)
- Mixed woodland – semi-natural (A1.3.1)
- Mixed woodland – plantation (A1.3.2)
- Scrub – scattered (A2.2)
- Broadleaved parkland/scattered trees (A3.1)
- Poor semi-improved grassland (B6)
- Other tall herb and fern – ruderal (C3.1)
- Cultivated/disturbed land – amenity grassland (J1.2)
- Cultivated/disturbed land – ephemeral/short perennial (J1.3)
- Introduced scrub (J1.4)
- Intact hedge – species poor (J2.1.2)
- Dry ditch (J2.6)
- Bare ground (J4)

Protected Species and Species Groups

A.5.13. For more detailed species lists regarding protected species and species groups, please refer to the PEAR (Appendix C).

Flora and Fungi

A.5.14. NESBReC returned one record of wild pansy (*Ascophyllum nodosum*) approximately 850m from the scheme. Wild pansy is listed on the Scottish Biodiversity List (SBL) and UK Biodiversity Action Plan (UKBAP).

A.5.15. NESBReC returned four species listed on the North-East Scotland Local Biodiversity Action Plan (NE LBAP)[37]: water-plantain (*Alisma plantago-aquatica*), greater spearwort (*Ranunculus lingua*), bluebell (*Hyacinthoides non-scripta*) and field scabious (*Knautia arvensis*). The closest of these records, water-plantain, was located approximately 270m west of the scheme.

A.5.16. No notable plant species were recorded during the PEA.

[37] "North East Scotland Biodiversity Partnership," 2017. [Online]. Available: https://www.nesbiodiversity.org.uk/the-north-east-scotland-biodiversity-partnership/public-document-archive/. [Accessed 23 August 2023].

Invertebrates

A.5.17. NESBReC returned nine records of notable invertebrate species within 2km of the scheme. All species are listed on the SBL and/or UKBAP. No notable invertebrate species were recorded during the PEA and habitats present on site are thought to be suitable for supporting common species only.

Reptiles

A.5.18. There were no records of reptiles returned within 2km of the scheme.

A.5.19. No reptiles were recorded during the survey. The habitats on site do not provide good opportunities for foraging, basking or hibernating and therefore are considered unsuitable for reptiles. Furthermore, there is a lack of connectivity to any potentially suitable habitats. It is considered unlikely that reptiles would be present on site and are not considered further in this assessment.

Amphibians

A.5.20. One record of common toad (*Bufo bufo*) was returned from NESBReC, located 1.6km to the southeast of the scheme boundary. Common toad is listed on both the SBL and UKBAP.

A.5.21. Habitats on site do not provide suitable breeding habitat for common amphibians and are not considered further in this assessment.

Birds

A.5.22. NESBReC returned 76 notable bird species recorded within 2km of the scheme (Appendix C). These include bird species listed on Schedule 1 part 1 and 2 of the Wildlife and Countryside Act (WCA1i & WCA1ii), Priority Species (SBL and UKBAP) and those with a conservation status currently listed as red[38] (BRed) or amber[39] (BAmb) by the 5th review of Birds of Conservation Concern (BoCC)[40].

A.5.23. The habitats across the scheme and immediately adjacent provide suitable breeding habitat for a large variety of bird species. Specifically, the woodland, scrub, hedgerows and buildings.

[38] Red is the highest conservation priority with species requiring urgent action and includes globally threatened species and species that have experienced a sever historical decline. A summary of relevant factors can be accessed via the RSPB website: https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/uk-conservation-status-explained/

[39] Amber is the next most critical group after red and includes species which have suffered a moderate decline. A summary of relevant factors can be accessed via the RSPB website: https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/uk-conservation-status-explained/

[40] A. Stanbury, M. Eaton, N. Aebischer, D. Balmer, A. Brown, A. Douse, P. Lindley, N. McCulloch, D. Noble and I. Win, "Birds of Conservation Concern 5: the population status of birds in the UK, Channel Islands and Isle of Man British Birds," vol. 108, pp. 708-746.

Bats

A.5.24. Eleven records of bats were recorded within 2km from the scheme boundary including common pipistrelle (*Pipistrellus pipistrellus*), Nathusius's pipistrelle (*Pipistrellus nathusii*) and Daubenton's bat (*Myotis daubentonii*). The two closest records were located 0.7km to the southwest of the scheme boundary.

A.5.25. The existing Wellington Road is fully illuminated at night making it suboptimal for bats. However, the woodland area to the east of the scheme is unlit and offers good foraging and commuting habitat.

A.5.26. A preliminary roost assessment was undertaken on nine buildings and one tree within 30m of the scheme boundary. Eight of the buildings were assessed as having low potential and one as having moderate potential to support roosting bats. These are shown on Figure D5.4 (Extended Phase 1 Habitat Map Sheets A-D) and labelled B1-B9. Detailed descriptions of each, including bat roost potential (BRP) can be viewed in Appendix D.

A.5.27. One mature sycamore tree (T1) with a knothole on the southern side, approximately 2.5m high was assessed as having low potential to support roosting bats, shown on Figure D5.4.

Otter and Water Vole

A.5.28. There were 18 records of otter returned from within 2km of the scheme, located primarily along the River Dee and Aberdeen Bay with the closest record located approximately 1.4km to the southwest of the scheme.

A.5.29. There were no records of water vole returned within 2km of the site.

A.5.30. Due to the lack of hydrological connectivity to the scheme from the River Dee and Aberdeen Bay, and habitats on site not providing suitable habitat for otter and water vole, they are not considered further in this assessment.

Badger

A.5.31. Three records of badger within 2km of the scheme were returned from the data search. The closest record is approximately 0.3km west of the site.

A.5.32. During the survey two latrines were recorded, providing evidence of badger using the woodland area to the east of Wellington Road. Additionally, mammal tracks were evident throughout the woodland, primarily along the fence line away from Wellington Road, which also had an evident push-through to the other side.

A.5.33. The woodland area is suitable for sett creation, but none were found during the survey.

Pine Marten and Red Squirrel

A.5.34. There were five records returned for pine marten and one for red squirrel within 2km of the scheme boundary, the closest record was approximately 0.3km west of the site within Kincorth Hill LNCS.

A.5.35. Woodland habitats on site are suitable for both species, however connectivity is limited by the existing road network and urban areas. Connectivity to Kincorth Hill LNCS, which had previous records of pine marten, is limited by the existing road infrastructure. There was no evidence recorded during the survey.

Invasive Non-Native Plant Species

A.5.36. Six invasive non-native plant species (INNS) were returned from the data search within 2km of the scheme, including Japanese knotweed (*Fallopia japonica*), giant hogweed (*Heracleum mantegazzianum*), Himalayan balsam (*Impatiens glandulifera*), Himalayan knotweed (*Persicaria wallichii*), American skunk-cabbage (*Lysichiton americanus*) and white butterbur (*Petasites albus*), all of which are considered to be among the most damaging INNS of plants in Scotland.

A.5.37. During the survey all recorded INNS were within areas of ornamental planting along the Wellington Road corridor. The species recorded included: rhododendron (*Rhododendron ponticum L*.), spotted-laurel (*Aucuba japonica*), Thunberg's barberry (*Berberis thunbergia*), butterfly-bush (*Buddleja davidii*), snowberry (*Symphoricarpos albus*) and cotoneaster (*Cotoneaster sp*.). None of the species noted during the data search were recorded on site. The locations are shown on Figure D5.4 (Extended Phase 1 Habitat Map Sheets A-D).

Appraisal

A.5.38. The eleven options (A-K) have been reviewed with respect to potential impacts on statutory sites, habitats, and protected and notable species. The potential impacts are described below.

Designated Sites

A.5.39. No statutory designated sites are expected to be directly impacted by any of the options. Potential impacts are considered unlikely due to the lack of hydrological and terrestrial connectivity to any of the sites, however, impacts from pollution

cannot be ruled out. Furthermore, consultation with NatureScot[41] confirmed that a Habitats Regulations Appraisal (HRA) would not be required for this project.

A.5.40. Non-statutory sites are also considered unlikely to be impacted by the options. Kincorth Hill and Tullos Hill LNCS are both within 200m of the scheme boundary, but connectivity is limited by the existing road network and urban areas. The next closest site, Loirston Loch LNCS, is designated for overwintering waterfowl, but due to the existing likely disturbance from the heavy traffic on Wellington Road it is not considered likely to be directly impacted by the options over 200m away. Potential pollution impacts on the sites from the options cannot be entirely ruled out and have been considered below.

Ancient Woodland and Native Woodland Survey of Scotland (NWSS) Sites

A.5.41. No parcels of AWI and/or NWSS would be impacted by any of the options and are therefore not considered a constraint.

Habitats

A.5.42. All options have minor loss of habitats including amenity grassland, poor semi-improved grassland, scrub, mixed plantation woodland, broadleaved parkland/scattered trees, tall ruderal and hedgerows on the northbound side of Wellington Road.

A.5.43. Options E-H have an additional minor loss of amenity grassland and plantation woodland at Souterhead roundabout, between the Souterhead Road and Wellington Road exits. These options also include a section of amenity grassland habitat loss along Langdykes Road.

A.5.44. Options D and H have additional habitat loss on the southbound side of Wellington Road to the north of the Souterhead Roundabout, which would see the loss primarily of amenity grassland, plantation coniferous and semi-natural mixed woodland.

A.5.45. Options D-H all impact additional woodland areas, with the most impact required for options D and H. At future project stages, further assessments on tree clearance impact may be required. The Scottish Government has a strong presumption against removal of woodland in Scotland in line with NPF4.

[41] P. Thompson, *Naturescot. Email Subject: Aberdeen South Harbour Link Road,* 2023.

Protected Species and Species Groups

Birds

A.5.46. The scheme and surrounding area are suitable for a variety of nesting birds in buildings, hedgerows, tall ruderal, grassland, woodland and scrub. All options would have an impact on these habitats, as discussed above.

A.5.47. Options which include additional woodland loss would have the greatest impact on nesting birds. These include options E-H with additional minor loss of woodland at Souterhead roundabout, and options D and H with additional loss of woodland on the southbound side of Wellington Road.

Bats

A.5.48. The retaining wall in all options, located off the northbound carriageway to the south of Hareness Roundabout, has the potential to impact two buildings (B3 and B7) assessed as having potential to support roosting bats, which may require further surveys.

A.5.49. The woodland impacted by options A-C and I-K was assessed as being unsuitable for roosting bats.

A.5.50. Options D-H all impact on woodland that may have the potential to support roosting bats, requiring additional surveys and associated mitigation. Options D and H would impact on a larger area of woodland; including an area containing more mature trees with increased potential to support roosting bats.

A.5.51. Options D and H also have the potential to impact an additional building (B8), off the southbound carriageway south of Hareness Roundabout, which has been assessed as having low potential to support roosting bats (Figure D5.4: Extended Phase 1 Habitat Map Sheets A-D) and may require additional surveys.

Badger

A.5.52. Evidence of badger was recorded in the woodland on the southbound side of Wellington Road, however, no setts were found. Within the survey boundary this area is considered the only habitat suitable for badger sett creation, although the nearby LNCSs also offer good habitat for this species.

A.5.53. Options A-C and I-K are anticipated to have the least potential to impact badger as no works are anticipated in habitats suitable for badger.

A.5.54. Options D-H all include additional woodland loss within an area with recorded badger signs, therefore, these options could have potential impacts on badger

with additional surveys and associated mitigation required. Options D and H are considered the most likely to have an impact on badger due to the proximity of works to recorded badger signs and the increased amount of woodland habitat loss.

Pine Marten and Red Squirrel

A.5.55. No evidence of either species was recorded during the survey and connectivity to Kincorth Hill LNCS, which had previous recordings of pine marten, is limited by the existing road infrastructure.

A.5.56. Options D-H all impact on woodland that has limited potential to support pine marten and red squirrel, potentially requiring additional surveys and associated mitigation. Options D and H would impact on a larger area of woodland, including an area of semi-natural woodland with increased potential to support populations of these species.

Invasive Non-Native Plant Species

A.5.57. All options involve impacting areas which have recorded INNS. However, the species recorded on site during the PEA are not considered to be of the most damaging in Scotland[42].

Summary and Next Steps

A.5.58. It is considered that options A-C would have the least adverse impact on biodiversity of all the shortlisted options, primarily due to having a lower level of habitat loss. Options I-K are considered to have an almost identical impact but include a very small increase in the loss of amenity grassland habitat off the northbound carriageway south of Souterhead Roundabout, compared to options A-C.

A.5.59. Options E-H have additional loss of woodland at Souterhead roundabout and include a small area on Langdykes Road. Options D and H would lose additional woodland habitat on the southbound side of Wellington Road. Options D-H could therefore have additional impacts to biodiversity, with options D and H being the most likely to do so.

A.5.60. The following ecological features need to be considered and, where appropriate, potential impacts mitigated for:

[42] NatureScot, “Invasive non-native plants,” 17 May 2023. [Online]. Available: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/invasive-non-native-species/invasive-non-native-plants. [Accessed 23 August 2023].

- designated sites;
- woodland;
- birds;
- bats;
- badger;
- pine marten and red squirrel; and
- invasive non-native species.

A.5.61. It is considered **best practice** that appropriate precautions be taken, documented, and implemented through a Pollution Prevention Plan (PPP) to safeguard habitats from being detrimentally impacted during the pre-construction (e.g., ground investigation works), construction and operation phases of the scheme. Best practice and guidance will be considered in the preparation of the PPP and will include SEPA's Guidance for Pollution Prevention (GPPs[43]). These measures include but are not limited to appropriate storage of fuels/oils, treatment of arisings and silt/pollution control and protection.

A.5.62. It is **recommended** that vegetation clearance and tree felling across the site is kept to a minimum. The Scottish Government's Policy on Control of Woodland Removal[44] provides guidance on whether removal of woodland is likely to be permitted. There is a strong presumption against removal of woodland in Scotland. If design proposals include felling of woodland, then consultation with the planning department within Aberdeen City Council is recommended to establish whether the proposed extent of removal would be acceptable and the requirements for compensatory planting and mitigation.

A.5.63. It is a **mandatory requirement** that nesting birds (or their nests or eggs), including ground and bank nesting birds and waterfowl, would not be killed or injured or their active nests destroyed as a result of activities on site.

A.5.64. It is **recommended** that clearance of vegetation that is suitable for nesting birds is undertaken outside the core nesting bird season (March to August inclusive) and if the works programme cannot be amended to facilitate this, that a pre-works check for nesting birds be undertaken by a suitably qualified ecologist one week

[43] NetRegs, "Guidance for Pollution prevention (GPPs) - Full List," [Online]. Available: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list. [Accessed April 2023].
[44] Scottish Forestry, "Woodland Removal," 2019. [Online]. Available: https://forestry.gov.scot/support-regulations/control-of-woodland-removal. [Accessed April 2023].

and then no more than 48 hours prior to works. If active nests were found, there would be no other option but to delay works in this immediate area until chicks have fledged which could be a period of up to ten weeks.

A.5.65. It is **recommended** that all buildings assessed as having the potential to support roosting bats, and likely to be impacted by the preferred option, require further surveys to determine presence/absence of bats. Buildings categorised as having low potential would require one dusk emergence or pre-dawn re-entry survey and the building categorised as having moderate potential would require two surveys. These must be undertaken between May and August in line with Bat Conservation Trust best practice guidance[45].

A.5.66. The tree (T1) assessed as having low potential will not be impacted by any of the options and will not require any further surveys. If any of the options D-H are taken forward, then it is **recommended** that a detailed assessment of all trees to be lost is undertaken to determine suitability to support roosting bats.

A.5.67. The majority of Wellington Road is currently lit by streetlamps. It is **recommended** that any currently unlit areas, particularly the woodland on the southbound side of Wellington Road, should not be illuminated during construction or operation of the scheme as this provides optimal foraging and commuting habitat for bats. If the lighting within the site is to be considerably altered, it is further recommended that a sensitive lighting plan is to be produced which would cover the construction and operation of the development to minimise disturbance to bats and would be reviewed by a suitably qualified ecologist[46] [47].

A.5.68. If any of the options D-H are taken forward, it is **recommended** that a detailed badger survey is undertaken, ideally during winter months, to identify any setts in the woodland on the southbound side of Wellington Road, up to 100m from the scheme boundary. Furthermore, as detailed above for bats, it is **recommended** that the woodland areas remain unlit during construction and operation to avoid causing disturbance to commuting badger.

A.5.69. If any of the options D-H are taken forward, then additional surveys and mitigation may be required for pine marten and red squirrel.

[45] J. Collins, Ed., Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd ed., London: The Bat Conservation Trust., 2016.

[46] Institution of Lighting Professionals, "Guidance Notes for the Reduction of Obtrusive Light GN01," 2011. [Online]. Available: https://www.theilp.org.uk/documents/obtrusive-light/ [Accessed 2023].

[47] Institute of Lighting Professionals and the Bat Conservation Trust, "Guidance Note 08/18 Bats and Artificial Lighting in the UK," Institute of Lighting Professionals and the Bat Conservation Trust, 2018.

A.5.70. No INNS species considered the most damaging in Scotland were recorded on site[48]. However, it is **recommended** that if any INNS recorded during the survey is to be removed it is done so in a responsible manner and any waste is stored so as not to facilitate further spread of INNS. The details of any INNS removal and storage should be detailed in a Construction Environmental Management Plan (CEMP).

A.5.71. The activities involved in the management and disposal of INNS are subject to regulatory control. It is a **mandatory requirement** to demonstrate that reasonable steps to avoid unlawful spread of INNS have been taken and ensure compliance with Scottish Government's Code of Practice[49].

A.5.72. At DMRB Stage 3, further discussions will be held with ACC planners, and other relevant organisations if required, to review opportunities to promote biodiversity enhancements, in line with Policy 3 of NPF4. This may include a review of the types of habitats and species that ACC want to encourage within the scheme boundary, and taking cognisance of aims and targets in the North-East Scotland Local Biodiversity Action Plan (NE LBAP).

A.6. Landscape and Visual Amenity

Introduction

A.6.1. This section provides an assessment of the likely impacts upon the landscape and visual amenity which could arise from the options and reports upon the potential adverse or beneficial effects in terms of the following:

- The likely general effect of the options on local landscape character and the ability of the landscape to accommodate the change.
- Likely visual effects on key receptors such as people in residential areas, at recognised viewpoints, and using key transport routes.

Approach and Methods

A.6.2. This assessment has been carried out in accordance with the following methodology:

[48] NatureScot, "Invasive non-native plants," 17 May 2023. [Online]. Available: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/invasive-non-native-species/invasive-non-native-plants [Accessed 18 May 2023].
[49] The Scottish Government, "Code of Practice on Non-Native Species," 2012

- Design Manual for Roads and Bridges (DMRB) LA 107 – Landscape and Visual Effects[50].
- Section 7.4.7 (Landscape) and Section 7.4.8 (Visual Amenity), Section 7 (Environment), Transport Scotland STAG Technical Database, April 2015[51].
- DfT TAG Unit A3 – Environmental Impact Appraisal[52].

A.6.3. For clarity, the landscape is considered a resource inclusive of townscape (as stated in DMRB).

Assumptions and Limitations

A.6.4. There have been no known material deviations from the published guidance for appraising the impacts on landscape and visual amenity provided in the DMRB LA 107.

A.6.5. Potential impacts on landscape and visual amenity during construction will be assessed at DMRB Stage 3 when more design information is available. Based on the scale and nature of the options, construction is not considered to be a differentiating factor in this comparative assessment and has therefore been scoped out at this stage.

A.6.6. Landscape mitigation has been considered; however, it has not influenced the overall assessment score at this stage. At DMRB Stage 3, landscape and visual mitigation will be developed as part of the ongoing design process.

A.6.7. The landscape and visual assessment has been undertaken in year 1 (assumed Scheme opening year, 2026) and year 15 (Scheme design year, 2041).

Baseline

Landscape Designations

A.6.8. There are no protected national or local landscape designations covering the section of Wellington Road under consideration.

[50] Design Manual for Roads and Bridges (DMRB) (2020) LA 107 – Landscape and Visual Effects. Available online: https://www.standardsforhighways.co.uk/dmrb/search/bc8a371f-2443-4761-af5d-f37d632c5734

[51] Transport Scotland (2015) Scottish Transport Analysis Guide (Scot-TAG) – Section 7 (Environment). Available online: https://www.transport.gov.scot/our-approach/industry-guidance/scottish-transport-analysis-guide-scot-tag/#42948

[52] Department for Transport (2022) TAG Unit A3 – Environmental Impact Appraisal, Transport Analysis Guidance. Available online: https://www.gov.uk/guidance/transport-analysis-guidance-tag

A.6.9. The following designations, which are relevant to landscape and visual amenity, are present within a 2km radius of the section of Wellington Road under consideration (the study area) - see Figure D5.1: Environmental Constraints, Figure D5.2: Aberdeen Local Development Plan (LDP) Constraints, and Figure D5.6: National Coastal and Landscape Character, in Appendix D:

- The Inventory-listed Duthie Park Garden & Designed Landscape (GDL), which is located northwest, approximately 1km from the Scheme boundary at its closest extent.
- Loirston Country Park which lies approximately 200m east at its closest extent.
- Kincorth Hill Local Nature Reserve (LNR) and Loirston Loch LNR, which are approximately 100m west and 300m southwest, respectively. Other LNRs include The River Dee Corridor and Deeside Old Railway which lie approximately 600m and 1.5km northwest respectively, and the Tullos Hill and Balnagask to Cove LNRs, which lie approximately 200m and 1km east, respectively.
- Core Path (CP) 81 intersects Wellington Road north of the Souterhead Roundabout, whilst CP 103 intersects with Wellington Road near the Hareness Roundabout and Loirston Country Park.
- National Cycle Route (NCR) 1 crosses the study area from north to south, passing approximately 700m east of Wellington Road at its closest point. NCR 195 connects with NCR 1 at Duthie Park over 1km northwest. Both routes extend beyond the extents of the study area, providing localised access and forming part of the wider recreational network.

Planning Policy

A.6.10. Plans and policies relevant to landscape and visual amenity are summarised below. Refer to Section 5.5 of the main report for information on plans and policies relevant to the general environment.

Aberdeen Local Development Plan (LDP), 2023

Policy NE1 Green Belt

A.6.11. The proposal does not directly impact Green Belt land. Designated areas in the immediate landscape setting of the section of Wellington Road under consideration (up to 2km) largely cover the coastline; and more inland areas centred on Loirston Country Park and Kincorth Hill, which lie to the northeast and west respectively (see Figure D5.2, Appendix D):

- *"Development in areas defined as Green Belt on the Proposals Map will not be supported. Exceptions to this general presumption will only be supported where the proposal:*

  a) is directly associated with and required for agriculture, woodland or forestry; or

  b) is for leisure or recreational uses compatible with an agricultural or natural setting; or

  c) is for the extraction of minerals that meets an established need, if no other suitable site is available, or quarry restoration; or

  d) is associated with existing activities in the Green Belt and is within the boundary of that activity, is small-scale, does not significantly increase the intensity of the activity and the proposed built construction is subordinate to what already exists (including extensions to existing dwellings); or

  e) is directly associated with essential infrastructure such as telecommunications, electricity grid connections, transport proposals identified in the Plan or roads planned through masterplanning of sites, if they cannot be accommodated anywhere other than the Green Belt; or

  f) is related to the generation of renewable energy (wind turbine, solar farm, or hydro scheme) and/or heat; or

  g) is for a dwelling house to replace a dwelling house. This will be on a 'one for one' basis for development of a similar scale within the same footprint or existing curtilage of the site. This may be applicable to vacant properties in poor condition. All applications will be considered on a case by case basis; or

  h) is for the appropriate change of use of a building with a historic or architectural interest that makes a worthwhile contribution to the landscape character of the Green Belt; or

  i) is for a conversion/ rehabilitation scheme of a historic building. If extending, the original building will remain visually dominant to the new extension, the design and siting of the extension will be sympathetic in terms of massing, detailing and materials, and it will relate well to the original building."

Policy NE2 Green and Blue Infrastructure

A.6.12. The Green Space Network and Urban Green Spaces covered by this policy largely follow the pattern of Green Belt land described above (see Figure D5.2, Appendix D):

- Green Space Network

  "Development proposals will seek to protect, support and enhance the Green Space Network (identified on the Proposals Map). This broadly

encompasses the wildlife, biodiversity, ecosystem services & functions, access, recreation, landscape and townscape value of the Green Space Network. Development that does not achieve this will not be supported.

Coherence of the Green Space Network should also be maintained when considering any development and infrastructure proposals. Where infrastructure projects or certain developments necessitate crossing the Green Space Network, they should maintain and enhance the coherence and quality of the network. In doing so, appropriate provision should be made for access across roads for wildlife and outdoor recreation.

Masterplans will determine the location, extent and configuration of the Green Space Network within the area, and its connectivity with the wider network."

- Urban Green Space

  "We will protect, support and enhance the city's Urban Green Space (parks, playing fields, sports pitches, outdoor sport facilities, woods, food-growing spaces, or all other areas including smaller spaces not identified on the Proposals Map such as amenity space or garden ground). Development proposals that do not achieve this will not be supported.

  Exceptions may be made when a suitable alternative and equally convenient and accessible area for public space is provided by the applicant for Urban Green Space purposes, for example through the replacement of school buildings, within the locality of the site. Where proposals would affect an outdoor sports facility, development may also be acceptable where it would be ancillary to and/or not affect its current and potential principal use for sport and training; or a clear excess of provision is demonstrated. In all cases, development will only be acceptable if it meets criteria set out in the Aberdeen Planning Guidance: Open Space and Green Infrastructure."

- Open Space in New Development

  "We will require the provision of biodiverse, usable and appropriate open space in new developments to ensure functionality. Please see Aberdeen Planning Guidance: Open Space and Green Infrastructure for information on how to calculate open space requirements, as well as different types of provision (including food-growing) and the expected accessibility and quality standards.

  We will seek open space provision in all developments, including on brownfield sites. It may not be possible to increase the amount of open space on some brownfield sites, for example where existing buildings on the site are being retained. In these cases, appropriate design solutions to deliver on-site amenity will be sought in the first instance and commuted sums towards off-site provision or enhancement of existing open spaces will be sought where appropriate.

In areas where the Open Space Audit has shown that there is opportunity for improvement of existing open space, contributions may be sought to enhance existing provision instead of new provision being required. The Open Space Audit and Strategy provides details of any improvements or enhancements that may be required to open spaces in different areas of the city, and how the linkages between them may be improved. Further guidance is included in Aberdeen Planning Guidance: Open Space and Green Infrastructure."

- Outdoor Access and Core Paths

  "New development will maintain and enhance the integrity of existing access rights to; land and water, Core Paths, other paths and rights of way, or safeguard potential access opportunities to these. This includes any impacts on access during the construction, operation, decommissioning and reclamation phases of development.

  In exceptional circumstances routes may be affected by development. In these cases it will be necessary to maintain their condition, enhance their amenity value, or provide an alternative path or access (which links the same locations) that is safe, high quality and convenient for the public to use.

  Development proposals should include new or improved provision for public access, permeability, and links to the core path network and green spaces for recreation and active travel within their design. We may seek Developer Obligations for Core Paths where appropriate."

Policy NE5 – Trees and Woodlands

- *"Development should not result in the loss of, or damage to, trees and woodlands.*
- *Development proposals will seek to increase tree and woodland cover and achieve the long-term retention of existing trees and woodlands that the planning authority consider worthy of retention. Particular emphasis is placed on the protection and ongoing management of Ancient Woodlands. Where tree removal takes place or is necessary for good arboricultural reasons, replacement planting will be required to ensure an overall net gain in tree cover. Development that does not achieve this will not be supported.*
- *Buildings and infrastructure should be sited to allow adequate space for a tree's natural development, taking into account the predicted mature height, canopy spread and future rooting environment.*
- *Where applicable, root protection areas should be established, and protective barriers erected prior to any work commencing."*

Policy D2 – Amenity

- "In order to ensure provision of amenity the following principles will be applied.
- Development will be designed to:

  make the most of any opportunities offered by the site to optimise views and sunlight through appropriate siting, layout and orientation;

  ensure that occupiers are afforded adequate levels of amenity in relation to daylight, sunlight, noise, air quality and immediate outlook;

  ensure that occupiers are afforded adequate levels of amenity in relation to daylight, sunlight, noise, air quality and immediate outlook;

  have a public face to the street to ensure natural surveillance, and active street frontages;

  ensure that refuse and recycling facilities, cycle storage, low and zero carbon technology, plant and services are sensitively integrated into the design;

  ensure that external lighting minimises light spillage into adjoining areas and the sky."

Policy D4 – Landscape

- *"Landscape / seascape / townscape character and existing elements which provide, or contribute to, a distinct 'sense of place' will not be adversely affected by development. Development will provide opportunities for conserving or enhancing existing landscape / seascape / townscape elements (natural and built), including linear and boundary features or other components which contribute to character and 'sense of place'.*
- *Development should avoid adversely affecting the character of landscapes and seascapes which are important for the setting of the city, including the coast, river valleys and hill landscapes.*
- *Important views of the city's townscape, landmarks and features (including the coast, river valleys, and hills) when seen from busy or important publicly accessible vantage points such as roads, railways, recreation areas, and path networks and particularly from the main city approaches (gateways) will not be adversely affected by development. Where development is permitted on gateways routes it will be expected to enhance the gateway route frontage.*
- *Development should avoid disturbance to, or loss or damage to important recreation, wildlife or natural resources (such as woodland, rivers, coast) or to the physical and functional links between them.*
- *Green spaces between and around places or communities, and those which can provide opportunities for countryside activities, will not be eroded by development."*

Policy D5 – Landscape Design

- *"Development proposals will be designed with an effective, functional and attractive landscape framework supported by clear design objectives. The level of detail required will be appropriate to the scale of development.*
- *Landscape design will:*

  be integrated early into the layout and design of the site, informing the spatial arrangement of both built and natural elements;

  ensure a sense of place is maintained and enhanced through an assessment of the site and its surrounding landscape/seascape/townscape character; and sympathetically incorporate existing key characteristics and features that contribute to landscape/seascape/townscape character;

  mitigate any negative landscape and visual impacts;

  ensure physical connectivity to adjoining and nearby green spaces, buildings and features;

  maximise adaptation and resilience of the built and natural environment to the effects of climate change, and mitigate the impacts of climate change;

  protect and enhance biodiversity by designing the spatial arrangement of new and existing habitats to maximise connectivity between habitats within and around the site, including the design of SuDS, and through the careful use of informed habitat creation and planting design techniques;

  impact positively on health and wellbeing; ensure active travel routes and areas of recreational / open space are designed to be well connected, inclusive and safe; and help to mitigate air, light and noise pollution.

  be designed for low maintenance where feasible and appropriate to the design objectives."

Landscape Character

Landscape Character Assessment

A.6.13. According to the NatureScot (formally Scottish Natural Heritage, SNH) National Landscape Character Assessment[53], the section of Wellington Road under consideration falls within the Urban Landscape Character Type (LCT). The

[53] NatureScot (2019) Scottish Landscape Character Types Map and Descriptions. Available online: https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

Aberdeen Landscape Study: Landscape Character Assessment[54] also identifies the carriageway as being located in an Urban LCT.

A.6.14. Whilst neither guidance document lists the key characteristics of the Urban LCT, urban landscapes generally share a widely recognised suite of shared characteristics that include built features such as established and recently constructed settlements and residential areas; industrial estates; business parks; retail parks; transport corridors; as well as interspersing pockets of open space, woodland, and street and garden planting. The landscape sensitivity of the LCT is considered to be medium owing to its aesthetic/perceptual and cultural/social attributes but its inherent ability to accommodate change.

Coastal Character Assessment

A.6.15. The coastal characterisation of Scotland by NatureScot has identified 13 National Coastal Character Types[55] at a very broad scale.

A.6.16. As shown on Figure D5.6, the coastline of the study area is characterised as a mix of Type 2: Rocky Coastline/Open Sea Views and Type 3: Deposition Coastline, Open views. There are no published descriptions of these coastal character types.

A.6.17. A more detailed level of characterisation of the Aberdeen coastline has been undertaken in The Aberdeen Landscape Study: Coastal Character Assessment[56], with the Types divided into Coastal Character Areas (CCA). The coastline of the study area is characterised as a mix of CCA 3: Aberdeen Harbour, CCA 4: Girdle Ness, CCA 5: Bay of Nigg, and CCA 6: Souter Head, with the guidance providing a thorough account for each.

Visual Amenity

A.6.18. Views along the section of Wellington Road under consideration are currently largely enclosed by a combination of industrial units, settlement, residential areas, and woodland. The presence of enclosed built form and tree cover limits the opportunity to view the full extents of the section of Wellington Road under consideration from the immediate surrounds, with partial or filtered views most

[54] Aberdeen City Council (2021) The Aberdeen Landscape Study. Landscape Character Assessment. Available online: https://www.aberdeencity.gov.uk/sites/default/files/2023-03/Landscape%20Character%20Assessment%20Final%202021.pdf

[55] NatureScot (16 August 2023) Coastal Character Assessment. Available online: https://www.nature.scot/professional-advice/landscape/coastal-character-assessment

[56] Aberdeen City Council (2021) The Aberdeen Landscape Study. Coastal Character Assessment. Available online: https://www.aberdeencity.gov.uk/sites/default/files/2023-03/CoastalCharacterAssessmentFinal2021.pdf

common, including from the elevated summits of the nearby Kincorth Hill and Tullos Hill.

A.6.19. The assessment of visual amenity has considered:

- Residents: residents living in the recently constructed Charleston residential development; the established Redmoss Park, Redmoss Avenue, and Redmoss Terrace; and the limited number in roadside properties. Residents are considered to be of high sensitivity to the type of development proposed.
- Recreational users: visitors to local attractions such as Kincorth Hill, Tullos Hill, and Loirston Country Park. Recreational users are considered to be of high sensitivity to the type of development proposed.
- Footway/cycleway users: users of CP 81, CP 103, and NCR 1, who are considered to be of moderate sensitivity to the type of development proposed.
- Road users: users of Wellington Road, Hareness Road, and the local road network who are considered to be of low sensitivity to the type of development proposed.
- Users of Employment Sites: users of Altens Industrial Estate, West Tullos Industrial Estate, and East Tullos Industrial Estate, who are considered to be of low sensitivity to the type of development proposed.

A.6.20. Figure D5.2 (Aberdeen LDP Constraints) illustrates the location of many of the visual receptors identified above.

Appraisal

A.6.21. The aspects of the proposal which are likely to have permanent effects on the landscape and visual amenity in the site boundary and the immediate surrounds are as follows:

- Potential loss of trees, hedgerows, areas of grassland and areas of scrub/woodland which contribute to the existing street scene and improve the visual experience by 'softening' and filtering views of adjacent built form.

A.6.22. Compensatory tree and hedgerow planting would help to mitigate the loss of vegetation required to accommodate the built footprint of the proposal; however, due to the spatial requirement and general urban setting of the proposals there is limited scope for replacement woodland planting. At DMRB Stage 3, further discussions will be held with ACC planners, and other relevant organisations if required, to review opportunities to promote landscape and biodiversity enhancements, where appropriate, in line with Policy 3 of NPF4.

Impacts on Landscape

A.6.23. No landscape designations would be adversely affected as a result of any of the shortlisted improvement options.

A.6.24. The Urban LCT would be slightly affected by Options A, B, C, E, F, G, I, J, and K due to the realignment and widening of Wellington Road necessitating tree line and hedgerow vegetation removal along the section of the road under consideration. As a result of a minor magnitude of effect, there would likely be direct, permanent, slight adverse landscape impacts on the Urban LCT in both Year 1 (2026 assumed scheme opening year) and Year 15 (2041 design year). Options D and H include additional earthworks in the semi-natural woodland which would result in further tree loss adjacent to the carriageway. Subsequently, Options D and H would result in a moderate magnitude of effect leading to direct, permanent, moderate adverse landscape impacts on the Urban LCT in both Year 1 and Year 15.

Impacts on Visual Amenity

A.6.25. Residents: residents living in the recently constructed Charleston residential development; the established Redmoss Park, Redmoss Avenue, and Redmoss Terrace; and the limited number of roadside properties located along the section of Wellington Road under consideration, have the potential to experience open views of the proposals in close proximity depending upon building orientation and the level of intervening vegetation removal/compensatory planting between their property and the carriageway. As the road realignment/widening associated with each improvement option would be viewed in the context of the existing road corridor, the magnitude of visual effect is considered to be minor for each of the proposals which would result in direct, long-term, and permanent slight adverse impacts on visual amenity in both Year 1 and Year 15.

A.6.26. Recreational users: due to the distance from the site boundary and the visual screening influence provided by intervening landform, settlement, industrial units, and tree cover, the proposals would be barely noticeable from nearby visitor attractions. Owing to proximity, the attractions providing the greatest opportunity to experience open views of the proposals would be the Kincorth and Tullos hills. From unwooded areas near the hill summits, the proposals would be experienced in panoramic views in the context of a myriad of built features that feature in the Aberdeen cityscape. As a result, the associated magnitude of visual effect for each of the improvement options would be negligible, resulting in direct, long-term, and permanent slight adverse impacts on visual amenity in both Year 1 and Year 15.

A.6.27. Footway/cycleway users: views of the proposals would largely be screened for users of NCR 1. Users of CP 81 and CP 103 would experience open views at close proximity at the point each path intersects with Wellington Road, with any associated path diversions/closures the same for each option. Across the wider extents of each core path, views would largely be screened or filtered by intervening visual influences such as settlement, industrial units, and tree cover. As the proposals would be viewed in the context of the existing road corridor, the associated magnitude of visual effect for each of the improvement options would be minor, which results in direct, long-term, and permanent slight adverse impacts on visual amenity in both Year 1 and Year 15.

A.6.28. Road users: due to views of the proposals being transient and in the context of the existing corridor, the associated magnitude of visual effect for each of the improvement options would be negligible, which results in direct, long-term, and permanent neutral impacts on visual amenity in both Year 1 and Year 15.

A.6.29. Users of employment sites: there would be limited views of the proposals from within Altens Industrial Estate due to screening provided by surrounding industrial units and tree cover. Views would be similarly restricted from within the West Tullos Industrial Estate and the East Tullos Industrial Estate. Whilst there is prospect for open views of each of the proposals from the eastern extents of West Tullos Industrial Estate, and the western extents of East Tullos Industrial Estate, the proposals would be viewed in the context of the existing road corridor. As a result, the associated magnitude of visual effect for each of the improvement options would be negligible, which results in direct, long-term, and permanent neutral impacts on visual amenity in both Year 1 and Year 15.

Summary

A.6.30. In landscape terms, the section of Wellington Road under consideration routes through an urban environment in the coastal hinterland of the North Sea. In the immediate landscape setting of the transport corridor (up to approximately 2km from the Scheme boundary), there are numerous industrial influences, including the Aberdeen – Dundee railway line, Altens Industrial Estate, East and West Tullos industrial estates, the A92 road, and the existing Wellington Road. The area is further influenced by nearby settlement and the quarrying activities at Black Hills Quarry shown on Figure D5.2.

A.6.31. The proposals would be in character with the existing infrastructure and would largely follow the alignment of the existing carriageway. Each of the options would require land acquisition and result in the loss of vegetation to accommodate the route realignment and road widening, with Options D and H requiring additional

earthworks and tree loss. For Options A, B, C, E, F, G, I, J, and K, vegetation loss could be mitigated by an appropriate replacement planting design/strategy to be developed at future project stages; although, owing to the spatial requirement of the proposals, there would be limited scope to replace the woodland planting lost from Options D and H in close proximity to the proposals.

A.6.32. It is considered there would likely be a direct, long-term, individual, and permanent slight adverse impact on the landscape character of the Urban LCT in both Year 1 (opening year) and Year 15 (design year) from Options A, B, C, E, F, G, I, J, and K. Options D and H are likely to result in direct, permanent, moderate adverse landscape impacts in Year 1 and Year 15.

A.6.33. In terms of visual amenity, the route realignment and road widening would result in perceptible changes in views; although, the overall composition and focus of views of visual receptors would largely be unaltered. The incorporation of a segregated cycleway would result in a greater physical separation between the footway and carriageway, which may improve the overall visual experience for footway/cycleway users. The inclusion of mitigation planting would help soften the appearance of the proposals in the landscape, including for residents in nearby properties that look directly towards the carriageway.

A.6.34. At this stage of the project, there are considered to be no differentiating factors between Options A, B, C, E, F, G, I, J, and K in terms of landscape and visual amenity; however, Options D and H would result in the increased loss of established semi-mature tree cover.

A.6.35. Options A, B, C, E, F, G, I, J, and K are considered to result in direct, long-term, individual, and permanent slight adverse or neutral impacts on the visual amenity of the receptors considered in both Year 1 and Year 15.

A.6.36. Overall, when selecting from Options A, B, C, E, F, G, I, J, and K, it is considered that landscape character and visual amenity is unlikely to be a primary influential factor in the decision-making process. Options D and H result in slightly greater adverse impacts.

Next Steps

A.6.37. At future project stages (DMRB Stage 3 and beyond), the design proposals would be further developed and informed by recommendations for landscape mitigation. Further landscape and visual assessment work would be undertaken to assess potential impacts of the proposals in more detail based on the greater level of design information available.

A.6.38. Consultation should be undertaken with ACC, and NatureScot (if required), at DMRB Stage 3 in order to agree representative viewpoints to inform the visual assessment and the requirements and scope for a full Landscape and Visual Impact Assessment (LVIA). Opportunities to promote landscape and associated biodiversity enhancements will also be reviewed and incorporated into the design and mitigation strategy where appropriate, in line with NPF4.

A.7. Geology and Soils

Introduction

A.7.1. This section provides an assessment of the effects of the shortlisted options on the geology of the study area in accordance with DMRB LA 109 Geology and Soils[57].

A.7.2. In order to complete this assessment, a review of the baseline geological conditions across the study area has been undertaken followed by consideration of the potential impacts of the options on the underlying geology.

Approach and Methods

A.7.3. The existing Preliminary Sources Study Report (PSSR) produced by Sweco in June 2023[58] has been used to provide baseline information within the study area, specifically information relating to the existing ground conditions and statutory and non-statutory designations. The data provided within the PSSR has also been supplemented by the following sources of information:

- British Geological Survey (BGS) – survey information, geological maps, and historical borehole records[59]; and,
- NatureScot (formerly Scottish Natural Heritage) – Sites of Special Scientific Interest (SSSI) designations, Geological Conservation Review Sites, and Local Geodiversity Sites[60].

A.7.4. The significance of an impact on the geology of the study area has been determined based on the predicted deviation from baseline conditions and the

[57] LA 109 Geology and soils-web
[58] Sweco (2023) Preliminary Sources Study Report (PSSR) for the Wellington Road Junction Improvements (WRJI)
[59] British Geological Survey - Geoindex (onshore). Available online: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/
[60] NatureScot (2020) Protected Areas and Designated Sites. Available online: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas

scale of impact to geology assessed qualitatively, as per Tables 3.11 and 3.12 of DMRB LA 109.

Assumptions and Limitations

A.7.5. To date, no intrusive ground investigations in relation to the options have been undertaken within the study area.

A.7.6. The impacts to geology associated with the construction phase of the scheme has not been considered in this appraisal. This assessment relates to potential impacts posed by the operational phase of the options only.

Baseline

A.7.7. The baseline geological conditions within the study area have been determined from a review of published geological mapping obtained from the BGS and are summarised below. Further details are also provided in Section 4.5 (Geotechnics and Earthworks) of the main report.

Superficial Geology

A.7.8. The superficial geology underlying the study area is described in detail in Sections 4.5.2 to 4.5.5 of the main report.

Solid Geology

A.7.9. The solid geology underlying the study area comprises the Aberdeen Formation which is described in Sections 4.5.6 and 4.5.7 of the main report.

Designated Sites (Statutory and Non-Statutory)

A.7.10. A geological SSSI, Nigg Bay, is located approximately 2km northeast of the Scheme boundary. The SSSI is approximately 4.4 hectares (ha) in size and has been designated a SSSI due to its geological importance (Geological Conservation Review site). Nigg Bay is considered as a key reference site for the Quaternary stratigraphy in northeast Scotland. It illustrates several of the characteristic glacial deposits for the area, as well as demonstrating the complexity of deposits which may be produced by a single glacial episode.

Mining and Mineral Reserves

A.7.11. One BritPit (British Pit), identified as Loirston Sand Pit (inactive) is located within the study area but does not intersect Wellington Road itself. Sand and gravel is

noted as a potential resource within the local area as indicated by the presence of several BritPits within 1km of the boundary.

A.7.12. There are no known areas of coal, gypsum, tin, or clay mining within, or within the vicinity of the Scheme boundary.

Appraisal

Nigg Bay SSSI

A.7.13. The Nigg Bay SSSI is located outwith the study area and will not be affected by any of the options. Nigg Bay SSSI is therefore not considered further in this assessment.

Mineral Reserves

A.7.14. There is evidence that land within the study area has historically been used for the abstraction of sand and gravel. However, there are no known current or future (planned) abstractions within the study area, and based on the surrounding land use, it is unlikely any will be developed in future. As such, the sensitivity of the mineral reserves located within the study area is considered to be Low.

A.7.15. The options are therefore unlikely to have a negative impact on the potential for future abstraction(s). The impact on mineral reserves is considered to be of negligible magnitude and 'Neutral' significance for all options.

Summary and Next Steps

A.7.16. No adverse impacts to identified mineral reserves are considered to be likely from any of the options, and therefore the impact is considered to be of neutral significance for all options.

A.7.17. Additional information on the geology within the scheme study area will be obtained via intrusive ground investigation during future stages of the project.

A.8. Water Quality and Flood Defence

Introduction

A.8.1. This section comprises the following sub-topics:

- Water Quality: various attributes of watercourses and water bodies including water supply/quality, dilution and removal of waste products, recreation, value to the economy and biodiversity.

- Hydrology and Flood Risk: the flow of water on or near the land surface. Flooding has many sources including coastal, river (fluvial), surface water (pluvial), sewer and groundwater.

A.8.2. An overview of the baseline water environment within a 500m study area is of the scheme boundary is provided followed by a high-level appraisal.

Approach and Methods

A.8.3. A desk-based assessment has been undertaken in accordance with the principles of DMRB LA 113 (Road Drainage and the Water Environment).

A.8.4. SEPA's online flood maps were also reviewed, showing river, surface water, groundwater flood extents at https://map.sepa.org.uk/floodmap/map.htm

Assumptions and Limitations

A.8.5. No assumptions or limitations were noted for the high-level options appraisal at this stage.

Baseline

A.8.6. Two waterbodies are located in the study area; the River Dee at the northern extent and Loirston Loch in the south-west. Some culverted watercourses may also be present in the study area.

A.8.7. The area containing the scheme is within a groundwater potentially vulnerable area (PVA 02/06/25). However, SEPA's flood maps show no river or coastal flood risk to the scheme.

A.8.8. Surface water flooding is patchy and localised in the built-up areas on both sides of Wellington Road up to the 1 in 200-year flood event.

Appraisal

A.8.9. There is relatively more land-take associated with Options D and H, and to a lesser extent Options I, J and K, compared to the other options due to the additional northbound lane. This would result in a slight increase in impermeable area compared to the existing conditions and therefore a higher risk of surface runoff and flooding/ponding although this risk is considered to be minor. For all options it is anticipated that surface water drainage will be adequately dealt with through the drainage strategy to be developed for the scheme in future project stages. As mentioned above, there is no risk to any of the options from river or coastal flooding.

A.8.10. The drainage design/strategy will account for potential increases in surface water due to climate change and extreme weather events.

Summary and Next Steps

A.8.11. No adverse impacts on flood risk impacts are likely from any of the options, and therefore the impact is considered to be of Neutral significance for all options.

A.8.12. Additional information on the water environment within the scheme study area will be obtained during future stages of the project, and opportunities to improve the condition of the blue network, within the scope and context of the scheme, will be further discussed with ACC.

A.8.13. Surface water drainage will be dealt with through a drainage / SuDS strategy for the scheme, which should include an appropriate allowance for climate change to ensure scheme resilience (to be developed at DMRB Stage 3 in consultation with SEPA).

Appendix B.

WRJI Whole Life Carbon Appraisal Report (Sweco, 2023a)

Appendix C.

Preliminary Ecological Appraisal Report (Sweco, 2023b)

Appendix D.

Drawing Figures

FIGURE D2.1 – EXISTING WELLINGTON ROAD PLAN AND PROFILE SHEET 1 OF 4

FIGURE D2.2 – EXISTING WELLINGTON ROAD PLAN AND PROFILE SHEET 2 OF 4

FIGURE D2.3 – EXISTING WELLINGTON ROAD PLAN AND PROFILE SHEET 3 OF 4

FIGURE D2.4 – EXISTING WELLINGTON ROAD PLAN AND PROFILE SHEET 4 OF 4

FIGURE D2.5 – EXISTING CONDITIONS SHEET 1 OF 2

FIGURE D2.6 – EXISTING CONDITIONS SHEET 2 OF 2

FIGURE D2.7 – EXISTING BUS ROUTES SHEET 1 OF 2

FIGURE D2.8 – EXISTING BUS ROUTES SHEET 2 OF 2

FIGURE D2.9 – EXISTING UTILITIES LEGEND

FIGURE D2.10 – EXISTING UTILITIES PLAN

FIGURE D3.1 – NORTH OF HARENESS OPTION ASSESSMENT

FIGURE D3.2 – SEGREGATED TWO-WAY LINK DESIGN

FIGURE D3.3 – SEGREGATED WITH-FLOW DESIGN

FIGURE D3.4 – OPTION A PLAN

FIGURE D3.5 – OPTION B PLAN

FIGURE D3.6 – OPTION C PLAN

FIGURE D3.7 – OPTION D PLAN

FIGURE D3.8 – OPTION E PLAN

FIGURE D3.9 – OPTION F PLAN

Appendix E.

Paramics Heatmaps

Appendix F.

Paramics Journey Time Graphs