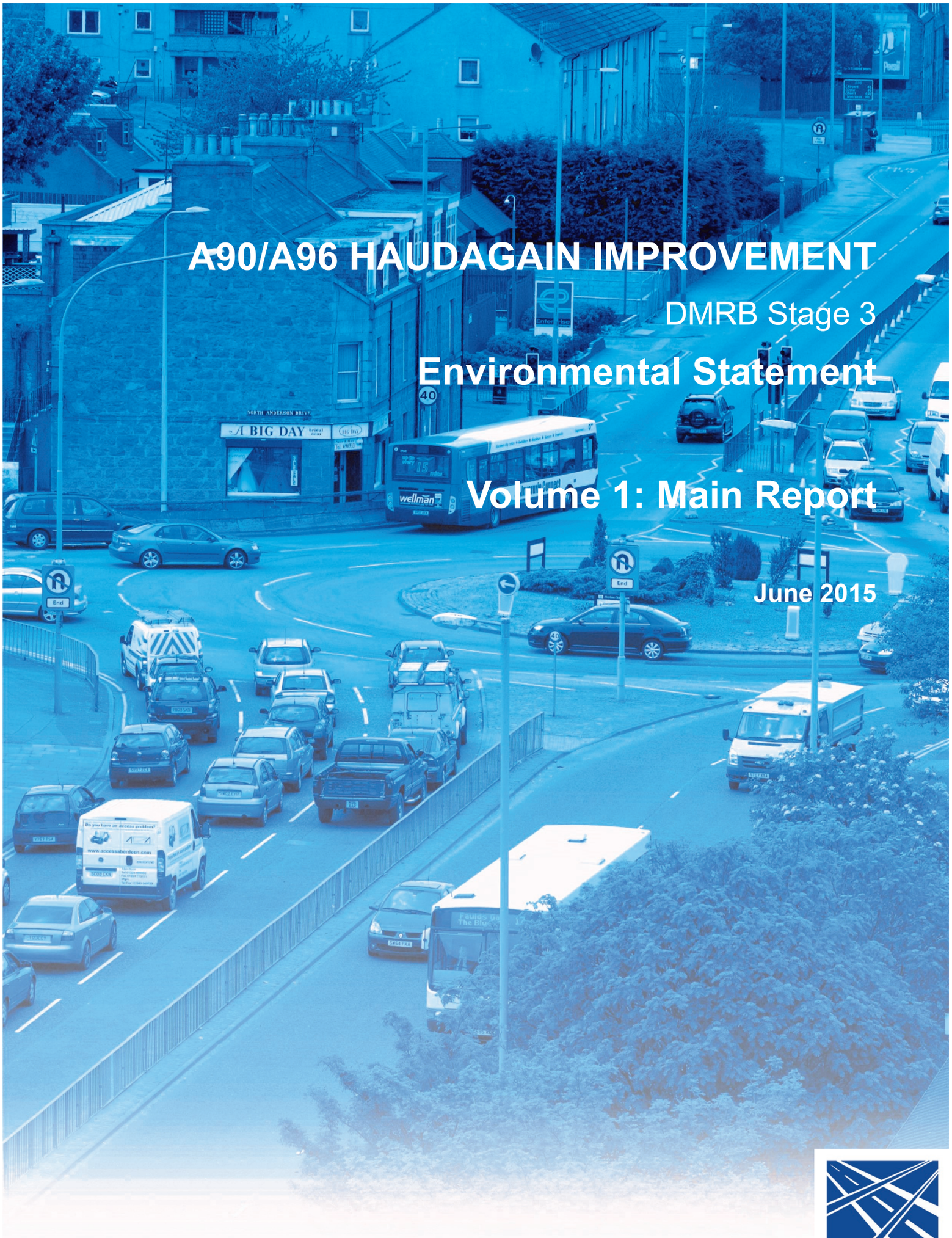

A90/A96 HAUDAGAIN IMPROVEMENT

DMRB Stage 3

Environmental Statement

Volume 1: Main Report

June 2015

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

Contents

Volume 1: Main Report

Appendices A4.1 to A17.2 are provided within Volume 2: Technical Appendices

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Non-Technical Summary

PREFACE

This document is the Non-Technical Summary (NTS) of the Environmental Statement (ES) for the A90/A96 Haudagain Improvement project. Copies of the ES and the draft Road Orders are available to view during normal office hours at the following location:

Transport Scotland
Major Transport Infrastructure Projects (MTRIPS)
Buchanan House
58 Port Dundas Street
Glasgow
G4 0HF

Telephone: 0141 272 7100

08.30 to 17.00 Monday to Thursday
08.30 to 16.30 Friday

The ES (including this NTS) and draft Road Orders may also be viewed online at

http://www.transportscotland.gov.uk/project/a90a96-haudagain-improvement.

A bound paper copy of the ES may be purchased at a cost of £215 or in DVD format at a cost of £10 by writing to Transport Scotland at the address on Page 1 of this NTS. Copies of this NTS are available free of charge from the same address.

Any person wishing to make representation to the ES should write to Transport Scotland at the address on Page 1 of this NTS. Formal representations are invited within six weeks of the advertised date of publication of the ES.

Proposed A90/A96 Haudagain Improvement

INTRODUCTION

Background

This document is the Non-Technical Summary (NTS) of the Environmental Statement (ES) for the A90/A96 Haudagain Improvement project. The project is being taken forward by Transport Scotland (TS), an agency of the Scottish Government.

The Haudagain Roundabout is located in the north-west of Aberdeen. The roundabout serves both the A90 and A96 Trunk Roads which enable access into and around Aberdeen from the north and north-west. The junction has significant queues, especially during peak periods, with delays on all approach arms.

The A90/A96 Haudagain Improvement project (referred to as 'the proposed scheme') includes approximately 500m of new dual carriageway link road, three new signal-controlled junctions to connect existing roads to the new link road, a detention basin to store and treat surface water run-off, new footpaths and shared footway/cycleways. The proposed scheme is illustrated on Figure 1.

It is anticipated that construction will start following completion of the Aberdeen Western Peripheral Route (AWPR) in late 2017 and be completed within 2 years.

Existing Haudagain Roundabout

Environmental Impact Assessment

An Environmental Impact Assessment (EIA) of the proposed scheme is required under European and UK legislation. The ES reports the findings of the EIA work carried out on the proposed scheme.

The purpose of EIA is to investigate the likely effect of the proposed scheme on the biological, physical and historical environment, as well as on members of the public and on current or planned future use of the environment. This NTS presents the key issues identified in the ES, including beneficial and adverse impacts considered to be of particular importance.

The EIA process provides a valuable opportunity to reduce potential environmental impacts through design refinement. The EIA process has included consultation, environmental surveys and technical assessments. The information gathered has informed decision-making throughout the design process, providing opportunity to address potentially significant impacts where practicable, for example by refinement of route alignment or by the incorporation of measures to avoid or reduce potential adverse impacts.

Need for the Scheme

The Haudagain Roundabout is currently operating over its capacity leading to congestion and unreliable journey times. This has caused significant queueing and delays to traffic on approach roads including the A96(T) Auchmill Road and A90(T) North Anderson Drive. The proposed scheme seeks to improve this situation.

The need for the scheme is reflected in local planning policy. The Aberdeen City Council (ACC) Strategic Infrastructure Plan (SIP) (2013) notes that the north of Aberdeen currently suffers from serious congestion problems and indicates that the situation will become worse as future development is implemented. Middlefield is identified in the SIP as a regeneration priority alongside the works associated with the Haudagain Improvement scheme.

The Scottish Government has committed to improvements to Haudagain Roundabout following completion of the AWPR.

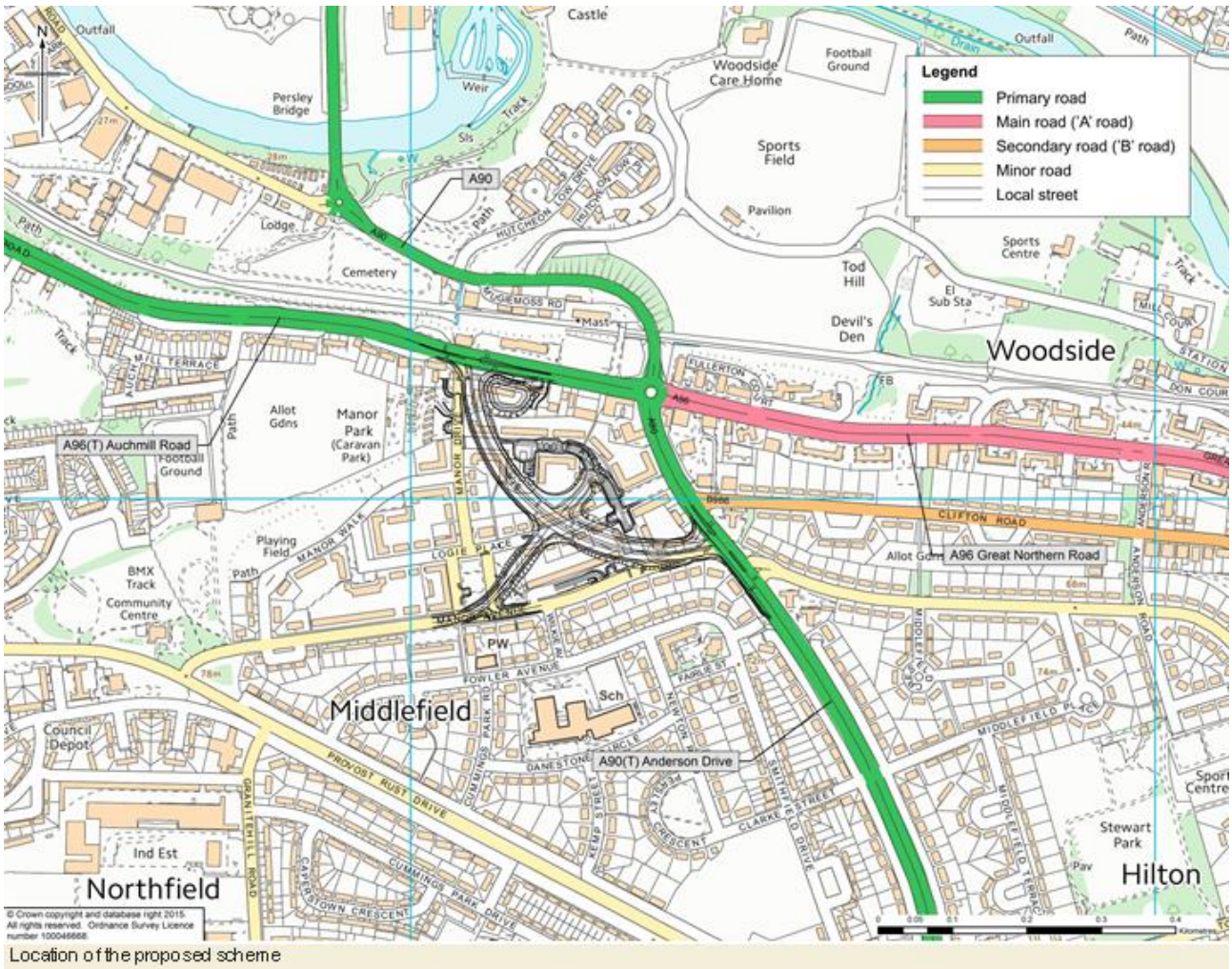
Scheme Objectives

The objectives developed for the proposed scheme are as follows:

- to reduce congestion and unreliability by improving and sustaining base year 2004 journey times for commercial and public transport traffic until 2033;
- measures must minimise the risk of transport related accidents especially for vulnerable users in the vicinity of the junction to improve on 2002 – 2006 casualty levels;
- to make socially-inclusive and healthy transport modes more attractive to use, including cycling, walking and public transport measures to be promoted in all measures;
- to minimise traffic induced severance on communities by ensuring measures do not have a significant detrimental impact on 2004 walk time accessibility; and
- to contribute to ACC's regeneration aims by complementing the development of the Logie/Manor area of Middlefield.

Alternatives Considered

As part of earlier work undertaken by ACC, 41 options were identified through consultation with stakeholders and the public. A further eight options were developed as part of further work undertaken. All 49 options were then assessed as part of a sifting process which considered operational performance, compliance with the scheme objectives, environmental impact, engineering complexity and cost. The following options were identified as satisfying all of the



Location of the proposed scheme

criteria and were therefore taken forward for a more detailed assessment:

- Option 4: signal-controlled crossroads;
- Option 5: new dual carriageway link road; and
- Option 13: signalised roundabout.

The detailed assessment for each option was undertaken in three parts: an engineering assessment, a traffic and economic assessment and an environmental assessment. Option 5 was selected as the preferred option based on both the outcomes of the assessment and performance against the scheme objectives. Option 5 was presented as the preferred option at public exhibitions held at the Lord Provost Henry E Rae Community Centre in Middlefield on the 24th and 25th April 2014.

The Proposed Scheme

The proposed scheme is shown on Figure 2 and consists of a new dual carriageway link road. Signal-controlled T-junctions are proposed at the western and eastern extents of the new dual carriageway link road where it connects to the A96 and A90 respectively. A signal-controlled crossroad is also proposed at the approximate midpoint of the new dual carriageway link road to provide local access to Logie Avenue to the north and to Manor Avenue to the south.

In addition, the following ACC side roads require reconfiguration as part of the proposed scheme:

- Manor Avenue to be realigned to tie-in to the new dual carriageway link road;
- Manor Drive to be stopped up at its northern extent;
- Logie Avenue to be realigned to tie-in to the new dual carriageway link road;
- Logie Place to be stopped up at its eastern extent;
- Logie Terrace to be stopped up at its southern extent; and
- Manor Terrace to be stopped up.

Other proposed features of the scheme include shared footway/cycleways, energy efficient street lighting and a detention basin which stores and treats drainage from the proposed roads.

Overview of the Environmental Impact Assessment Process

The EIA has been undertaken as an integral part of the design process, informing decisions on the proposals as they were developed. Environmental constraints and issues were identified and incorporated into the decision-making process throughout. Information gathered through the extensive surveys undertaken for the proposed scheme was used in the assessment.

The aims of the EIA are to:

- gather information about the environment, identify environmental constraints and opportunities which may influence, or be affected by the proposed scheme;
- identify and assess potential environmental impacts;
- identify and incorporate measures into the proposed scheme design and operation to avoid, reduce or offset adverse impacts, and where possible enhance beneficial impacts; and
- assess the residual impacts of the proposed scheme i.e. those impacts remaining after measures are implemented to avoid or reduce potential impacts.

The River Don, north of the proposed scheme

Impacts were assessed by comparing the existing situation (the baseline conditions) to the conditions that would occur with the proposed scheme in place.

Consultation and Scoping

As part of the design development and assessment process a comprehensive consultation exercise was carried out with approximately 30 groups of consultees including ACC, Middlefield Area Residents Action Group and the Scottish Environment Protection Agency. Public exhibitions were held in April 2014 as part of a programme of ongoing public engagement and consultation. These were attended by over 250 people.

The purpose of the consultation was to:

- ensure that statutory consultees, other bodies with a particular interest in the environment and members of the public were informed of the proposals and provided with an opportunity to comment;
- collate baseline information regarding existing environmental site conditions;
- obtain input to the identification of potential impacts and the development of appropriate mitigation;
- inform the scope of the assessments being undertaken; and
- seek consultee input to the proposed scheme design.

The project team has worked closely with all the key stakeholders to develop a proposed scheme that aims to reduce the overall environmental impact through careful design. Stakeholder feedback was reviewed by the project team and incorporated into the design and assessment process where appropriate.

IMPACTS OF THE PROPOSALS

Community and Private Assets

The study area for the assessment contains land used for residential, commercial, community, development and recreational purposes including open space.

The general location of the proposed scheme and the wider Middlefield area, is designated as residential however, the ACC Local Development Plan safeguards some of this area for the Haudagain Roundabout improvement. The implementation of the proposed scheme would enable the progression of regeneration proposals for the Middlefield area as outlined in the Aberdeen Local Development Plan.

The proposed scheme would result in some significant adverse impacts to Community and Private Assets. These include the demolition or acquisition of 134 residential properties and 5 properties associated with 3 community facilities (Middlefield Community Project Office and Nursery, Logie Neighbourhood Services and Logie Health Clinic). The proposed scheme would also result in the loss of garden ground from several properties along Logie Avenue, Manor Avenue and North Anderson Drive. Additional impacts result from changes to the access routes to/from properties and parking provisions.

No commercial properties are to be demolished or impacted by land take as a result of the proposed scheme, with businesses likely to experience temporary benefits as a result of construction workers' spend. The proposed scheme is not expected to impact the future viability of any businesses in the area.

Reductions in traffic flows are anticipated for A90(T) North Anderson Drive and A96(T) Auchmill Road existing pedestrian crossing points. Increased traffic is anticipated through Middlefield as a result of the link road component of the proposed scheme, however new pedestrian crossings will be provided to maintain access to community facilities in the area.

Six areas of open space would be significantly affected through land-take. The proposed scheme would include exchange land to mitigate the loss of open space.

Geology, Contaminated Land and Groundwater

The assessment was undertaken through desk based review and was supplemented by information from intrusive ground investigation works conducted between November 2014 and January 2015.

The proposed scheme is underlain by several types of soil and other material, including sands, gravels, alluvium and glacial till. The solid geology (rock) of Aberdeen Pluton Granite underlies the study area and extends to 12 metres below ground level. No sites of geological value are present within the study area.

26 potential sources of contamination have been identified within the study area. These include the Denhead Gas Works and Persley Service Station. However, by taking into account proposed mitigation measures no significant adverse impacts have been identified.

Ground investigation works

Road Drainage and the Water Environment

The assessment of road drainage and the water environment considers impacts associated with surface water hydrology, flood risk, water quality and drainage. There are three watercourses in the study area: the River Don and two of its small tributaries, Scatter Burn and Woodside Burn, which are extensively culverted within the heavily urbanised catchment. The River Don and its tributaries are classified as salmonid waters (i.e. containing salmon, brown trout and sea trout).

A detention basin is proposed as part of the scheme. A detention basin is a pond which stores and treats drainage from the proposed roads during times of rainfall. This will help prevent flooding and improve water quality. Modelling of Scatter Burn and Woodside Burn was undertaken to ensure that there is no increased flood risk as a result of the scheme.

Following the implementation of proposed mitigation during construction and operation, no significant impacts on the water environment are predicted.

Ecology and Nature Conservation

There are no ecologically sensitive sites within the study area. Grassland and amenity grassland comprise the majority habitat types within the study area with smaller areas of woodland and semi-natural habitats are also present.

Bats were identified as the main receptor to be potentially impacted as a result of the proposed scheme and detailed assessments were undertaken to determine their presence in the area. No bat roosts were confirmed within the surveyed buildings or trees and bat activity within the area was considered low.

It was therefore determined that there would be no significant residual impacts on the ecology and nature conservation of the area following successful implementation of proposed mitigation measures.


Virtual reality model rendering looking north west along new link road

Landscape and Visual

An assessment has been made of the impacts of the proposed scheme on the surrounding urban landscape (townscape). Potential impacts include changes to the townscape pattern and character, and these impacts have been assessed for both the winter year of opening (when all new planting would be in place but not yet fully matured and effective) and during the summer 15 years after opening (when mitigation planting has become established).

The assessment has identified five distinct Urban Character Areas (UCAs) within the study area, three of which would experience direct physical impacts as a result of the proposed scheme. Of these UCAs, two would be affected by significant impacts. The North Middlefield UCA (between Manor Avenue and the A96(T) Auchmill Road) would experience the greatest direct impact as the majority of the proposed scheme and all of the associated demolition would be located within it. Here the impact would be significant both in winter year of opening and summer, 15 years after opening. Although the physical impact of the proposed scheme on South Middlefield UCA (south of Manor Avenue) would be limited, the setting of this area would be significantly affected by changes to views in winter year of opening and summer 15 years after opening. None of the remaining three UCAs (Auchmill Road UCA, Great Northern Road UCA, and South Middlefield and Hilton UCA) would experience significant impacts in either winter year of opening or summer after 15 years.

An assessment has been made of the degree of anticipated change that the proposed scheme would have upon people's views from receptors such as houses, footpaths and outdoor spaces. Built receptors including residential properties and places of work have been split into groups for the purposes of the assessment.

The proposed scheme would have a visual impact on a total of 43 built receptor groups (predominantly residential) and seven outdoor receptors (a public park and six stretches of existing road with associated footways). Of the built receptor groups, in the winter year of opening 18 would experience significant visual impacts. By summer 15 years after opening, 14 would experience significant impacts. Of the outdoor receptors, in the winter year of opening four would experience significant impacts, reducing to three

in the summer 15 years after opening.

Landscape mitigation measures proposed to reduce landscape and visual impacts and help integrate the proposed scheme into the urban setting are illustrated on Figure 3.

Cultural Heritage

Cultural heritage sites within the study area include archaeological remains, historic buildings and historic landscape types. The assessment identified 22 archaeological remains, 11 historic buildings, and nine historic landscape types, mainly dating from the post-medieval period onwards. Potential impacts on these cultural heritage assets include changes to the surroundings and views of historic buildings and historic landscape types, or the requirement to remove existing features during construction (such as remains of previous settlements).

After mitigation is in place no significant residual impacts are predicted on any cultural heritage assets.

Air Quality

The existing air quality throughout the area is characterised by the existing emissions from road traffic. Air quality modelling has been undertaken to determine potential for changes to air quality as a result of the proposed scheme, and any related effects on local communities. The assessment used air quality monitoring and modelling to consider the following pollutants emitted from vehicles: nitrogen oxides, nitrogen dioxide and fine particulate matter.

ACC has declared three Air Quality Management Areas (i.e. areas were air quality thresholds are being exceeded or would be exceeded in the near future). Of these, one is located within the study area, Anderson Drive/Haudagain Roundabout AQMA, which is declared for nitrogen dioxide (NO_2).

The local air quality assessment considered 26 representative sensitive receptors. Modelling was used to predict pollutant concentrations at the year of proposed scheme opening (2018). A regional air quality assessment was also undertaken for the year of opening (2018) and the design year, 15 years after opening (2033). Potential for air quality effects during construction was also considered.

With the implementation of appropriate dust control measures, the construction phase of the proposed scheme is not predicted to cause any significant impacts. The air quality assessment also concluded that there are no significant adverse impacts predicted during operation.

Noise and Vibration

The proposed scheme passes through an urban area, where the noise environment is currently largely dominated by road traffic on the existing A90, A96 and connecting side roads. The impacts from the scheme include both increases and decreases in noise levels at sensitive receptors. These noise changes are associated primarily with a receptor's proximity to the new link road, the bypassed Haudagain roundabout and proximity to existing roads seeing changes in traffic flow. There are also changes in the numbers of people likely to be bothered by airborne vibration, as the response to this is related to the noise levels.

The use of screening to reduce noise, where practicable, has been considered based on a combination of:

- the change in noise level with the scheme in place.
- The predicted noise level with the scheme in place.
- The extent to which noise barriers could be successfully integrated into the urban setting in combination with the landscape mitigation proposals.

Three noise barriers are proposed as part of the scheme to mitigate for potential noise increases.


Baseline noise monitoring

A noise assessment was undertaken for the short term (year of opening 2018) and the long term (design year 2033).

Key findings of the short-term assessment are:

- More sensitive receptors experiencing perceptible noise increases than would experience perceptible decreases.
- 105 more dwellings would experience Major adverse noise impact during daytime.
- 89 more dwellings would experience Moderate adverse noise impact during daytime.

Key findings of the long-term (2033) assessment comparing the situation with the proposed scheme and mitigation in place, to the without scheme (Do Minimum) situation are:

- A reduction in the number of noise sensitive receptors, including dwellings, experiencing perceptible daytime noise impacts in the long-term with the proposed scheme in place.
- 40 more dwellings would experience Major adverse noise impact during daytime in the long-term, largely due to their proximity to the proposed scheme.
- 207 fewer dwellings would experience Moderate adverse noise impact. Without the scheme in place the A96 Great Northern Road and the A90(T) North Anderson Drive would become heavily congested, resulting in an increase in traffic flows along local roads in the Woodside area (including Clifton Road, Hilton Drive and Hilton Ave) and increased noise levels at nearby properties.
- A similar number of dwellings would be affected by noise impact at night-time in the long-term both with and without the scheme.
- Some construction works would take place in the vicinity of sensitive receptors, particularly Logie Avenue, Logie Place and Manor Avenue. Significant temporary noise and vibration effects are likely at these locations and mitigation measures will need to be taken to reduce these.

The assessment shows that there would be an overall neutral long-term noise impact with the scheme in place. This is due to the transference of traffic from smaller local roads onto the A96 and A90 reducing local traffic congestion.

The Noise Insulation (Scotland) Regulations 1975 set out criteria for the provision of secondary glazing to selected rooms in qualifying properties where noise increases above a threshold occur as a consequence of traffic levels associated with a road improvement scheme. Potential impacts, mitigation and residual impacts discussed within the Environmental Statement do not include the benefits of such secondary glazing, entitlement to which will be assessed as required by the legislation.

Effects on All Travellers

This assessment considered the potential impacts of the proposed scheme on pedestrians, cyclists and equestrians (referred to as Non-Motorised Users (NMUs)) in terms of journey lengths and amenity. Impacts on vehicle travellers are also considered in terms of changes to driver stress.

Within the study area five core paths, one aspirational core path (i.e. proposed future route), National Cycle Route 1, and several other local footpath and cycle paths are present.

With the proposed scheme in place, beneficial impacts for NMUs were identified as a result of the provision of additional footpaths and shared footway/cycleways. These would maintain existing access and also provide safer access across the proposed scheme. Some adverse visual and noise impacts are predicted for NMUs using paths in the immediate vicinity of the proposed scheme, however, this would be offset by improvements to safety for NMUs passing through the study area. There would also be beneficial noise and air quality impacts predicted for a number of NMUs using paths in the immediate vicinity of the proposed scheme.

Overall, journey lengths and the amenity value of paths would not be significantly affected with the proposed scheme in place. Access to outdoor areas would not be significantly affected as a result of the operation of the proposed scheme. Impact on users of public transport (i.e. bus users) in the study area would benefit due to an overall reduction in journey times.

Existing cycle and pedestrian provision on Auchmill Road

Materials

The amount of material required for the proposed scheme has been estimated and the range of material wastes likely to be generated described. Potential impacts associated with the use of material resources and the management of waste during the construction of the proposed scheme were considered.

By applying key material and waste management principles, the impacts on natural resources and need for permanent disposal of wastes would be reduced. In particular, this would be achieved by re-using existing soils and infrastructure, considering the environmental impacts of products, and sourcing materials from local suppliers.

The potential for impacts on material resources or waste disposal facilities is principally related to the performance of the Contractor during completion of the construction works. Any surplus materials or waste sent off site could have a resultant impact on the available waste management infrastructure and depletion of resources. The risk of such impacts occurring would be managed and reduced through the development and application of several plans addressing different aspects of construction site management, such as a Construction Environmental Management Plan and a Site Waste Management Plan .

With the implementation of proposed mitigation no significant impacts affecting material resources or waste infrastructure are predicted. The construction of the proposed scheme is expected to give rise to small-scale, localised, impacts only.

Policies and Plans

The principle of development of the proposed scheme is established and generally supported in national, regional and local planning policy including the ACC Local Development Plan, Aberdeen City and Shire Strategic Development Plan, and the Scottish Government's Infrastructure Investment Plan. The proposed scheme supports regional transport policy objectives as part of a wider strategy to assist in providing enhanced connectivity to deliver prosperity and connect communities across the region.

The assessment has identified where potential impacts associated with the proposed scheme could result in potential non-compliance with

aspects of policy. The proposed measures to address potential impacts have been identified in the specialist assessment chapters of this ES (i.e. chapters 7-16). Taking this into account the proposed scheme is considered to be broadly compliant with national, regional and local planning policies.

Cumulative Assessment

The cumulative assessment provides an overview of the combined impacts of the proposed scheme and also includes impacts from other proposed developments.

Potential for cumulative impacts due to the combined effect of a number of different environmental impacts of the proposed scheme on a single receptor/resource was assessed. No significant cumulative construction or operation impacts on ecological receptors are anticipated. Cumulative construction and operation impacts on several residential receptors, in close proximity to the proposed scheme, have been identified as a result of noise and visual impacts. In addition to cumulative noise and visual impacts, some receptors would also experience significant land-take and/or severance of vehicular access.

The combination of the proposed scheme and the AWPR scheme would be beneficial to traffic flows in the Haudagain area overall. The Third Don Crossing road scheme would also contribute beneficially to the area by re-routing traffic away from the existing Haudagain Roundabout.

Figure 1

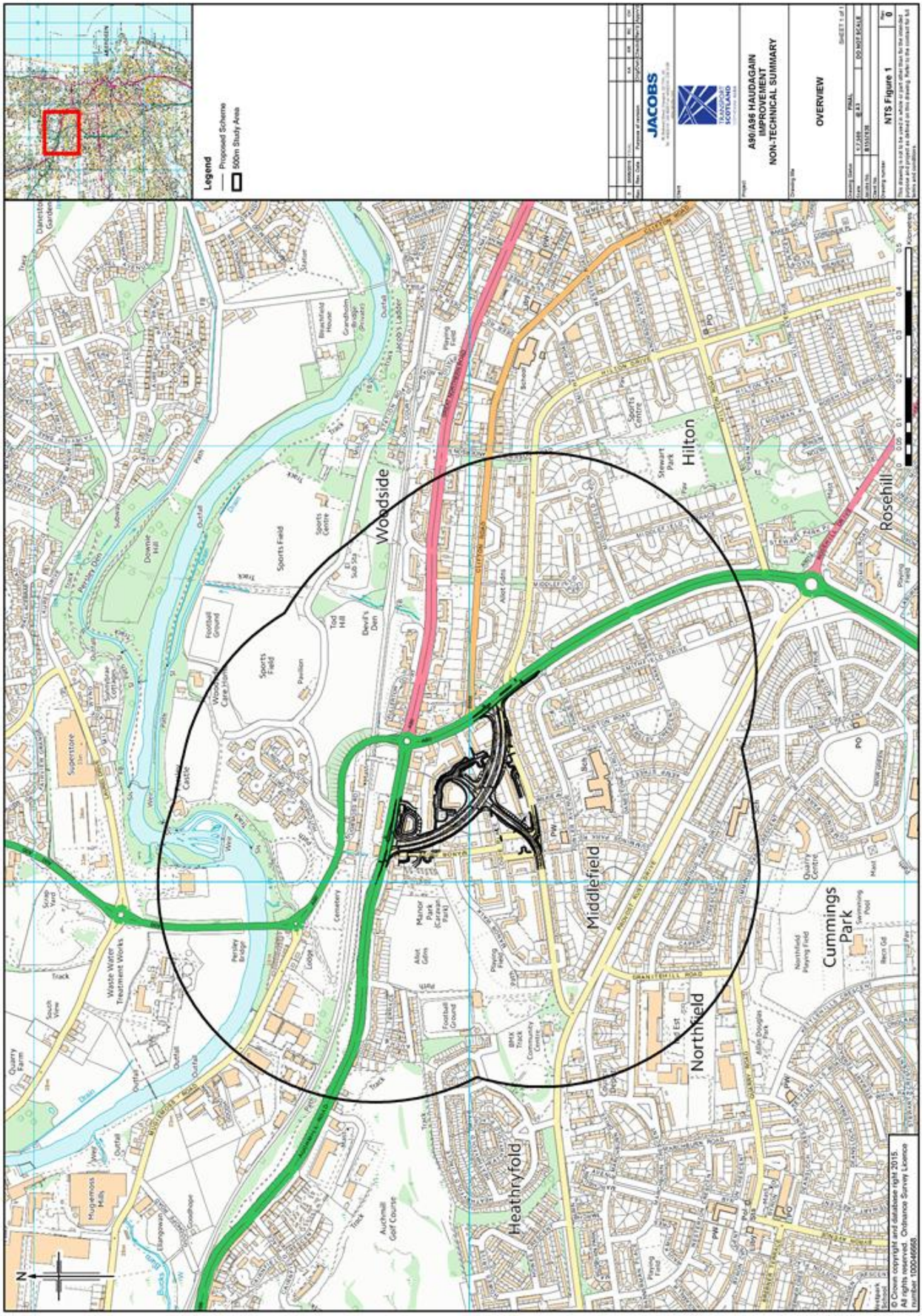

Legend
Proposed Scheme
500m Study Area
JACOBS
A90/A96 HAUDAGAIN IMPROVEMENT
NON-TECHNICAL SUMMARY
OVERVIEW
NTS Figure 1
Woodside
Hilton
Rosehill
Middlefield
Cummings Park
Northfield
Heathryfold
N

Figure 2


Legend
Proposed Scheme
JACOBS
TRANSPORT SCOTLAND
A90/A96 HAUDAGAIN IMPROVEMENT NON-TECHNICAL SUMMARY
PROPOSED SCHEME
NTS Figure 2
Proposed Signalised Junction
Proposed NMU Crossing Point
Proposed Pedestrian Crossing Point
Proposed Footway/Cycleway
Proposed Re-aligned Manor Avenue
Proposed Detention Basin
Proposed Dual Carriageway Link Road
Proposed Footway
Proposed Logie Avenue - West
Proposed Logie Avenue - East
Proposed Signalised Junction
Proposed NMU Crossing Point
Proposed Footway
Proposed Footway/Cycleway
Existing Pedestrian Crossing Point Extended
Proposed Signalised Junction
Access to Manor Avenue
N
Metres
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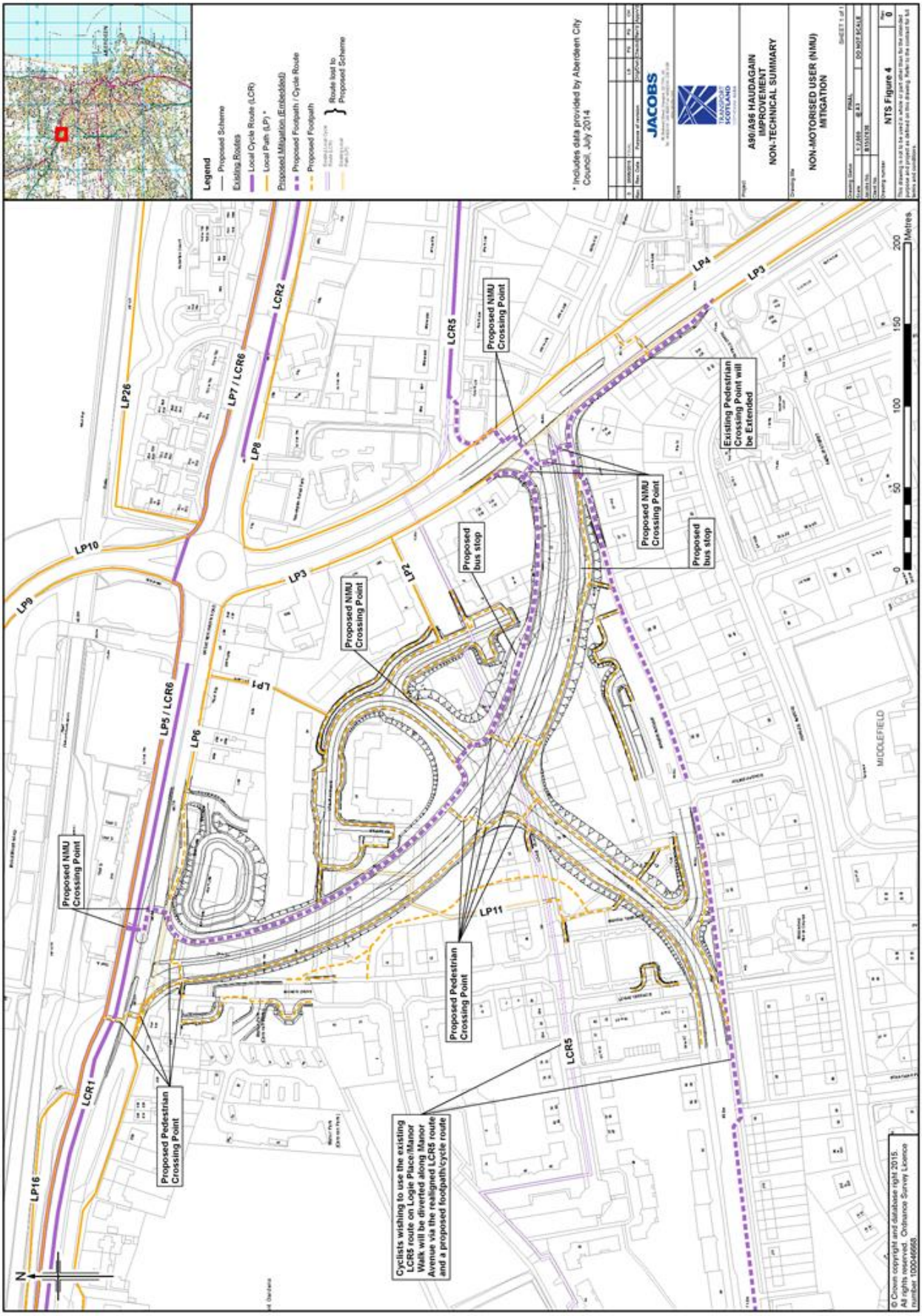
Figure 3


JACOBS
TRANSPORT SCOTLAND
A90/A96 HAUDAGAIN IMPROVEMENT
NON-TECHNICAL SUMMARY
PRELIMINARY CONCEPTUAL LANDSCAPE PROPOSALS
FINAL
NTS Figure 3
Potential location of Play Park / Play Area
Potential location of Play Park / Play Area
Community Park
A90 North Anderson Drive
A90 Auchmill Road
A90 Mugiemoss Road
N

Figure 4


Legend
Proposed Scheme
Existing Routes
Local Cycle Route (LCR)
Local Path (LP) *
Proposed Mitigation (Embedded)
Proposed Footpath / Cycle Route
Proposed Footpath
Route lost to Proposed Scheme
* Includes data provided by Aberdeen City Council, July 2014
JACOBS
TRANSPORT SCOTLAND
A90/A96 HAUDAGAIN IMPROVEMENT NON-TECHNICAL SUMMARY
NON-MOTORISED USER (NMU) MITIGATION
NTS Figure 4
LP1
LP2
LP3
LP4
LP5 / LCR6
LP6
LP7 / LCR6
LP8
LP9
LP10
LP11
LP16
LP26
LCR1
LCR2
LCR5
Proposed NMU Crossing Point
Proposed Pedestrian Crossing Point
Proposed bus stop
Existing Pedestrian Crossing Point will be Extended
Cyclists wishing to use the existing LCR5 route on Logie Place/Manor Walk will be diverted along Manor Avenue via the realigned LCR5 route and a proposed footpath/cycle route
MIDDLEFIELD
Metres
0
50
100
150
200
N
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Abbreviations

AADT	Annual Average Daily Traffic
AAFN	Access to Aberdeen From the North
AAWT	Average Annual Weekday Traffic
ACC	Aberdeen City Council
ACP	Aspirational Core Path
ACSSDP	Aberdeen City and Shire Strategic Development Plan
ADMS	Advanced Dispersion Modelling Software
AEP	Annual Exceedance Probability
ALDP	Aberdeen Local Development Plan
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
ASAM 4A	Aberdeen Sub Area Model version 4A
ATC	Automatic Traffic Counter
AWI	Ancient Woodland Inventory
AWPR	Aberdeen Western Peripheral Route
BCR	Benefit to Cost Ratio
BGS	British Geological Survey
BNL	Basic Noise Level
BoCC	Birds of Conservation Concern
BS	British Standard
BTEX	Benzene, toluene, ethylbenzene and xylene
CAs	Conflict Areas
CAR	Water Environment (Controlled Activities) (Scotland) Regulations 2011
CEEQUAL	Civil Engineering Environment and Quality Award Scheme
CEMP	Construction Environmental Management Plan

CERC	Cambridge Environmental Research Consultants
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CMS	Central Management System
CNMA	Candidate Noise Management Areas
CO_2	Carbon Dioxide
CP	Core Path
CPO	Compulsory Purchase Order
CQA	Candidate Quiet Area
CRRN	Compliance Risk Road Network
CRTN	Calculation of Road Traffic Noise
cSAC	Candidate Special Area of Conservation
CSM	Conceptual Site Model
CSO	Combined Sewer Overflow
CTC	Cycle Touring Club
dB	Decibel
D&B	Design and Build
DEFRA	Department of the Environment, Food and Rural Affairs
DI	Deposit Index
DM	Do-Minimum
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
DMP	Dust Management Plan
DWPA	Drinking Water Protection Area
DWS	District Wildlife Site
DWS	District Wildlife Site
EC	European Commission

ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
END	Environmental Noise Directive
EnvCoW	Environmental Clerk of Works
EQS	Environmental Quality Standards
ES	Environmental Statement
EU	European Union
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
GBR	General Binding Rules
GCR	Geological Conservation Review
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare
HA	Highways Agency
HAWRAT	Highways Agency Water Risk Assessment Tool.
HDV	Heavy Duty Vehicle
HLT	Historic Landscape Type
HMS	Habitat Modification Score
HMWB	Heavily Modified Water Bodies
HRA	Hot Rolled Asphalt
IAN	Interim Advice Note
IAQM	Institute Air Quality Management
IBAA	Incinerator Bottom Ash Aggregate
ICD	Inscribed circle diameter
IEEM	Institute of Ecology and Environmental Management

IEMA	Institute of Environmental Management and Assessment
IIP	Infrastructure Investment Plan
INNS	Invasive Non-Native Species/Genera
IUCN	International Union for the Conservation of Nature
JSA	Job Seeker Allowance
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LATIS	Land Use and Transport Integration in Scotland Framework
LBAP	Local Biodiversity Action Plan
LC	Low Carbon
LCR	Local Cycle Route
LDV	Light Duty Vehicle
LEDs	Light Emitting Diodes
LGV	Large Goods Vehicle
LNCS	Local Nature Conservation Site
LNR	Local Nature Reserve
LNRS	Low Noise Road Surfacing
LP	Local Path
LTS	Local Transport Strategy
LTT	Long Term Trends
LWS	Local Wildlife Sites
MIR	Main Issues Report
MMP	Materials Management Plan
MTRIPS	Major Transport Infrastructure Projects
NAEI	National Atmospheric Emissions Inventory
NBN	National Biodiversity Network
NCR	National Cycle Route
NCSA	Nature Conservation (Scotland) Act 2004

NESA	National Evaluation from Surveys and Assignments
NESBReC	North East Scotland Biological Records Centre
NESLBAP	North East Scotland Local Biodiversity Action Plan
NESTRANS	North East Scotland Transport Partnership
NGR	National Grid Reference
NISR	Noise Insulation (Scotland) Regulations
NMU	Non-Motorised User
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NPF	National Planning Framework
NRMM	Non-road Mobile Machinery
NSA	National Scenic Areas
NTS	National Transport Strategy
NVZ	Nitrate Vulnerable Zone
OBCF	Octave Band Centre Frequency
OP	Opportunity Site
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbons
PAN	Planning Advice Note
PCM	Pollution Climate Mapping
PEL	Probable Effects Level
PM	Particulate Matter
PPE	Personal Protective Equipment
PPG	Pollution Prevention Guideline
PR	Progress Reports
PSYM	Predictive System for Multimetrics
PWL	Sound Power Level

R&A	Review and Assessment
RBMP	River Basin Management Plan
RCAHMS	Royal Commission on Ancient and Historical Monuments of Scotland
RIGS	Regionally Important Geological Sites
RMSE	Root Mean Squared Error
RoD	Record of Determination
RSPB	Royal Society for the Protection of Birds
RTA	Road Traffic Accident
RTS	Regional Transport Strategy
RST	Runoff Specific Threshold
SAC	Special Area of Conservation
SAQD	Scottish Air Quality Database
SBL	Scottish Biodiversity List
SCI	Site of Community Importance
Scotways	Scottish Rights of Way and Access Society
SDPA	Aberdeen City and Shire Strategic Development Planning Authority
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SHEP	Scottish Historic Environmental Policy
SIMD	Scottish Index of Multiple Deprivation
SINC	Site of Importance for Nature Conservation
SINS	Sites of Interest to Natural Science
SIP	Strategic Infrastructure Plan
SMA	Stone Mastic Asphalt
SMR	Sites and Monuments Record
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPL	Sound Pressure Level

SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
STAG	Scottish Transport Appraisal Guidance
STPR	Strategic Transport Projects Review
SUDS	Sustainable Drainage Systems
SWF	Surface Water Features
SWMP	Site Waste Management Plan
TEL	Threshold Effects Levels
TMfS	Transport Model for Scotland
TS	Transport Scotland
UCA	Urban Character Areas
UKBAP	UK Biodiversity Action Plan
USAs	Updating and Screening Assessments
UWWTD	Urban Wastewater Treatment Directive
VEM	Visual Envelope Map
WCA	Wildlife and Countryside Act
WEWS	Water Environment and Water Services
WFD	Water Framework Directive
WML	Waste Management Licensing (Scotland) Regulations 2011

Glossary

Aggregate	Materials used in construction, including sand, gravel, crushed stone, slag, or recycled crushed concrete.
Air Quality Management Area (AQMA)	A non-permanent designation created if monitoring reveals that statutory air quality thresholds are being exceeded or will be exceeded in the near future.
Allocation	A proposal for land for housing, industry or other uses within the Local Development Plan that identifies a specific area of land to be developed within the time period of the plan.
Alluvium	Sediment deposited by a river.
Ambient Noise	The all encompassing sound at any point in time.
Amenity grassland	Intensively managed and regularly mown grasslands that are typical of golf courses, sports pitches, playing fields and lawns. These grasslands are typically of low diversity and limited wildlife and landscape value.
Amenity value	Defined as the relative pleasantness of a journey and relates in particular to the exposure of pedestrians and others to traffic.
Amphibian	Any cold blooded animal of the class Amphibia which includes frogs, toads and newts.
Ancient Woodland	Areas of land that appear as wooded on maps dated pre-1750 (in Scotland) and are considered likely to have been continuously wooded from this date.
Ancient Woodland Inventory	Aims to list all probable ancient semi-natural woodlands on a county basis together with those woodlands in other ancient categories of lesser woodland nature conservation interest.
Assessment	An umbrella term for description, analysis and evaluation.
Attenuation	Increase in duration of flow hydrograph with a consequent reduction in peak flow.
Attribute	Characteristics of an ecological receptor.
Baseline	The existing conditions which form the basis or start point of the environmental assessment.
Bedrock	A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.
Biodiversity	Biological diversity, or richness of living organisms present in representative communities and populations.
Biodiversity Action Plan (BAP)	Sets objectives, along with measurable targets for the conservation of biodiversity.
Broadleaved woodland	An area of woodland with predominantly deciduous tree species (less than 10% coniferous trees in the canopy).

Buffer	A natural, undisturbed strip surrounding a development or land disturbance activity or bordering a stream or permanent water body.
Bund	An embankment, wall or dam that can be used to minimise noise or alternatively built around an oil tank to contain the contents in the event of spillage.
Burn	A small stream.
Catchment	The area contributing flow to a point on a drainage system.
Community	Assemblage of interacting populations that occupy a given area.
Community Severance	Community severance is defined here as the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows.
Compulsory Purchase Order (CPO)	A legal document giving the government (Scottish Ministers) power to compulsorily purchase the areas of land necessary for construction of the scheme.
Coniferous woodland	An area of woodland with predominantly coniferous tree species (less than 10% deciduous trees in the canopy).
Conservation	Preservation or restoration of the natural environment and wildlife.
Contaminated land	Land in such condition by reason of substances on or under the land that significant harm is being caused, there is a significant possibility of such harm being caused or pollution of controlled water is being, or likely to be caused'.
Controlled Activity Regulations (Scotland) 2011	Controls all engineering activity in or near watercourses.
Core Path	A right of way designated by a Local Authority as being of importance to maintain access and leisure provision.
Culvert	A metal, wooden, plastic, or concrete conduit through which surface water can flow under or across roads.
Decibel (dB)	The range of audible sound pressures is approximately 0.00002 Pa to 00 Pa. Using decibel notation presents this range in a more manageable form, 0 dB to 140 dB. Mathematically: Sound pressure Level (dB) = 20 log (pt / p0) where p0 = 2 x 10-5 Pa
Deciduous	Trees and shrubs that shed their leaves annually.
Detention Basin	Surface storage basin or facility that provides flow control through attenuation of stormwater runoff.
Discharge	The rate of flow of a river at a particular moment in time, relative to volume and velocity.
District Wildlife Sites	Local council designation.

(DWS)	
Do-Minimum	The base situation where there are no modifications to the existing road network. May also refer to the minimum modifications, which will necessarily take place in the absence of a proposed scheme.
Do-Something	The 'with proposed scheme' scenario for assessment purposes.
Earthworks	Works created through the moving of quantities of soil or unformed rock.
Ecological receptors	Living organisms, habitats, or natural resources that could be impacted by the construction or operation of the proposed scheme.
Ecology	The branch of biology concerned with the relations of organisms to one another and to their physical surroundings.
Ecosystem	A biological community of organisms interacting with one another and their physical environment.
Effect	The result of change or changes on specific environmental resources or receptors.
Element	A component part of the landscape or environment (e.g. roods, hedges, woodlands).
Environmental Impact Assessment (EIA)	The process by which information about the environmental effects of a project is evaluated and mitigation measures are identified.
Construction Environmental Management Plan (CEMP)	Document which describes the processes to be followed to ensure compliance with environmental legislation and policy and minimise harm to the environment.
Environmental Statement (ES)	Document provided by the Developer to the Competent Authority, containing environmental information required under Article 5 of Directive 85/337/EEC as amended.
Façade Level	Façade levels refer to levels taken at a distance of between 1 and 3.5 m of the façade of a building. The difference between the façade and free-field level will depend on the distance from the reflecting surface, but is generally accepted to be approximately 2.5 dB(A).
Fauna	Referring to animals of a particular region or habitat.
Fill	Material deposited by man in ground depression or excavated area.
Floodplain	Land adjacent to a river, which is subject to regular flooding.
Flora	Referring to plants of a particular region or habitat.
Flow regime	Combinations of river discharge and corresponding water levels and their respective (yearly or seasonally) averaged values and characteristic fluctuations around these values.
Fluvial geomorphology	The study of landforms associated with river channels and the sediment processes which form them.

Footprint	The geographical extent of an ecological impact.
Foraging	Searching for food or provisions.
Free-Field	The term Free-Field refers to sound levels that have been measured or predicted in the absence of any influence of reflections from nearby surfaces. In practice, a measurement is considered to be free-field if it was taken at a distance of over 3.5 m from any reflecting surfaces.
Freshwater	Bodies of water such as ponds, lakes, rivers and streams containing low concentrations of dissolved salts and other total dissolved solids.
Generic mitigation	Measures which are applicable throughout the scheme and which aim to prevent, reduce or offset impacts.
Geomorphology	The branch of geology concerned with the structure, origin and development of topographical features of the earth's crust.
Glacial Till	A form of diamicton derived from glacial processes.
Ground Investigation	Exploratory investigation to determine the structure and characteristics of the ground influenced by a development. The collected information is used to establish or predict ground and groundwater behaviour during, and subsequent to, construction.
Groundwater	Water below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
Habitat	Term most accurately meaning the place in which a species lives, but also used to describe plant communities or agglomerations of plant communities, as used, for example in a Phase 1 Habitat Survey.
Habitats Directive	EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
Heavy Duty Vehicles	Vehicles with 3 axles (articulated) or 4 or more axles (rigid and articulated).
Heterogeneous	If something is heterogeneous it is different in kind/type/origin, for example, a riverbed containing silt, gravel and pebbles can be said to be heterogeneous.
Hydrogeology	The branch of geology that deals with the occurrence, distribution, and effect of ground water.
Hydrological	The exchange of water between the atmosphere, the land and the oceans.
Impact	Any changes attributable to the proposed scheme that have the potential to have environmental effects (i.e. the causes of the effects).
Impermeable	Material that does not allow fluids to pass through it.
Improved grassland	Grasslands that have been so modified by fertilisers, drainage or grazing that they have lost most of the species expected in unimproved grassland.
Incidental receptor information	Information gathered through casual observation of a plant or animal of one or more species recorded whilst performing a non-relevant ecological survey.

Infrastructure	The basic structure or features of a system or organisation.
Intake	The place where water is taken into a pipe or conduit (e.g. for cooling water); opposed to outlet.
Invertebrate	An animal without a backbone.
Japanese Knotweed	Invasive strong-growing, clump-forming plant, with tall, dense annual stems.
L_{Aeq}	Equivalent Continuous Sound Level. A notional steady sound level which would cause the same A-weighted sound energy to be received as that due to the actual, possibly fluctuating, sound level over a given period of time.
L_{eq}	The L_{eq} is defined as the equivalent continuous sound level and is the most widely used parameter for assessing environmental noise. Since this descriptor is a type of average level, it must by definition have an associated time period over which the measurement is referring to. This is often included in the abbreviation in the form $L_{eq,T}$, where T is the time period (i.e. $L_{Aeq\ 5\ min}$). The formula for calculating the L_{eq} is: $L_{eq} = 10\log_{10}\left(\frac{1}{t_2 - t_1}\int_{t_1}^{t_2}\frac{p^2}{p_{ref}^2}.dt\right)$
L_{max}	The L_{max} is defined as the maximum rms level recorded during a measurement period.
L_n	The L_n is a statistical descriptor and refers to the level that is exceeded for n% of the time during a particular measurement period. Again, the measurement period that the descriptor refers to is often included in the abbreviation in the format Ln, T. Two of the most commonly used statistical descriptors used for environmental noise assessments are the L90 and the L10. These are described in more detail below.
L_{night}	The L_{night} is a façade noise index derived from the $L_{A10,18h}$ index using TRL conversion method.
$L_{night,outside}$	The $L_{night,outside}$ is defined as the free-field A-weighted long-term average sound level of the 8-hour night-time period determined over all nights of a year outside a property.
L_{10}	The L_{10} refers to the level exceeded for 10% of the measurement period and is commonly used in assessing road traffic noise as it has been found to give a good indication of the subjective human response to this type of noise.
L_{90}	The L_{90} refers to the level exceeded for 90% of the measurement period and is widely considered to represent background sound levels, or the underlying sound in an area between noisy events (such as cars passing etc.).
Landform	Combination of slope and elevation producing the shape and form of the land surface.
Landscape	Human perception of the land, conditioned by knowledge and identity with a place.
Land-take	Acquired land which is necessary to construct the scheme and associated infrastructure and to undertake the essential environmental mitigation measures.

Listed Building	Building included on the list of buildings of special architectural or historic interest and afforded statutory protection under the 'Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997' and other planning legislation. Classified categories A – C(s).
Local Landscape Character Area (LLCA)	An area outlined as having distinct characteristics based on landscape features. Derived from regional landscape studies available for SNH.
Magnitude	Size, extent, scale and duration of an impact.
Mineral extraction	The removal of a naturally occurring solid formed through geological process that has a characteristic chemical composition, a highly ordered atomic structure and specific physical properties.
Mitigation	Term used to indicate avoidance, remediation or alleviation of adverse impacts.
Native	A species occurring naturally, in its normal geographic range.
Non-Motorised User	A non-vehicular user of the road network. Includes pedestrians and cyclists.
Non-Statutory Guidance/Organisation	Direction from a professional governing body and not directly through legislation.
Offsetting	The process of compensating for something with something else.
Open space	Any land laid out as public parks or used for the purpose of public recreation, or land which is a disused burial ground.
Outfall	The place of discharge e.g. where a sewage pipe discharges into a river.
Permeable	Something that can be penetrated/passed through by something else e.g. soil is permeable to water as the water can pass through it.
pH	A figure expressing acidity or alkalinity on a logarithmic scale of 0 to 14.
Phase 1 Habitat Survey	This identifies the different habitats that are contained within or make up a site, and the key plant species for each of those habitat types.
Planning Advice Note (PAN)	Supporting document to National Planning Policy Guidelines, which disseminates good practice and provides more specific design advice of a practical nature.
Proposed Scheme	The scheme design as reported in Chapter 4 of the ES, and used as the basis for environmental assessment and reporting.
Qualitative	Concerned only with the nature of the organism/substance being investigated.
Quantitative	Concerned with the number, as well as nature of the organism/substance being investigated.
Ramsar sites	Internationally important wetland identified for conservation under the Ramsar convention (1971).
Reach	A stretch or portion between defined limits. The stretch of water visible between bends in a watercourse.

Receptor	An ecological element that is affected (either directly or indirectly) by an ecological driver that causes a change in an organism, community, ecosystem, or other ecological component of the landscape.
Receptor (visual)	A dwelling, workplace or other building, outdoor space, viewpoint, road or footpath with views which may be changed in character and visual amenity by a proposed development.
Regionally Important Geological Sites (RIGS)	Sites designated by regional geological groups on locally developed criteria, currently the most important places for geology and geomorphology outside statutorily protected land such as Sites of Special Scientific Interest (SSSI).
Residual impact	Residual impact means the environmental impact after the provision of mitigation measures, if any.
Right of way	A public right of way is a defined route which has been used by the general public for at least 20 years and which links two public places (usually public roads).
Riparian zone	Natural home for plants and animals occurring in a thin strip of land bordering a stream or river.
River basin management plan	A plan setting out actions required within a river basin to achieve set environmental quality objectives, reviewed on a six yearly basis.
Roost	Any resting site used by bats including maternity roosts which are used by females and their young, hibernacula which are used during winter hibernation and transitional roosts which may be used at any time.
Rough grassland	Rank or tussocky grassland. May have been drained, grazed, mown or treated with manure but not so improved by fertiliser or herbicides as to have altered the sward composition greatly. Associated with unenclosed uplands, lowlands with poor access or wet areas, and road verges.
Runoff	Water that flows over the ground surface to the drainage system. This occurs if the ground is impermeable or if permeable ground is saturated.
Salmonid	Pertaining or belonging to the family Salmonidae (salmon, trout and charr).
Scheduled Monument (SM)	A monument which has been scheduled by the Scottish Ministers as being of national importance under the terms of the 'Ancient Monuments and Archaeological Areas Act 1979'.
Scour	A depression or hole left when sediment is washed away from the bottom of a river.
Scrub	Climax vegetation dominated by locally native shrubs, usually less than 5m tall.
Sediment	Material carried in particles by water or wind and deposited on the land surface or seabed.
Sedimentation	The deposition or accumulation of sediment.
Semi-improved grassland	Grassland that has been modified by fertilizers, drainage or intensive grazing. Contain less species diversity than unimproved grasslands.

Semi-natural woodland	Woodland that does not obviously originate from planting. The distribution of species will generally reflect the variations in the site and the soil. Planted trees must account for less than 30% of the canopy composition.
Semi-natural habitat	Habitat which has been altered by altered by land management.
Severance	The separation of communities from facilities and services they use within their community. Alternatively, in relation to agricultural land, the division of plots of land into separate land parcels, potentially affecting access or creating areas that may be impractical for agricultural use.
Shelterbelt	A barrier of shrubs and trees, which provides protection against the wind and reduces erosion.
Site compound	A secure area close to the construction site white provides full site services including storage for equipment, materials and fuel, offices and amenity areas.
Site of Importance to Nature Conservation (SINC)	Non-statutory designation which seeks to protect areas of high wildlife value at a local level.
Sites of Special Scientific Interest (SSSI)	Areas of national importance. The aim of the SSSI network is to maintain an adequate representation of all natural and semi-natural habitats and native species across Britain. The site network is protected under the provisions of Sections 28 and 19 of the Wildlife and Countryside Act 1981 as well as the Amendment Act 1985 and the Environmental Protection Act 1990.
Special Area of Conservation (SAC)	An area designated under the EC Habitats Directive to ensure that rare, endangered or vulnerable habitats or species of community interest are either maintained at or restored to a favourable conservation status.
Special Protection Area (SPA)	An area designated under the Wild Birds Directive (Directive74/409/EEC) to protect important bird habitats. Implemented under the Wildlife and Countryside Act 1981. Under the Habitats Directive, all SPAs will be proposed Special Areas of Conservation.
Stakeholder	A person or group that has an investment, share or interest in something.
Superficial Deposits	The youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back 1.8 million years from the present.
Surface water hydrology and flood risk	The study of water on or near the land surface.
Susceptibility	The ability to accommodate change arising from the proposed road without adverse effect.
Sustainable drainage systems (SUDS)	A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. Referred to in earlier guidance as 'Sustainable *Urban* Drainage Systems'.
Terrestrial	The environment above the mean high water spring
Threshold	The minimum intensity or value of a signal etc that will produce a response or specified effect.

Topsoil	The upper, outermost layer of soil.
Vernacular	Refers to a type of architecture which is indigenous to a specific time or place.
Water Framework Directive (WFD)	Wide-ranging European environmental legislation (2000/60/EC). Addresses inland surface waters, estuarine and coastal waters and groundwater. The fundamental objective of the WFD is to maintain “high status” of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least “good status” in relation to all waters by 2015.
Water quality	The chemical and biological status of various parameters within the water column and their interactions, for example dissolved oxygen, indicator metals such as dissolved copper, or suspended solids (the movement of which is determined by hydrological process and forms geomorphological landforms).
Wildlife and Countryside Act 1981 (WCA)	Principal mechanism for wildlife protection in the UK.
Working corridor	Strip of land either side of a proposed development.

1 Introduction

1.1 Background

1.1.1 The Haudagain Roundabout is located in the north-west of Aberdeen and serves both the A90 and A96 Trunk Roads which enable access into and around Aberdeen from the north and north-west. The junction regularly experiences significant queuing, especially during peak periods, with delays on all approach arms, as it is currently operating over its capacity. The resulting congestion leads to unreliable journey times. The Scottish Government has committed to undertake infrastructure improvements at Haudagain to address these issues. Those improvement works will follow on from completion of the Aberdeen Western Peripheral Route (AWPR), which is now in construction and will provide the future Trunk Road network in the Aberdeen area. In addition, Aberdeen City Council is in the process of implementing the Access from the North Proposals ("Third Don Crossing") which will precede the construction of the Haudagain Roundabout improvement and will provide transport improvements across the local road network.

1.1.2 Previous work to identify measures to address transport problems at the Haudagain Roundabout was undertaken by Aberdeen City Council (ACC) as part of a study commissioned by a steering group comprising Transport Scotland (TS), the North East of Scotland Transport Partnership (Nestrans) and ACC. The study was undertaken using Scottish Transport Appraisal Guidance (STAG) methodology and included consideration of the wider planning objectives for the area. A report on the assessment of potential improvement options was published in July 2008. Option 5, which required the construction of a new dual carriageway link road through the Middlefield area of Aberdeen, was identified as the preferred option based on the STAG work. ACC and Nestrans have expressed their support for Option 5.

1.1.3 The options identified within the STAG report were re-assessed as part of a sifting process in February 2014, along with a further eight options developed as part of the current commission. The sifting process considered the following criteria: operational performance; compliance with the scheme objectives; environmental impact; engineering complexity; and cost. The following options were identified as satisfying all of the criteria and were therefore taken forward for a full Design Manual for Roads and Bridges (DMRB) Stage 2 Assessment:

- Option 4: signal junction with north and south left slip.
- Option 5: existing carriageway with new dual carriageway.
- Option 13: signalised roundabout.

1.1.4 Further detail regarding route options is provided in Chapter 3 (Alternatives Considered).

1.1.5 Option 5 was selected as the preferred option based on both the outcomes of the DMRB Stage 2 Assessment and performance against the scheme objectives. Option 5 was presented as the preferred option at public exhibitions held at the Lord Provost Henry E Rae Community Centre in Middlefield on the 24th and 25th April 2014.

1.2 The Proposed Scheme

Scheme Objectives

1.2.1 The objectives developed for the proposed scheme are as follows:

- To reduce congestion and unreliability by improving and sustaining base year 2004 journey times for commercial and public transport traffic until 2033.
- Measures must minimise the risk of transport related accidents especially for vulnerable users in the vicinity of the junction to improve on 2002 - 2006 casualty levels.
- To make socially-inclusive and healthy transport modes more attractive to use, including cycling, walking and public transport measures to be promoted in all measures.

- To minimise traffic induced severance on communities by ensuring measures do not have a significant detrimental impact on 2004 walk time accessibility.
- To contribute to ACC's regeneration aims by complementing the development of the Logie/Manor area of Middlefield.

Scheme Description

1.2.2 The location of the proposed scheme is shown on Figure 1.1. The proposed scheme includes approximately 500m of new dual carriageway link road, three new signal-controlled junctions to connect existing roads to the new link road, a detention basin to store and treat surface water run-off and new footways and shared footway/cycleways. The key elements are summarised in Chapter 4 (Proposed Scheme).

1.3 Statutory Context of EIA

1.3.1 EIA of certain road construction or improvement projects is required under the terms of the Roads (Scotland) Act 1984, as amended by Part III of the Environmental Impact Assessment (Scotland) Regulations 1999, the Environmental Impact Assessment (Scotland) Amendment Regulations 2006 and the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 which consolidate, update and replace part II of the 1999 Regulations as amended. This ES has been prepared in accordance with the requirements of the Roads (Scotland) Act 1984 and Directive 2011/92/EU on the effects of certain public and private projects on the environment in so far as it applies to trunk road development. The Directive is implemented in Scotland through the Environmental Impact Assessment (Scotland) Regulations 2011.

1.3.2 Based on the outcome of the Stage 2 environmental assessment, as well as the selection criteria in the Directive, it is considered likely that the proposed scheme would have significant environmental effects and therefore requires an EIA. The screening process was recorded in information to support a Record of Determination, submitted to Transport Scotland in June 2014 (see Appendix A6.3: Record of Determination).

1.3.3 The EIA of the proposed scheme has formed an integral part of the engineering design and appraisal process. The purpose of EIA is to investigate the likely effect of the proposed scheme on the biological, physical and historical environment, as well as on members of the public and on current or planned future use of the environment.

1.3.4 The EIA process also provides a valuable opportunity to reduce potential environmental effects through design refinement. The EIA has informed decision making throughout the design process to address potentially significant effects where practicable, such as by refinement of route alignment or by the incorporation of measures to avoid or prevent, reduce, remedy or offset any potential adverse environmental effects.

1.4 Environmental Statement

1.4.1 The proposed scheme was subject to an EIA, which has established detailed information about the main environmental effects anticipated. This Environmental Statement (ES) reports on the findings of the EIA process.

1.4.2 Annex IV of the Directive and Part III of the 1999 EIA Regulations, confirm the information to be included in an ES. In accordance with these regulations, this ES provides the following:

- a description of the proposed scheme, including details of the site and the road design, land use requirements during construction and operation, and an estimate by type and quantity of any emissions arising from the development;
- an outline of the main alternatives and the main reasons for the choice of the preferred scheme, taking into account environmental effects;

- a description of the aspects of the environment likely to be significantly affected by the proposed scheme;
- a description of the likely significant effects of the proposed scheme on the environment, including direct and any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects, and a description of the forecasting methods used to assess the effects on the environment;
- a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment;
- an indication of any difficulties encountered in compiling the required information; and
- a non-technical summary of the above information.

1.4.3 The structure of this ES is presented in Table 1.1.

Table 1.1: Structure of the Environmental Statement

ES Component	Description
Non Technical Summary	
Provided at the front of the ES	Summary of the ES in non-technical language. Also available as a separate document.
Volume 1: Main Report	
Chapters 1-4	These provide project background and proposed scheme information. Following Chapter 1 (this chapter), Chapter 2 sets out the need for the scheme, Chapter 3 explains the alternatives considered and Chapter 4 provides a description of the Stage 3 design.
Chapter 5	This provides an overview of the assessment process, setting out the environmental parameters considered, and explaining how impact assessments were undertaken.
Chapter 6	This summarises the EIA consultation and scoping process, and provides a summary of the key issues raised and how these have been taken into account.
Chapters 7-17	Reporting of the EIA for each specialist environmental parameter, including an introduction to the subject area, approach and methods, baseline (i.e. existing) conditions, assessment of effects and mitigation and residual effects.
Chapter 18	This provides the assessment made of the overall (cumulative) impact of the proposed scheme. Consideration is also given to the cumulative impact of other developments in the area.
Chapters 19-20	These provide tabulated summaries of the mitigation proposed and the key residual impacts remaining after implementation of mitigation.
Volume 2: Appendices – Specialist Technical Reports	
Appendices A4.1 – A17.2	Technical reference information supporting the ES chapters, such as calculations and detailed background data. Appendix number corresponds to the relevant ES chapter (e.g. Appendix A7.1 relates to Chapter 7, Appendix A11.1 relates to Chapter 11).
Volume 3: Figures	
Figures 1.1 – 15.3	Graphics supporting the ES chapters, illustrating the proposed scheme and environmental information. Figure reference corresponds to the relevant ES chapter (e.g. Chapter 7 refers to Figure 7.1 *et seq*.).

1.4.4 A glossary of terms and a list of abbreviations are also provided at the front of the main report.

1.4.5 This ES presents the assessment of the proposed scheme as described in Chapter 4 (The Proposed Scheme). The design of the proposed scheme may be refined but will still be deemed to comply with this ES provided that such refinements to this design will be subject to environmental review to ensure that the residual impacts will be no worse than those reported in this ES. Any further environmental review would be appropriately reported in a manner to be agreed with the Overseeing Organisation.

1.4.6 Some detailed aspects of the proposed scheme design, such as construction methods and traffic management, will depend on the approved construction proposals of the appointed contractor(s), details of which will not be available until the construction stage. Assumptions have been made

where necessary to inform the assessment, as described in Chapter 4 (The Proposed Scheme) and in individual chapters of the ES where relevant.

1.5 The Assessment Team

1.5.1 The EIA was undertaken, managed and compiled by Jacobs UK Limited. Jacobs UK Limited is an Institute of Environmental Management and Assessment (IEMA) Registered EIA Quality Mark Company. Additional specialist environmental input was also provided to some technical components where appropriate, as identified within the relevant ES chapters.

1.5.2 Independent reviews and audits of assessments have been undertaken at key stages to ensure a robust EIA that complies with requirements of the EIA Regulations. Furthermore, consultees have been consulted with regard to the scope, approach and results of assessment, as described in further detail in Chapter 6 (Consultation and Scoping).

1.6 Review and Comments

1.6.1 Copies of this ES are made available for inspection during normal office hours at:

Transport Scotland
Major Transport Infrastructure Projects (MTRIPS)
Buchanan House
58 Port Dundas Street
Glasgow
G4 0HF

Telephone: 0141 272 7100

08.30 to 17.00 Monday to Thursday

08.30 to 16.30 Friday

1.6.2 The Environmental Statement can be viewed on the following website:

(http://www.transportscotland.gov.uk/project/a90a96-haudagain-improvement)

1.6.3 A bound paper copy of the ES may be purchased at a cost of £215, and the ES is also available in DVD format at a cost of £10 by writing to Transport Scotland at the address shown above, or by email to: info@transportscotland.gsi.gov.uk.

1.6.4 Any person wishing to make representation on the ES should write to Transport Scotland at the above address. Representations must be received within six weeks of the advertised date of publication of the ES.

1.7 References

Environmental Impact Assessment (Scotland) Regulations 1999, Part III, Roads.

Jacobs UK Limited (2014). A90/A96 Haudagain Improvement. Options Sifting Report.

Jacobs UK Limited (2014). A96/A90 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment.

Jacobs UK Limited (2014). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment, Part 2: Environmental Assessment.

SiAS Limited (2008). A96(T)/A90(T) Haudagain Improvement STAG Report - Aberdeen City Council on behalf of Transport Scotland and Nestrans.

2 Need for the Scheme

2.1 Introduction

2.1.1 This chapter sets out the main reasons why the proposed scheme is required. A summary of existing traffic conditions in the locality of the proposed scheme is also provided.

2.2 Existing Haudagain Roundabout

2.2.1 The Haudagain Roundabout is located to the north-west of Aberdeen city centre and is the junction between the A90 and A96 trunk roads. The A90 is a strategic trunk road linking Edinburgh to Fraserburgh and the A96 provides an important link between Aberdeen and Inverness. The Haudagain Roundabout is currently operating over its capacity leading to congestion and unreliable journey times. This has caused significant queueing and delays to traffic on approach roads including the A96(T) Auchmill Road and A90 North Anderson Drive.

2.2.2 When complete, the Aberdeen Western Peripheral Route (AWPR) which is currently in construction, will form the Trunk Road network in the Aberdeen area. The effect of the AWPR will be to reduce traffic volumes across a wide area, including along the A90 and A96 corridors. However, due to the significance of Aberdeen as a destination, there will continue to be significant levels of traffic passing through Haudagain Roundabout on a daily basis.

2.2.3 In the long-term the A90 between Stonehaven and Blackdog and the A96 between Haudagain and Craibstone will be de-trunked, at which time responsibility for these roads will transfer to the local Roads Authority, Aberdeen City Council (ACC).

2.3 National Context for the A90/A96 Haudagain Improvement

2.3.1 Previous work to identify measures to address transport problems at the Haudagain Roundabout was undertaken by ACC as part of a study commissioned by a steering group comprising Transport Scotland (TS), the North East of Scotland Transport Partnership (Nestrans) and ACC. The study was undertaken using Scottish Transport Appraisal Guidance (STAG) methodology and included consideration of the wider planning objectives for the area. A report on the assessment of potential improvement options was published in July 2008. Option 5, which required the construction of a new dual carriageway link road through the Middlefield area of Aberdeen, was identified as the preferred option based on the STAG work. ACC and Nestrans have expressed their support for Option 5.

2.3.2 During the Scottish Transport Projects Review (STPR) debate on Wednesday 10 December 2008 the then Minister for Transport, Stewart Stevenson MSP, stated that an appropriate intervention would be made to address operational problems at Haudagain Roundabout following the completion of the AWPR.

2.3.3 In August 2010 the then Minister for Transport, Infrastructure and Climate Change, Stewart Stevenson MSP, announced that Option 5 was the preferred option for improvements at the junction.

2.3.4 Following public exhibitions in April 2014 where Transport Scotland confirmed that Option 5 remained the preferred option for the scheme the then Minister for Transport and Veterans, Keith Brown MSP, stated that the Scottish Government would progress design work so that construction could begin as soon as the AWPR is completed.

Strategic Transport Projects Review

2.3.5 The Strategic Transport Projects Review (STPR) is a study which has been undertaken by Transport Scotland to define the most appropriate strategic investments in Scotland's national transport network between 2012 and 2022.

2.3.6 The STPR has identified road-based improvements in Aberdeen and North East Scotland (A90) to enhance both the physical condition of the route and safety standards to support expected levels of traffic. The STPR has also identified a number of targeted improvements for the A96 as initial priorities, including physical works aimed at providing safer overtaking opportunities such as local realignments and junction improvements.

National Planning Framework 3

2.3.7 The National Planning Framework 3 (NPF3) was published by the Scottish Government in June 2014. This framework sets out a long term vision for the development of Scotland, with a focus on supporting sustainable economic growth and the transition to a low carbon economy. NPF3 is the statutory framework that informs development and investment decisions of the Scottish Government and guides Scotland's spatial development over the next 20 to 30 years. The central vision is set out over four key aspects; a successful, sustainable place; a low carbon place; a natural, resilient place; and a connected place. In relation to the A90/A96 the NPF3 states:

"We will complete dualling of the trunk roads between cities, with dualling of the A9 from Perth to Inverness complete by 2025 and dualling of the A96 from Inverness to Aberdeen by 2030. In addition, the Scottish Government's Infrastructure Investment Plan includes measures to improve the safety, capacity and performance of the strategic inter-city road network."

2.3.8 Further information relating to the national policy context for the proposed scheme is provided in Chapter 17 (Policies and Plans).

2.4 Local Context for the Haudagain Improvement

2.4.1 In addition to the national context, the following local level considerations support the need for the proposed scheme.

Local Planning Policy

Aberdeen Local Development Plan (ALDP) (2012)

2.4.2 The ALDP recognises that good transport connections will support the economic development of Aberdeen and the quality of life for people living and working in the City. The ALDP identifies the Haudagain Improvement scheme under Policy T1 (Land for Transport), along with several other transport schemes in Aberdeen including the AWPR and the Third Don Crossing. Policy T1 safeguards land specifically for the roundabout improvements, along with improvements to surrounding walking and cycling facilities.

2.4.3 The proposed improvements to the Haudagain Roundabout would also contribute to and complement the proposed regeneration of the Middlefield area. It would also provide essential road infrastructure for the proposed residential and commercial developments in the Logie/Manor area, referred to as Opportunity Site (OP19) and Opportunity Site (OP21) in the ALDP. These designations, including details on Middlefield Regeneration, are discussed further in Chapter 7 (Community and Private Assets). The ALDP and its wider policy framework are discussed in Chapter 17 (Policies and Plans).

Local and Regional Transport Policies, Strategies and Other Policies

The Aberdeen Local Transport Strategy (LTS) (2008)

2.4.4 The LTS aims to ensure the provision of an integrated and accessible transport system, as well as minimising the environmental impact of transport and to integrate with and support sustainable development, health and social inclusion. The LTS notes various transport scheme initiatives which includes improvements to the A90/A96 Haudagain junction.

The Aberdeen City Council Strategic Infrastructure Plan (SIP) (2013)

2.4.5 The SIP highlights the key strategic priorities for ACC and supports the aims and objectives of the ALDP. Middlefield is identified in the SIP as a regeneration priority alongside the works associated with the Haudagain Improvement scheme. The SIP notes that the north of Aberdeen currently suffers from serious congestion problems and indicates that the situation will become worse as future development is implemented.

NESTRANS Regional Transport Strategy Refresh (RTS) (2014)

2.4.6 The upgrading of the A90/A96 Haudagain junction is considered to be a key priority for action by NESTRANS under the 'Internal Connections Strategy'.

2.4.7 The provisions of the LTS 2008, SIP 2013 and RTS 2014 are further discussed in Chapter 17 (Policies and Plans).

2.5 References

Aberdeen City Council (2008). Aberdeen Local Transport Strategy, March 2008.

Aberdeen City Council (2012). Aberdeen Local Development Plan 2012.

Aberdeen City Council (2013). Aberdeen City Council Strategic Infrastructure Plan.

Jacobs UK Limited (2014). A96/A90 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment.

North East of Scotland Transport Partnership (NESTRANS) (2014). Regional Transport Strategy Refresh.

Scottish Government (2009). Strategic Transport Projects Review (STPR), November 2009.

Scottish Government (2014). National Planning Framework 3.

3 Alternatives Considered

3.1 Introduction

3.1.1 This chapter provides a summary of the assessment work commissioned by Transport Scotland (TS) and includes an overview of the process undertaken in the selection of a preferred route corridor.

3.2 The Proposed Scheme – Assessment and Development

DMRB Stage 2 Assessment (July 2013 to April 2014)

3.2.1 The DMRB Stage 2 Assessment was carried out in accordance with the Design Manual for Roads and Bridges (DMRB), Volume 5, Section 1, Part 2, TD 37 'Scheme Assessment Reporting' (TD37/93) which sets out a three stage process for developing and assessing trunk road projects.

3.2.2 TD37/93 explains that, at the outset of Stage 2, a wide range of options will have been identified. As part of the STAG work, ACC had identified 41 options through consultation with stakeholders and the public. An additional eight options were subsequently developed by Jacobs UK Limited as part of the current commission. TD37/93 explains that the options considered most likely to meet the objectives of the scheme brief will be selected for a full DMRB Stage 2 assessment. The Options Sifting Report (Jacobs UK Limited, February 2014) outlines the process that was undertaken to select the most appropriate options for this commission.

Options Sifting Report

3.2.3 As part of the options sifting process an assessment of each option was carried out considering the following criteria:

- operational performance;
- scheme objectives;
- environmental impact;
- engineering complexity; and
- cost.

3.2.4 A sifting workshop was held on the 15th of August 2013 where the assessment of each option was considered to identify those options that were most likely to satisfy the above criteria. The approach adopted at the workshop allowed options which had significant performance issues in relation to the above criteria to be suspended from further consideration. The following options were identified as satisfying all of the criteria and were therefore taken forward for a full Design Manual for Roads and Bridges (DMRB) Stage 2 Assessment:

- Option 4 – Signal-Controlled Crossroads;
- Option 5 – New Dual Carriageway Link Road; and
- Option 13 – Signalised Roundabout.

3.2.5 Each of the options taken forward are described in the following paragraphs:

Option 4

3.2.6 Option 4 would replace the existing Haudagain Roundabout with signal-controlled crossroads. The junction area associated with the proposed signal-controlled crossroads was slightly larger than the footprint of the existing roundabout. Carriageway widening was also proposed on the approach arms as follows:

- A90(T) Mugiemoss Road – to be widened to accommodate two lanes in each direction in the vicinity of the junction.
- A96 Great Northern Road – no carriageway widening proposed.
- A90(T) North Anderson Drive – northbound carriageway to be widened to accommodate an additional two lanes on approach to the junction.
- A96(T) Auchmill Road – eastbound carriageway to be widened to accommodate an additional lane on approach to the junction.

Option 5

3.2.7 Option 5, which now forms the proposed scheme, includes a new dual carriageway link road, approximately 500 metres in length, connecting to the A90(T) North Anderson Drive and the A96(T) Auchmill Road. The proposed scheme is discussed in further detail in Chapter 4 (The Proposed Scheme).

Option 13

3.2.8 Option 13 would replace the existing Haudagain Roundabout with a large signalised roundabout. Whilst this option sought to minimise encroachment outside the footprint of the existing roundabout on its eastern side, extensive construction would have been required outside the north-west and south-west extents of the existing roundabout. The larger roundabout would have had a 100 metres inscribed circle diameter (ICD). The roundabout would have operated under direct signal-control, incorporating signals on each external approach and on the circulatory carriageway.

3.2.9 The proposed approach roads were generally within the footprint of the existing roads with widening required at the entries to, and exits from, the roundabout. The roads approaching the roundabout would have been widened as follows.

- A90(T) Mugiemoss Road – widened to accommodate two lanes in each direction in the vicinity of the roundabout.
- A96 Great Northern Road – westbound carriageway widened in the vicinity of the stop line to accommodate the new entry to the larger roundabout.
- A90(T) North Anderson Drive – northbound carriageway realigned to accommodate larger roundabout and the new entry.
- A96(T) Auchmill Road – eastbound carriageway widened to accommodate an additional lane on approach to the roundabout. Westbound carriageway realigned to accommodate the exit from the larger roundabout.

<u>DMRB Stage 2 Assessment Results</u>

3.2.10 The DMRB Stage 2 Assessment Report (Jacobs UK Limited, March 2014) considered the likely engineering, environmental, traffic and economic effects of each option taken forward. The report included a summary of option performance against each assessment heading and also against the scheme objectives. The key points are summarised below.

Engineering Assessment

3.2.11 Options 4 and 13 would require significantly less demolition (17 and 16 properties respectively) than Option 5 (131). However, from a construction perspective, significant disruption to road users could be expected during the construction of Option 4 and Option 13. In comparative terms, Option 5 could be expected to allow the majority of the route to be constructed with minimal disruption to traffic flow as they would be built on the line of the existing A90(T) North Anderson Drive and A96(T) Auchmill Road.

Environmental Assessment

3.2.12 The environmental assessment recorded that Option 5 would have the most significant impacts on the landscape and visual resource and on community and private assets, in part due to the extent of demolition. However, Option 5 did result in the fewest receptors affected by perceptible noise increases and the most receptors affected by perceptible noise reductions, compared to the other route options.

Traffic Assessment

3.2.13 Each of the proposed design options for the Haudagain Improvement scheme were assessed against the Do-Minimum scenario. The Do-Minimum represents the current road network infrastructure along with committed, future year wider area network improvements and traffic growth forecasts.

3.2.14 With the Aberdeen Western Peripheral Route and Third Don Crossing in place by 2018, the combined effects of these schemes would remove traffic from the Haudagain area and lead to decreases in the level of traffic passing through Haudagain junction. As traffic continues to grow beyond 2018, the assessment concluded that the increased capacity of Options 4 and 5 compared to the Do-Minimum scenario allowed more significant journey time reductions to be provided. However, these reductions would not have been provided by Option 13.

3.2.15 With respect to the journey time objective as detailed in Chapter 1 (Introduction) only Option 5 sustains 2004 journey times until 2033 when analysing the junction as a whole.

Economic Assessment

3.2.16 The core economic assessment showed that Option 4 provides the best BCR, followed by Option 5 then Option 13. Although Option 5 provides the greatest level of benefits, particularly journey time benefits, it also has the highest costs.

3.2.17 The sensitivity test using the low growth demand scenario showed that Option 5 would provide the highest levels of benefits and also the highest BCR. Option 4 would provide the lowest level of benefits and has the lowest BCR.

Scheme Objectives

3.2.18 Refer to 3.2.13 – 3.2.15 for performance against the journey time objective.

3.2.19 All three options would meet the accident objective through the provision of signalised junctions to safely manage traffic flows and the provision of signalised crossing points for vulnerable users such as pedestrians and cyclists. The use of current design standards will also contribute to the risk of accidents being minimised.

3.2.20 All three options would meet the walk time objective. Some increases in walk times are predicted, however it is anticipated that through appropriate mitigation measures such as the provision of additional pedestrian routes and the optimisation of signal timings that significant detrimental impacts can be avoided.

3.2.21 All three options would meet the healthy modes objective through the provision of safe and efficient walking routes and crossing points for pedestrians and cyclists.

3.2.22 All three options would meet the regeneration objective. Option 5 would provide direct access to ACC's proposed redevelopment area through a direct access from the new dual carriageway link road. For Options 4 and 13, access to the proposed redevelopment area could be maintained via the existing local road network.

Stakeholder and Community Engagement

3.2.23 Consultation with the community and stakeholders was an integral part of the route options selection process. Feedback from meetings with statutory and non-statutory consultees and replies to consultation letters sent at DMRB Stage 2 all informed the selection process. Consultation processes at Stage 3, as well as consultation undertaken during Stage 2, are further discussed in Chapter 6 (Consultation and Scoping).

Selection of Preferred Option

3.2.24 Following consideration of the DMRB Stage 2 Scheme Assessment findings, Option 5 was confirmed as the Preferred Option on the basis that:

- Option 5 is the only option that would sustain 2004 journey times until 2033 when analysing the junction as a whole.
- Option 5 would provide the greatest journey time saving when assessed against the Do-Minimum scenario.
- While Option 4 would deliver the highest BCR under the core growth scenario, Option 5 would be the most resilient option in terms of delivering economic benefits and would provide the highest level of traffic and economic benefits overall.
- Due to the on-line nature of Options 4 and 13, complicated construction phasing and traffic management would be likely, with significant disruption to the travelling public for extended periods of time and considerable night-time working.
- While land and demolition requirements would be greatest under Option 5, the scheme would contribute to the City Council's regeneration aims by complementing the development of the Logie / Manor area of Middlefield, a scheme objective.
- Option 5 would perform best against the scheme objectives. It would perform best against the journey efficiency objective and the regeneration objective. Although it is currently the worst performing option against the walk time objective, it is anticipated that any adverse impacts can be mitigated and the objective would be met.

Development of the Scheme Design

3.2.25 Following it's conformation as the Preferred Option, Option 5 was taken forward to DMRB Stage 3, and has been subject to ongoing design refinement informed by a range of considerations, including environmental assessment and consultation. The DMRB Stage 3 proposed scheme is described in Chapter 4 (The Proposed Scheme).

3.3 References

Jacobs UK Limited (2014a). A90/A96 Haudagain Improvement. Options Sifting Report.

Jacobs UK Limited (2014b). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment.

Jacobs UK Limited (2014c). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 2: Environmental Assessment.

SiAS Limited (2008). A96(T)/A90(T) Haudagain Improvement STAG Report - Aberdeen City Council on behalf of Transport Scotland and Nestrans.

4 The Proposed Scheme

4.1 Introduction

4.1.1 This chapter provides a description of the proposed scheme, including information on the procurement process, design of the preferred route, layout of the proposed scheme, methods and programme for construction.

4.1.2 This Environmental Statement (ES) reports on the proposed scheme at the Stage 3 level of engineering design as defined in the Design Manual for Roads and Bridges (DMRB).

4.2 Scheme Procurement

4.2.1 It is likely that the proposed scheme would be procured by means of a Design and Build (D&B) Contract. Under the terms of this contract, the Contractor would undertake both the detailed design and construction of the project. The demolition may be procured separately from the road construction works. Upon completion of the proposed scheme, the operation and maintenance of the new roads would be the responsibility of Aberdeen City Council (ACC) and incorporated into the Council's existing roads maintenance scheme.

4.2.2 Under a D&B style of contract, a specimen (outline) design is prepared for the proposed scheme, which the appointed Contractor(s) can optimise as the detailed design is developed. Such optimisation must be in accordance with the relevant statutory documents approved for the scheme, including the ES and Made Orders, together with any specific limits set within the contract documents. Chapter 19 of this ES provides the Schedule of Environmental Commitments to help ensure that the detailed design would be implemented in compliance with this ES.

4.3 Sustainable Development Policy

4.3.1 Consideration of sustainable development issues forms an important element of all activities in the project's life cycle, including:

- project design and appraisal;
- tender evaluation;
- construction;
- maintenance; and
- operation (and decommissioning).

4.3.2 The project includes the following examples of environmental principles of particular relevance to sustainable development:

- promote local / sustainable sourcing of materials;
- promote sustainable design and innovation to reduce material consumption;
- avoid and minimise waste generation;
- maximise re-use of material resources and use of recycled materials; and
- promote more sustainable modes of transport (public transport, non-motorised user (NMU) provision).

4.3.3 The outcomes in relation to sustainability will be taken into account by Transport Scotland (TS) during the progression of the proposed scheme.

4.4 Traffic Conditions

4.4.1 TS maintains a series of permanent Automatic Traffic Counters, three of which are located in the vicinity of Haudagain Roundabout. Data has been extracted from these and used to determine the Annual Average Daily Traffic (AADT) flows at the following locations; A96(T) Auchmill Road, A90(T) Mugiemoss A90 and A90 (T) North Anderson Drive. Data for the A96 Great Northern Road was determined using a classified junction turning count survey provided by ACC.

4.4.2 The Haudagain Roundabout currently has a 7 Day AADT flow of approximately 32,925 vehicles averaged over the 4 counter locations. It is estimated that HGVs constitute approximately 5.5% (based on 2012 figures).

4.4.3 Local traffic information was gathered from manual classified counts, queue length surveys and journey time surveys to produce traffic demand matrices, representative of base year 2012 traffic conditions.

4.4.4 The Aberdeen Sub Area Model version 4A (ASAM 4A) is a strategic transport model covering Aberdeen City and Aberdeenshire and includes the Aberdeen Western Peripheral Route (AWPR), planned public transport (bus and rail) improvements and the developments detailed in the Aberdeen City and Aberdeenshire Development Plan documents. Traffic growth forecasts from the ASAM 4A model inform the Access to Aberdeen from the North (AAFN) forecast year micro simulation models, developed by SIAS Limited, which have enabled assessment of the majority of traffic and economic work for the scheme.

4.4.5 TS is currently in the process of procuring services through The Land Use and Transport Integration in Scotland (LATIS) Framework in order to undertake an independent audit of ASAM4A.

4.4.6 Due to improvements to the wider road network, including the Third Don Crossing and the AWPR, the AADT traffic levels for the opening year (2018) are anticipated to be lower than the 2012 figures at an average at 29,600 over the 4 counter locations. With the design year (2033) the anticipated AADT traffic levels are averaged to be 31,990.

4.4.7 Planned infrastructure improvements across the Aberdeen City and Shire area are represented in the regional traffic model (ASAM4A) which forecasts the holistic effects that planned infrastructure will have on traffic patterns and flows across the region. As the AAFN microsimulation model matrices are informed by ASAM4A, the effects of the regional infrastructure improvements are captured in the development of the microsimulation future year model scenarios.

4.5 Scheme Design

4.5.1 As explained in Chapter 3 (Alternatives Considered), the preferred route for the proposed scheme was identified following the DMRB Stage 2 assessment.

4.5.2 Throughout the development of the proposed scheme described in this chapter, consultation has been undertaken with statutory and non-statutory consultees, including landowners who may be affected by the proposals. The feedback received from these consultations has been used to inform the DMRB Stage 3 design, with measures implemented, where reasonable and practicable, to address specific areas of concern. Further information regarding the consultation process is provided in Chapter 6 (Consultation and Scoping), with a summary of consultation responses and how these have been addressed provided in Appendix A6.2 (Summary of Consultation Responses).

4.5.3 The environmental constraints and issues identified within the study area of the proposed scheme have significantly informed scheme development. The DMRB Stage 3 design has been developed iteratively, taking into account the recommendations of environmental specialists, information sourced from the consultation process, and the results from the traffic, structural, geotechnical and drainage studies.

4.5.4 The proposed scheme design is shown on Figure 4.1 and environmental constraints are identified in Figure 4.2.

4.6 Summary of the Proposed Scheme

4.6.1 TS is taking forward development of the proposed scheme and has committed to beginning construction following completion of the AWPR. The proposed scheme would consist of the construction of a new link road approximately 500m in length to the south-west of the existing Haudagain Roundabout. The demolition of 129 residential and community premises would be required to accommodate this route.

Scheme Description

Mainline

4.6.2 The mainline of the proposed scheme consists of a new dual carriageway link road, approximately 500m in length, connecting to the A90(T) North Anderson Drive and the A96(T) Auchmill Road. Junctions between the link road and the A90 and A96 are proposed at the locations where Manor Avenue and Manor Drive currently connect to these roads.

4.6.3 The Link Road is designed as a dual 2 lane urban all-purpose road cross-section, in accordance with DMRB TD27/05, with a design speed of 70A kph. The proposed footway adjacent to the northbound carriageway is 3m wide including a 1m buffer strip and the proposed shared footway/cycleway adjacent to the southbound carriageway is 4m wide including a 1m buffer strip.

Mainline Junctions

4.6.4 Signal-controlled T-junctions are proposed at the western and eastern extents of the proposed Dual Carriageway Link Road where it connects to the A96 and A90 respectively. A signal-controlled crossroad is also proposed at the approximate midpoint of the proposed Dual Carriageway Link Road to provide local access to Logie Avenue to the north and to Manor Avenue to the south.

Side Roads

4.6.5 The following ACC side roads require reconfiguration as part of the proposed scheme:

- Manor Avenue to be realigned to tie-in to the new dual carriageway link road.
- Manor Drive to be stopped up at its northern extent.
- Logie Avenue to be realigned to tie-in to the new dual carriageway link road.
- Logie Place to be stopped up at its eastern extent.
- Logie Terrace to be stopped up at its southern extent.
- Manor Terrace to be stopped up.

4.6.6 Side roads will be reconfigured as necessary to accommodate the proposed scheme, as detailed in Table 4.1 below.

Table 4.1: Proposed Side Road Amendments

Side Road Name	Approximate mainline chainage (cross-reference with Figure 4.1).	Cross-section*
Proposed Realigned Manor Avenue	Ch. 245m	ACC Local Distributor Road: 3m footway (including 1m buffer strip), 7.3m carriageway, 3m footway (including 1m buffer strip)
Proposed Logie Avenue – West	Ch. 245m	ACC General Access Road: 2m footway, 6.5m carriageway, 2m footway
Proposed Logie Avenue – East	Ch. 245m	ACC General Access Road: 2m footway, 5.5m carriageway, 2m footway
Proposed Access to Manor Avenue	Connects to the Proposed Realigned Manor Avenue at Ch. 130m.	ACC General Access Road: Varies

* Minimum dimensions

Side Road Junctions

4.6.7 Major/minor priority junctions (T-junctions) are proposed at the following locations:

- Proposed Realigned Manor Avenue / Access to Manor Avenue Junction.
- Proposed Logie Avenue - West / Logie Avenue - East Junction.

Access to Land and Properties

4.6.8 A combined access track serving a domestic property at 871 Great Northern Road and a proposed Sustainable Drainage Systems (SUDS) detention basin is required. 871 Great Northern Road is currently accessed via Manor Drive, however a revised access is proposed via A96(T) Auchmill Road. A new access serving 438-440 Auchmill Road is required due to the existing access being stopped-up. A new access serving Manor Park Caravan Park is required due to the existing access being stopped-up. A new access is also required to maintain vehicular access between 73 Manor Avenue and the proposed Access to Manor Avenue.

Table 4.2: Proposed Access Provision forming part of the Proposed Scheme

Access Road Name	Approximate mainline chainage (cross-reference with Figure 4.1).	Cross-section
Combined Detention Basin Access Track / 871 Great Northern Road	New access provided from Great Northern Road.	• 1m verge, 3m track, 1m verge (with local widening to accommodate swept paths of design vehicles).
Access Track 438-440 Auchmill Road	New access provided from Manor Drive.	• 1m verge, 3m track, 1m verge (with local widening to accommodate swept paths of design vehicles).
Access Track Manor Park Caravan Park	New access provided from Manor Drive	• Cross-section to accommodate swept path of design vehicle.
Access Track 73 Manor Avenue	New access provided from Manor Avenue	• 3m track (with local widening to accommodate swept path of design vehicle if required).

Pedestrian and Cyclist Provision

4.6.9 Facilities for NMUs such as pedestrians and cyclists are an integral feature of the proposed scheme, with various links and accesses being provided to assist such movements. Existing

footways, footpaths and cycleways are shown in Figure 15.1 with further detail of proposed changes being shown in Table 15.10 of Chapter 15 (Effects on All Travellers).

4.6.10 Figure 15.3 illustrates the intended provision for NMUs with the proposed scheme in place.

4.6.11 The development of the proposed scheme design followed an iterative process in which provision for maintaining NMU journeys was taken into account (i.e. the proposed scheme design already has 'embedded' mitigation). Proposed facilities for pedestrians and cyclists are as follows:

- Extension of existing crossing point on the A90(T) North Anderson Drive.
- Replacement of existing pedestrian crossing point on Manor Drive at the proposed A96(T) Auchmill Road junction. Provision of a pedestrian crossing point on A96(T) Auchmill Road providing direct access to the existing bus stop located on the eastbound carriageway (west of the proposed junction).
- Provision of pedestrian crossing points through the proposed signalised junction to maintain access between the realigned Manor Avenue and Logie Avenue.
- Provision of steps to provide pedestrian access between the existing Manor Avenue and the Proposed Dual Carriageway Link Road including direct access to a proposed bus stop.
- Provision of steps to provide pedestrian access between the existing Manor Terrace and Manor Avenue and access to the realigned Manor Avenue.
- Footpath providing access between Logie Place and the Proposed Dual Carriageway Link Road.
- Footway/cycle route alongside the existing Manor Avenue.
- Footpath link from the existing Logie Terrace to the realigned Manor Avenue.
- Provision of a 2m wide footway (with an additional 1m separation strip) along the full length of the northbound carriageway of the Proposed Dual Carriageway Link Road and both sides of the realigned Manor Avenue.
- Provision of a 3m wide shared cycle route/footway (with an additional 1m separation strip) along the full length of the southbound carriageway of the Proposed Dual Carriageway Link Road.
- Provision of 2m wide footways along both sides of the realigned Logie Avenue with a proposed footpath providing access between Logie Avenue (West) and the Proposed Dual Carriageway Link Road.
- Footpath providing access between the existing Manor Drive and the Proposed Dual Carriageway Link Road.
- Provision of a signalised NMU crossing point on the Proposed Dual Carriageway Link Road (east of the Proposed Dual Carriageway Link Road / A90(T) Auchmill Road junction).
- Provision of two signalised NMU crossing points on the Proposed Dual Carriageway Link Road / A90(T) North Anderson Drive junction.

Earthworks

Cuttings and Embankments

4.6.12 The location of cuttings and embankments are shown on Figure 4.1 and summarised in Table 4.3 below. The slope angles of cuttings and embankments in the Stage 3 design are generally at a gradient of 1:2.

Table 4.3: Road Cuttings and Embankments in DMRB Stage 3 Design

Location	Cuttings		Embankments	
	Chainage	**Max Depth at Centre Line**	**Chainage**	**Max Height at Centre Line**
Proposed Dual Carriageway Link Road	Ch. 000m – 200m	1.70m	Ch. 200m – 295m	2.60m
	Ch. 295m – 473m	2.40m	N/A	N/A
Proposed Realigned Manor Avenue	Ch. 025m – 211m	2.7m	Ch. 000m - 025m	0.80m
Proposed Logie Avenue - West	N/A	N/A	Ch. 000m – 135m	2.00m
Proposed Logie Avenue - East	N/A	N/A	Ch. 000m – 090m	2.30m
Proposed Access to Manor Avenue	Ch. 000m – 077m	1.90m	N/A	N/A

Earthworks Balance

4.6.13 A summary of the estimated earthworks quantities for construction of the proposed scheme is provided below in Table 4.4, with further details of material use and management of waste during construction provided in Chapter 16 (Materials). The export quantity is material that is considered unsuitable to be re-used as engineering fill and cannot be accommodated due to limited scope for additional landscaping.

Table 4.4: Estimated Earthworks Volumes

Import/Export (disposal)	Approximate Volume (m^3)
Estimated Import	18,200
Estimated Disposal	31,700

Fencing and Noise Barriers

Fencing

4.6.14 To secure the land area acquired for the implementation of the proposed scheme, temporary fencing would be erected prior to the commencement of construction, where appropriate.

4.6.15 On completion of the works, any boundary fencing will be designed to be as unobtrusive as possible, with the fence type and alignment designed to minimise visual impact. Alternative methods of signifying property boundaries may include the planting of hedgerows or the construction of walls. However, it is important to note that a highway fence is not a requirement for an A-class road, and provision would therefore be subject to review through the detailed design.

Noise Barriers

4.6.16 Environmental barriers will be used to reduce the potential impacts of the proposed scheme at specific locations as described in Chapter 14 (Noise and Vibration).

Drainage Design

4.6.17 The proposed scheme design takes into consideration The Water Environment (Controlled Activities) (Scotland) Regulations 2011 and the Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 (together referred to as CAR) (Scottish Government, 2011 & 2013). These regulations require certain activities in the water environment to be authorised by the Scottish Environment Protection Agency, including surface water discharges.

4.6.18 Under CAR, SUDS are a legal requirement in Scotland for new developments, including new and improved road schemes. The drainage design strategy for the proposed scheme has been developed in accordance with SUDS guidance and through consultation with SEPA and ACC to provide adequate attenuation and treatment for road runoff from the new drainage areas prior to discharging to the Scatter Burn.

Traffic Signs and Lighting

Traffic Signs

4.6.19 The traffic signs required in the provision of the proposed scheme would be prepared to the relevant design standards. As part of the design process for the large advance direction signs, the Contractor would consult TS and the local roads authorities to develop and agree a destination strategy.

Lighting

4.6.20 The lighting design is in accordance with ACC's lighting and electrical specification, DMRB, BS 7671 (IET Wiring Regulations) and BS5489-1:2013 (Code of Practice for the Design of Road Lighting).

4.6.21 The lighting appraisal which was undertaken as part of the DMRB Stage 3 engineering assessment concluded that the preferred option is to install Light Emitting Diodes (LEDs) as opposed to the conventional High-Intensity Discharge (HID) lighting, which is currently in operation on ACC's existing road network. The use of LEDs would improve sustainability within the proposed scheme by providing a significant reduction in energy use and carbon emission (based on the 25 year life span of an LED).

4.6.22 The LEDs' control gear is proposed to be a Central Management System (CMS) which is compatible with ACC's current CMS provider. This will allow ACC to remotely control the lighting so that it can be controlled, dimmed, trimmed and monitored in order to provide the right amount of light at the right time and in the right place to achieve energy reductions and reduce environmental impacts.

4.7 Construction Methods and Programme

4.7.1 This section provides a brief outline of the envisaged construction programme and typical construction activities. Typical construction methods for these activities and the construction assumptions made for the purposes of this ES are provided in Appendix A4.1.

4.7.2 This section sets out a possible construction sequence for the proposed scheme, however, the design and construction process adopted by the Contractor may vary from that described in this outline methodology. The Contractor would be permitted to change the construction process and duration of each works element provided that environmental effects are no greater than those described in the ES, and that commitments given in the ES are adhered to or measures are implemented to provide equivalent mitigation, subject to agreement with TS.

4.7.3 It is currently anticipated that construction will commence late 2017 and is expected to be completed within two years.

Outline Construction Programme

4.7.4 To assist the EIA process, the approximate duration of construction activities has been estimated. A timescale for each element of the works is difficult to determine precisely as this would be determined by the date of commencement of the works, and the construction methods employed by the Contractor. An outline of the possible timing for the works is indicated in Table 4.5.

Table 4.5: Indicative Construction Works Timescales

Phase	Timescale (weeks)
Advance Works	
Works Area Established	1
Traffic Management	1
Site Clearance and Demolition	23
Service Diversions	8
Total Duration of Advanced Works	**23**
Main Contract Works Phase 1	
Reconfiguration of Traffic Management	1
Service Diversions	8
Construct Detention Basin and outfall to Scatter Burn culvert	8
Construct Sections of Link Road (Northbound and Southbound carriageway)	12
Construct section of existing Manor Avenue	4
Total Duration of Phase 1	**12**
Main Contract Works Phase 2	
Reconfiguration of Traffic Management	1
Service Diversions	4
Continue construction of Sections of Link Road (Northbound and Southbound carriageway)	24
Completion of Logie Avenue (East and West) including bus turning area	8
Total Duration of Phase 2	**24**
Main Contract Works Phase 3	
Reconfiguration of Traffic Management	1
Service Diversions	4
Construct Sections of Link Road (Northbound Carriageway)	12
Total Duration of Phase 3	**12**
Main Contract Works Phase 4	
Reconfiguration of Traffic Management	1
Service Diversions	4
Completion of A96(T) Auchmill Road tie-in	4
Construction of Realigned Manor Avenue and access to Manor Avenue	12
Total Duration of Phase 4	**12**
Main Contract Works Phase 5	
Reconfiguration of Traffic Management	2
Undertake pavement works on A96(T) Auchmill Road	4
Undertake pavement works on A90(T) North Anderson Drive	4
Total Duration of Phase 5	**8**

Note: Some activities may run concurrently.

Typical Construction Activities

4.7.5 The key elements of the construction works have been broken down to facilitate the assessment of environmental effects. The construction activities associated with the proposed scheme are outlined in Table 4.6.

Table 4.6: Typical Construction Activities

Section	Construction Activities
Advance Works	• Environmental mitigation to be implemented in advance of the main construction contract. • Advance services diversions. • Building demolitions. • Archaeological investigations and excavations.
Roadworks	• Site establishment and plant compounds at strategic locations. • Temporary and permanent fencing. • Site clearance and demolition. • Temporary and permanent surface water outfalls. • Service diversions. • Topsoil stripping and storage. • Pre-earthworks drainage. • Earthworks (cuttings and embankments). • Environmental bunds and landscaping. • Drainage, service ducts and chambers. • SUDS Detention Basin. • Topsoil spreading, seeding and turfing. • Pavement construction. • Roadwork finishes including road restraint systems, traffic signals, traffic signs and road markings. • Accommodation works.
Structures	• Culvert reconstruction following drainage connections. • Retaining wall construction.
Environmental	• Earthworks mitigation. • Landscape and ecological mitigation planting.
Temporary Works	• Temporary carriageway to maintain traffic flows where roads are narrow or are affected by construction of the scheme. • Narrow lanes, contraflows or lane / road closures. • Stream diversions to facilitate culvert construction. • Temporary balancing ponds at drainage outfalls.
Maintenance	• Landscaping maintenance. • Pavement rehabilitation and other routine maintenance and defects repair works • Winter maintenance.

Construction Compounds

4.7.6 The location of construction compounds is not known at this stage, as these will be determined by the appointed Contractor depending on phasing and execution of the works. However, where possible these would be located close to the proposed works where there is suitable access.

4.7.7 The proposed scheme is to be progressed under the Roads (Scotland) Act 1984. Under this legislation, the Contractor may wish to acquire additional land for construction compounds outside the land identified on the Compulsory Purchase Order (CPO). In this case, a separate planning application or a number of planning applications for the construction compounds may be required. This requirement may also apply to any other land that may be required beyond the CPO for related activities such as of temporary access routes/haul roads. Further information regarding the CPO process can be found in Chapter 7 (Community and Private Assets).

4.7.8 The construction compounds would provide toilet facilities, messing facilities and parking for office based staff and site operatives. In addition, stores and workshop areas located within or near the compounds would be provided for the construction phase.

Environmental Mitigation

4.7.9 The Contractor would be required to implement all relevant environmental mitigation measures at the appropriate time. These would include a range of measures to avoid or reduce construction and operational effects.

4.7.10 Where possible, physical environmental mitigation features, such as earthworks, would be constructed soon after the completion of the main engineering elements. Earthworks side slopes and verges would be top soiled and seeded/planted early to minimise the risk of sediment-laden runoff, which may affect the carriageway drainage system and create a potential pollution risk to watercourses. Planting works and ecological habitat creation areas are seasonally dependent and these may be left until later in the construction period following completion of the main works.

Land Acquisition

4.7.11 The land to be acquired for the proposed scheme includes land necessary to construct the proposed scheme and associated infrastructure and to undertake essential environmental mitigation measures.

4.7.12 All construction work would take place within the limit of the land made available to the Contractor as defined within the contract documents. However, as explained above in paragraph 4.7.7, construction compounds may be out with this land. The land made available would include some or all of the land acquired under CPO, land to which the Scottish Ministers already has ownership of or access to, or other areas the Contractor has acquired by agreement to facilitate construction of the works.

4.7.13 The Contractor may wish to utilise other areas of land not covered by the CPO. In such an instance, the Contractor would have to secure the use of these areas by agreement and through separate planning applications, where appropriate. As the location of these areas is currently unknown, it has not been possible to include an assessment of the effects of them within this ES.

4.8 References

Highways Agency et al. (2005). DMRB Volume 6, February 2005, Part 2, TD 27/05 Cross-sections and Headrooms. The Highways Agency, Scottish Government, Welsh Assembly Government and Department for Regional Development Northern Ireland.

Jacobs UK Limited (2014a). A90/A96 Haudagain Improvement. Options Sifting Report.

Jacobs UK Limited (2014b). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment.

Jacobs UK Limited (2014c). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment, Part 2: Environmental Assessment.

Roads (Scotland) Act 1984. www.legislation.gov.uk/ukpga/1984/54/contents

Scottish Government (2011). Environmental Impact Assessment (Scotland) Regulations 2011 (as amended).

SiAS Limited (2008). A96(T)/A90(T) Haudagain Improvement STAG Report - Aberdeen City Council on behalf of Transport Scotland and Nestrans.

Water Environment (Controlled Activities) (Scotland) Regulations 2011. www.legislation.gov.uk

5 Overview of Assessment Process

5.1 Introduction

5.1.1 This chapter outlines the general approach followed for the EIA of the proposed scheme in accordance with the Design Manual for Roads and Bridges (DMRB) and other relevant guidance. More detailed methodologies are provided in the respective chapters.

5.1.2 The aims of the environmental assessment are to:

- gather information about the environment of the study area and identify environmental constraints and opportunities associated with the area which may influence, or be affected by the proposed scheme;
- identify and assess potential environmental effects; and
- identify and incorporate into the scheme design and operation, features and measures to avoid, reduce or offset potential adverse effects, or in some cases to enhance predicted beneficial effects.

5.2 Scope and Guidance

Trunk Road EIA

5.2.1 The A90 and A96 to the west of Haudagain Roundabout are currently operating as trunk roads. The term 'trunk road' in Scotland refers to the strategic system of major roads and associated structures (including bridges) for which the Scottish Ministers have responsibility.

5.2.2 Annex E of Circular 8/2007 'The Environmental Impact Assessment (Scotland) Regulations 1999' (Scottish Government, 2007) provides guidance on EIAs of trunk road projects. Although the Environmental Impact Assessment (Scotland) Regulations 2011 consolidated, updated and replaced Part II of the Environmental Impact Assessment (Scotland) Regulations 1999, Parts III and IV of the 1999 Regulations concerning Roads, Bridges and Land Drainage, remain extant. Consequently the guidance contained in Circular 8/2007 in Annex E continues to apply and is relevant to the A90/A96 improvement project.

Design Manual for Roads and Bridges

5.2.3 The DMRB sets out governmental guidance on the development of trunk road schemes and is applicable to the proposed scheme. Volume 11 of DMRB specifically provides guidance on EIA, including the level of assessment at key stages of development and reporting of environmental effects.

5.2.4 DMRB considers three levels of assessment, comprising Stage 1, Stage 2 and Stage 3. The objectives of each stage are identified in Table 5.1.

Table 5.1: DMRB Stages of Environmental Assessment

Stage	Objectives
Stage 1	Identification of environmental advantages, disadvantages and constraints associated with broadly defined route corridors.
Stage 2	Identification of the factors and effects to be taken into account in the selection of route corridor options and in the identification of the environmental advantages, disadvantages and constraints associated with these route corridors.
Stage 3	Assessment to be undertaken in accordance with the 1999, as amended, Environmental Impact Assessment (Scotland) Regulations which implements EC Directive 85/337, with publication of an Environmental Statement or Environmental Assessment Report.

5.2.5 It should be noted that some recent DMRB guidance updates no longer refer specifically to assessment stages as listed above in Table 5.1, such as HA 213/08: Noise and Vibration (August 2008), which refers to 'simple' and 'detailed' assessment. However, for the purposes of consistency and clarity, this Environmental Statement (ES) refers to 'Stage 3 assessment' throughout.

5.2.6 In 2013/14 a DMRB Stage 2 environmental assessment confirmed the Stage 2 route corridor to be taken forward to Stage 3. This ES presents the findings of the DMRB Stage 3 environmental assessment.

Scope of Environmental Assessment

5.2.7 Consultation for the proposed scheme is being undertaken according to the guidance provided in Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment (Scottish Government, 2013), replacing PAN 58 (Scottish Executive, 1999). Cognisance has also been taken of PAN 81: Community Engagement (Scottish Executive, 2007). Chapter 6 (Consultation and Scoping) describes the consultation process.

5.2.8 In accordance with DMRB Volume 11, assessment has been undertaken of the environmental parameters presented in Table 5.2 and reported in Chapters 7 to 18. This environmental topic structure takes into account the advice in Interim Advice Note (IAN) 125/09: Supplementary Guidance for Users of DMRB Volume 11 Environmental Assessment (Highways Agency et al., 2009). In accordance with IAN 125/09, plans and policies were reviewed in the context of each of the topic chapters of this Stage 3 Report (Chapters 7-16), and the results are presented in Chapter 17 (Policies and Plans) and Appendix A17.2 (Planning Policy Context for Environmental Assessment).

Table 5.2: Environmental Parameters Assessed in Chapters 7 to 18

ES Chapter Reference	Environmental Parameter/Title	Comments
7	Community and Private Assets	Combines DMRB Volume 11 topics 'land use' and 'community effects' as proposed by IAN 125/09.
8	Geology, Soils, Contaminated Land and Groundwater	None
9	Road Drainage and the Water Environment	None
10	Ecology and Nature Conservation	None
11	Landscape and Visual	None
12	Cultural Heritage	None
13	Air Quality	None
14	Noise and Vibration	None
15	Effects on All Travellers	Combines DMRB Volume 11 topics 'pedestrians, cyclists and equestrians' and 'vehicle travellers', as proposed by IAN 125/09.
16	Materials	Inclusion of this topic takes cognisance of IAN 153/11 and draft DMRB HD 212/11.
17	Policies and Plans	None
18	Cumulative Impacts	Inclusion of this topic takes cognisance of the definition of a cumulative impact as stated in DMRB HA 205/08, HD 48/08 and IAN 125/09.

Study Area

5.2.9 The study area required or recommended by DMRB and best practice guidance varies depending on the specific environmental parameter being assessed, but is typically 500m in each direction from the centreline of the proposed scheme. However, baseline environmental surveys commenced in parallel with the consideration of various design and alignment options, and accordingly baseline data were collected for a wider study area to enable flexibility in the progression of the proposals.

5.3 Environmental Reporting

Chapter Structure

5.3.1 With reference to guidance set out in DMRB Volume 11 Section 2 Part 6, Chapters 7 to 16, as listed in Table 5.2, provide the following:

- an introduction to the subject area;
- approach and methods used in the assessment;
- baseline conditions (i.e. the 'existing' situation or for certain assessments the anticipated future situation in the absence of the proposed scheme);
- potential effects of the proposed scheme;
- proposed mitigation for the proposed scheme;
- residual effects of the proposed scheme (taking account of proposed mitigation); and
- references.

5.3.2 Chapter 17 (Policies and Plans) and Chapter 18 (Cumulative Impacts) have a slightly modified structure appropriate to the topic area. Chapter 19 (Schedule of Environmental Commitments) and Chapter 20 (Summary of Significant Residual Impacts) are presented in tabular format.

General Approach

Baseline Conditions

5.3.3 This EIA considers likely effects of the proposed scheme on each environmental parameter in comparison to baseline conditions, which were determined through field survey, desk-based review and consultation. Baseline conditions describe the environmental conditions at the site (and in the wider area as pertinent to the particular environmental parameter) in the absence of the proposed scheme (i.e. the 'Do-Minimum' scenario).

5.3.4 For assessments of potential impacts based on traffic data (such as drainage, water quality, air quality, noise and vibration), the assessment takes into account predicted changes in traffic flows in future years for the proposed scheme. This includes traffic generation from committed developments and also the impact of schemes such as the Aberdeen Western Peripheral Route (AWPR) and Third Don Crossing which are expected to reduce levels of traffic passing through the Haudagain junction. Traffic volumes for the Do-Minimum scenario and the proposed scheme were derived from the traffic model as explained in Section 4.4 of Chapter 4 (The Proposed Scheme).

Potential Impacts

5.3.5 The general approach to assessment is based on the determination of the significance of an impact from a combination of the sensitivity or importance of the baseline conditions (i.e. the current site and its environs, including the sensitivity of receptors) and the magnitude of potential impacts. This process is described in the respective environmental chapters, and where alternative approaches were considered more appropriate these are described and justified; such as consideration of ecological effects taking account of Institute of Ecology and Environmental Management (IEEM) guidance in Chapter 10 (Ecology and Nature Conservation).

5.3.6 It should be noted that the magnitude and significance reported within the 'Potential Impacts' section of each chapter are on the basis of no mitigation.

5.3.7 Chapters 7 to 18 describe and assess the envisaged effects of the proposed scheme during both its construction and operation (i.e. following scheme opening).

Mitigation

5.3.8 PAN 1/2013: Environmental Impact Assessment (Scottish Government, 2013) presents mitigation as a hierarchy of measures ranging from prevention of environmental effects by avoidance, to measures to offset any effects that cannot be remedied. The mitigation hierarchy is summarised in Table 5.3.

Table 5.3: Mitigation Hierarchy

Level of Mitigation	Definition
Prevent	To prevent adverse environmental effects at source (e.g. building design or specification of construction equipment).
Reduce	If adverse effects cannot be prevented, steps taken to secure a reduction of effects (e.g. minimisation of the cause of the effect at source, abatement on site and abatement at receptor).
Remedy/offset	When effects remain that cannot be prevented or reduced, they should be offset by remedial or compensatory action (e.g. provision of environmental improvements, opportunities for access and informal recreation, creation of alternative habitats and prior excavation of archaeological features).

5.3.9 Mitigation takes into account best practice, legislation, guidance and professional experience.

5.3.10 Where possible and reasonably practicable, potential adverse environmental impacts of the proposed scheme have been prevented through an iterative approach to the design process (i.e. 'embedded mitigation'), rather than relying on measures to mitigate the effects (e.g. incorporation of access arrangements for vehicles or pedestrians into the design).

5.3.11 Where complete prevention of potential effects was not feasible, measures have been proposed to reduce potentially significant effects through abatement measures either at source, at the site (e.g. visual screen planting and landscaping), or at the receptor (e.g. design of culverts). The level at which effects are considered 'significant' depends on the environmental parameter assessed, but generally potential effects of 'Moderate' or greater significance would be identified as priorities for mitigation.

5.3.12 Where potential adverse impacts cannot be prevented or reduced, consideration has been given to the specification of measures to be included in the contract documents that offset or, in certain circumstances, compensate for any damage. Measures as stipulated in this ES will form contractual requirements on the Contractor (or Transport Scotland where applicable).

Residual Impacts

5.3.13 Residual Impacts sections within the chapters report the anticipated significance of impacts remaining following application of the proposed mitigation identified in the ES.

Summary of Impacts and Mitigation

5.3.14 Chapter 18 (Cumulative Impacts) considers the potential for cumulative impacts of the proposed scheme, and also of the proposed scheme along with other reasonably foreseeable developments.

5.3.15 Chapter 19 (Schedule of Environmental Commitments) provides a summary of proposed mitigation as reported in ES Chapters 7 to 17. Chapter 20 (Summary of Significant Residual Impacts) provides a summary of those impacts still considered significant after successful implementation of any proposed mitigation.

Changes to Scheme Design

5.3.16 The assessment of potential impacts and the identification of mitigation measures in the ES are based on the DMRB Stage 3 design as described in Chapter 4 (The Proposed Scheme). As noted in Chapter 1 (Introduction), the design of the proposed scheme may be refined, but will still be

deemed to comply with this ES provided that such refinements to this design would be subject to environmental review to ensure that the effects would be no worse than those reported in this ES.

5.4 References

Highways Agency et al. (1993). Design Manual for Roads and Bridges (DMRB) Volume 11, June 1993. The Highways Agency, Scottish Government, Welsh Assembly Government and Department for Regional Development Northern Ireland.

Highways Agency et al. (2008). Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 6, August 2008, HD48/08. The Highways Agency, Scottish Government, Welsh Assembly Government and Department for Regional Development Northern Ireland.

Highways Agency et al. (2008). Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, August 2008, HA213/08. The Highways Agency, Scottish Government, Welsh Assembly Government and Department for Regional Development Northern Ireland.

Highways Agency et al. (2011). Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 6, HD212/11. The Highways Agency, Scottish Government, Welsh Assembly Government and Department for Regional Development Northern Ireland.

Highways Agency et al. (2009). Interim Advice Note (IAN) 125/09: Supplementary Guidance for Users of DMRB Volume 11 Environmental Assessment.

Highways Agency et al. (2011). Interim Advice Note 153/11. Guidance on the Environmental Assessment of Material Resources.

Jacobs UK Limited (2014a). A96/A90 Haudagain Improvement, DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment.

Jacobs UK Limited (2014b). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment, Part 2: Environmental Assessment.

Scottish Executive (1999). Planning Advice Note (PAN) 58: Environmental Impact Assessment.

Scottish Executive (2007). Planning Advice Note (PAN) 81: Community Engagement.

Scottish Government (2007). Circular 8/2007: Environmental Impact Assessment (Scotland) Regulations 1999.

Scottish Government (2013). Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment.

6 Consultation and Scoping

6.1 Introduction

6.1.1 This chapter explains the following closely linked elements of the Environmental Impact Assessment (EIA) process:

- Consultation with statutory consultees, other relevant bodies/organisations, and members of the public; and
- Scoping to determine the appropriate assessment approach and technical content of the Environmental Statement (ES).

Consultation

6.1.2 Consultation has provided an iterative and on-going input to the progression of the proposed scheme throughout the EIA and design process. This chapter summarises consultation undertaken and provides a summary of the key issues raised and how these have been taken into account. Appendix A6.1 provides a list of consultees and Appendix A6.2 provides a summary of consultation responses.

6.1.3 The chapter describes the consultation activities undertaken as part of the EIA, which commenced in May 2013, and includes both the initial review of the Design Manual for Roads and Bridges (DMRB) Stage 2 findings and the DMRB Stage 3 assessment of the proposed scheme as reported within this ES. The environmental consultation phases for Stage 2 (May – November 2013) and Stage 3 (July – September 2014) have been considered together within this chapter due to the close proximity of both assessments in time. Responses and information received at Stage 2 was used in the identification of consultees for the Stage 3 consultation phase and EIA as noted in Section 6.2 (Approach and Methods).

6.1.4 The main aims of consultation during the EIA process were to:

- ensure that statutory consultees, other bodies with a particular interest in the environment, and members of the public were informed of the proposals and provided with an opportunity to comment;
- collate baseline information regarding existing environmental site conditions;
- obtain input to the identification of potential impacts and the development of appropriate mitigation;
- inform the scope of the environmental assessment and ES reporting; and
- seek consultee input to the design.

Scoping

6.1.5 As explained in Chapter 5 (Overview of Assessment Process), the scope of EIA for the proposed scheme was defined taking into account DMRB assessment guidance. However, the scope was also informed by the consultation process described in this chapter; through meetings with consultees, review of information received and issues raised, and by a range of technical discussions on detailed methodologies.

6.1.6 A screening and scoping report was completed and submitted to Transport Scotland (TS) in August 2014 (Jacobs UK Limited, 2014) which set out the scope of the EIA and proposed structure of the ES. A Record of Determination (RoD) (Jacobs UK Limited, 2014) confirmed the need for EIA and the scope of the assessment in line with the Screening and Scoping Report. A copy of the RoD is provided in Appendix A6.3 (Record of Determination).

6.1.7 The specific aims of EIA scoping were to:

- identify key environmental issues to be considered as part of the EIA; and
- agree appropriate detailed methodologies for technical assessments with statutory consultees, such as Scottish Natural Heritage (SNH), the Scottish Environment Protection Agency (SEPA) and Aberdeen City Council (ACC).

6.1.8 An agricultural, forestry and sporting activities assessment was scoped out the Stage 3 assessment. The results of the Stage 2 assessment highlighted that no farming interests, commercial forestry or sporting activities would be impacted as a result of the proposed scheme.

6.2 Approach and Methods

6.2.1 The approach to consultation and scoping for the proposed scheme is described below.

Identification of Consultees

6.2.2 The process undertaken to identify relevant consultees for the proposed scheme aimed to ensure that all relevant consultees were engaged. This involved the following stages:

- A review of stakeholders involved on other major projects and related studies in the Aberdeen area. This included a review of the Aberdeen Western Peripheral Route (AWPR) and the Strategic Transport Appraisal Guidance (STAG) report (SiAS Limited, 2008).
- Input from the environment team. The environment team has been proactive in identifying additional consultees of importance to their area of expertise. These have been and will continue to be added to the database as appropriate.
- Consideration of the scale, size and impact of the proposed route options. The wider community has been taken into consideration. In addition to those directly affected by the scheme, communities and local authorities outwith the direct area of influence have also been included. A large number of environmental organisations have also been included.

6.2.3 A number of consultees were identified through this process at DMRB Stage 2 and Stage 3 including statutory and non-statutory consultees, community councils and interest groups listed in Appendix A6.1 (List of Consultees). The organisations consulted and the information they provided relevant to the EIA are listed in Appendix A6.2 (Summary of Consultation Responses).

Key Stages of EIA Consultation

6.2.4 The EIA consultation carried out is described below.

<u>DMRB Stage 2 Consultation (May 2013 to November 2013)</u>

6.2.5 In total, 32 letters were issued to consultees between May and November 2013 to inform the Stage 2 assessment. This gave consultees the opportunity to provide baseline information and identify key issues that should be considered in the scheme design and assessment. Feedback from the Stage 2 consultation letters were collated and used to inform the design of the three proposed route options and environmental assessment where appropriate.

<u>DMRB Stage 3 Consultation (July 2014 to September 2014)</u>

6.2.6 In July 2014, a further round of consultation was undertaken to inform the Stage 3 assessment and proposed scheme design. Stage 3 EIA consultation letters were issued to consultees requesting updates to the environmental baseline, and also provided them with an opportunity to comment on the scope of the EIA. Responses received were also used to inform the detailed design of the proposed scheme and environmental mitigation measures.

Public Exhibitions (April 2014)

6.2.7 Following the completion of the DMRB Stage 2 assessment, public exhibitions were held at the Lord Provost Henry E Rae Community Centre in Middlefield on the 24th and 25th of April 2014. Over the course of two days 250 people attended the exhibitions. The exhibitions were hosted by TS with support from members of the project team, including representatives of the environmental coordination team. Information was presented on the three route options assessed at Stage 2, and the preferred route option (Option 5) to be taken forward to Stage 3 assessment (i.e. the proposed scheme).

6.2.8 Exhibition visitors had the opportunity to fill in a comments sheet during the exhibitions, or post/ email their responses by the deadline date of 6th June 2014. Feedback forms were made available electronically on the TS website. Queries and comments raised during the public exhibitions have been considered in the development of the detailed design and in consideration of the environmental assessment process, including mitigation measures.

6.2.9 Further public exhibitions will be held at the end of the DMRB Stage 3 assessment following the publishing of the Environmental Statement and Draft Orders. The provisional date for these exhibitions has been set for July 2015.

Drop-in Events (December 2013 –November 2014)

6.2.10 Communication between stakeholders and the project team has been undertaken throughout the EIA process and is ongoing. To encourage community engagement, drop-in events have been held to allow members of the public to find out more about the proposed scheme and to provide an opportunity for local residents to raise any concerns or comments they have. The drop-in events have been hosted by a joint 'Stakeholder and Community Engagement Group' consisting of representatives from Jacobs UK Limited and Aberdeen City Council. Previous events have been held at 2 Logie Place in Middlefield on the following dates:

- 1st drop-in event: 12 December 2013 (10.00 – 16.00)
- 2nd drop-in event: 26 February 2014 (14.00 – 20.00)
- 3rd drop-in event: 26 November 2014 (14:00-19:00)

6.3 Consultation Summary

Consultee Communication

6.3.1 Table 6.1 presents a summary of the consultation meetings held as part of the EIA process from 2013 to 2015. This is intended to record the key meetings only, and not the on-going consultation as described above. As previously noted, consultation is an iterative and on-going feature of the project, so will also continue beyond that reported within this ES.

Table 6.1: Summary of Environmental Consultation Meetings

Consultee	Topic/Purpose	Date
Statutory/Mandatory Consultees		
Aberdeen City Council	Meetings to discuss and plan stakeholder and community engagement strategy.	02 October 2013 02 December 2013 04 March 2014 19 June 2014 26 August 2014 20 November 2014 28 January 2015
	Planning and Environmental Working Group Meeting to discuss environmental impacts identified at DMRB Stage 2; the DMRB Stage 3 EIA process; and	30 May 2014 28 August 2014

Consultee	Topic/Purpose	Date
	mitigation design and landscape/ urban design strategy.	02 December 2014
	Cycle group consultation meeting to discuss proposed footways, footpaths, shared footway/cycleways and cycle routes.	05 August 2014
SEPA	To discuss drainage for the DMRB Stage 2 environmental assessment.	02 October 2013
	To discuss drainage design and water quality.	19 August 2014
Non-Statutory Consultees		
Haudagain Access Forum	Meeting to discuss disabled access provisions to be incorporated into the proposed scheme.	30 July 2014 16 December 2014
Aberdeen Cycle Forum & Cycle Touring Club (Scotland) (CTC)	Cycle group consultation meeting to discuss proposed footways, footpaths, shared footway/cycleways and cycle routes.	05 August 2014
First Group	Meeting to discuss public transport proposals.	16 July 2014
Stagecoach	Meeting to discuss public transport proposals.	16 July 2014
Police Scotland	Meeting to discuss landscape design proposals and assist in reducing the opportunity for crime and the fear of crime, creating a safer and more secure environment.	04 December 2014
Middlefield Area Regeneration Action Group (MARAG)	Meeting to discuss proposed landscape and noise mitigation, and property demolitions.	02 February 2015

6.4 Key Issues Raised by Consultees

6.4.1 Table 6.2 provides a matrix of the input from consultees between May 2013 and January 2015 encompassing both Stage 2 and Stage 3 environmental consultations, in the context of each environmental parameter reported in this ES. Table 6.2 also includes a list of consultees from whom no response was received or no comments raised.

6.4.2 Further details of the key input provided by consultees in relation to environmental issues are provided in Appendix A6.2 (Summary of Consultation Responses). This also includes a response to key queries/comments and, where appropriate, explains how these were taken into account as part of the EIA process with cross-referencing to the relevant chapters of the ES.

Table 6.2: Scoping Matrix of Key Consultee Responses to EIA Scoping Consultation

Consultee	Environmental Parameter											
	General	Community & Private Assets	Geology, Contaminated Land & Groundwater	Water Environment	Ecology & Nature Conservation	Landscape & Visual	Cultural Heritage	Air Quality	Noise & Vibration	Effects on All Travellers	Materials	Policies & Plans
Statutory Consultees												
Historic Scotland							X					
Aberdeen City Council	X	X	X	X		X	X	X	X	X		X
Scottish Environment Protection Agency (SEPA)	X		X	X								
Scottish Natural Heritage (SNH)					X							
Non-Statutory Consultees												
Aberdeen and Grampian Chamber of Commerce	X											
Aberdeen Cycle Forum										X		
Aberdeen Friends of the Earth	X	X		X	X			X	X	X		
British Horse Society										X		
Cycle Touring Club (Scotland) (CTC)										X		
Middlefield Area Regeneration Action Group (MARAG)	X	X				X			X			
Network Rail				X								
North East Scotland Biological Records Centre (NESBReC)					X							
Police Scotland						X						
Scottish Badgers					X							
Scotways										X		
SUSTRANS										X		

No Comments or Issues Raised	No Response	
• Grampian Red Squirrel Group • Scottish Wildlife Trust	• Aberdeen Wheelers • Airport Taxis • Archaeology Scotland • Centre for Ecology and Hydrology • Confederation of Passenger Transport • First Group • Freight Transport Association	• Nestrans • North East Scotland Bat Group (formerly the Aberdeen Bat Group) • Northfield Community Council • River Don Trust • Road Haulage Association • The Garden History Society in Scotland

6.5 References

Jacobs UK Limited (2014). A90/A96 Haudagain Improvement Environmental Screening and Scoping Report.

Jacobs UK Limited (2014b). A90/A96 Haudagain Improvement, DMRB Stage 2 Scheme Assessment, Part 2: Environmental Assessment.

SiAS Limited (2008). A96(T)/A90(T) Haudagain Improvement STAG Report - Aberdeen City Council on behalf of Transport Scotland and Nestrans.

7 Community and Private Assets

This chapter presents an assessment of the potential impacts of the proposed scheme on community and private assets during both construction and operational phases. It outlines measures for mitigating these impacts and describes any residual impacts that may occur with mitigation in place.

The main settlements within 500m of the proposed scheme are Middlefield, Woodside, Hilton, Heathryfold, Northfield and Cummings Park.

Significant residual impacts are expected on 134 residential properties as a result of demolition or acquisition. 14 groups of properties, located on Logie Avenue, Manor Avenue and North Anderson Drive, are likely to experience significant residual impacts due to the loss of communal garden space, and a further two properties due to garden land-take. Landowners would be compensated financially for the loss. Additional residential impacts of the proposed scheme would result from changes to the access routes to/from properties and parking provisions, particularly for properties on Manor Avenue, Logie Place and Manor Drive.

No land-take or demolition of commercial properties is expected as a result of the proposed scheme, with businesses likely to experience temporary benefits as a result of construction workers' spend. Temporary and permanent changes in access are expected for businesses in close proximity to the proposed scheme; however, the impact is not expected to be significant. Therefore, the proposed scheme is not expected to impact the future viability of any businesses in the area.

Five properties associated with three community facilities (Middlefield Community Project Office and Nursery, Logie Neighbourhood Services and Logie Health Clinic) would experience significant residual impact due to demolition and a further three properties associated with two community facilities (Pathways Services Limited and Middlefield Community Project Youth Flat) due to land-take of communal garden space. Exchange land would be provided to compensate for land-take of six areas of allocated Public Open Space (Aberdeen Open Space Strategy 2011 - 2016). Following provision of exchange land the residual impact on the areas of Public Open Space would be reduced to non-significant.

Two development land allocations (Opportunity Site 19 (OP19): Haudagain Triangle, Middlefield and H1: Residential), outlined in the Aberdeen Local Development Plan (ALDP), are anticipated to experience Mixed impacts as a result of large land-take. The proposed scheme would require land-take from allocation H1 but this would allow for the development of the OP19 site through provision of essential road infrastructure, as noted in the ALDP. OP19 forms part of Aberdeen City Council's overarching regeneration plans for the Logie/Manor area of Middlefield. The proposed scheme would complement Opportunity Site (OP21) for replacement housing through provision of vehicular access.

Relief from existing severance at A90(T) North Anderson Drive and A96(T) Auchmill Road is expected due to change in traffic flows resulting from the proposed scheme. New severance is however anticipated as a result of the link road component of the proposed scheme.

7.1 Introduction

7.1.1 This chapter presents the assessment of the proposed scheme on community and private assets. This includes community, residential, commercial and development land, as well as potential impacts on communities. Agricultural, forestry and sporting activities assessments have been scoped out of the Design Manual for Roads and Bridges (DMRB) Stage 3 assessment. The results of the Stage 2 assessment highlighted that no farming interests, commercial forestry or sporting activities would be impacted as a result of the proposed scheme.

7.1.2 The chapter is supported by Appendix A7.1 (Residential Land-take for Proposed Scheme), which is cross referenced in the text where relevant.

7.1.3 In accordance with DMRB Interim Advice Note (IAN) 125/09, this environmental topic covers the previous 'land use' and 'community effects' topics of DMRB Volume 11, Section 3, Part 6 (Highways Agency et al., 2001) and Part 8 (Highways Agency et al., 1993). In relation to community effects (e.g. severance), reference should also be made to Chapter 15 (Effects on All Travellers).

7.1.4 This chapter considers permanent operational and temporary construction impacts of the proposed scheme.

7.2 Approach and Methods

7.2.1 This assessment has been undertaken in accordance with the DMRB Volume 11, Section 3, Part 6 (Highways Agency et al., 2001) and Part 8 (Highways Agency et al., 1993) taking cognisance of IAN 125/09. The approach used to establish the baseline conditions and assess the significance of potential impacts on community and private assets is explained in this section. In relation to impacts resulting from changes to access for 'Non-Motorised Users' (NMUs), all key paths and other routes of access are shown in Table 15.6 in Chapter 15 (Effects on All Travellers).

7.2.2 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to community and private assets has been undertaken and is detailed in Appendix 17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Study Area

7.2.3 Baseline conditions are described below to provide an overview of land use, community and private assets and communities within the study area. The study area for the purposes of the assessment of impacts varied according to the aspects of community and private assets under consideration. For example, DMRB Volume 11 Section 3 Part 6 (Effects on Development Land) does not explicitly state a study area for amenity impacts for land use. It states only that '*the impacts of planned land use changes for a scheme should considered in broad terms, as part of the overall assessment*.' A general 500m study area has therefore been applied for the development land assessment, which is sufficient to encompass both land-take impacts and significant amenity impacts. The study area is defined for the different receptors considered in the assessment as follows:

- Residential and commercial: receptors where land-take or changes in access would be required to accommodate the proposed scheme.
- Community land: areas that would be subject to direct land-take or changes in access as a result of the proposed scheme.
- Development land: planning applications and development plan allocations that are situated within 500m of the proposed scheme.
- Community Severance: residents and community facilities located within 500m of the proposed scheme.

7.2.4 In addition to the above, potential socio-economic impacts on people and communities that may be affected by the proposed scheme were assessed. The study area for this assessment in relation to residents and residential property is defined as those living in areas surrounding the proposed scheme including Middlefield, Hilton, Woodside, Heathryfold, Cummings Park and Northfield. The study area for this assessment in relation to businesses is defined as those that rely on access to the existing Haudagain Roundabout for trade or would be subject to land-take due to the proposed scheme. Potential impacts on employment are considered in the context of the wider local authority area of Aberdeen City Council (ACC).

7.2.5 The assessment considered data within the following areas:

- Neighbourhood zones (Aberdeen City Council, 2011a):
  - C4: Woodside
  - C5: Hilton
  - N7: Heathryfold
  - N8: Middlefield
  - N10: Northfield

  - N11: Cummings Park
- Local Authority area:
  - Aberdeen City Council

Land-take

7.2.6 Land-take is defined as land acquired predominantly through the Compulsory Purchase Order (CPO) process (DCLG, 2004) to provide sufficient land to construct and operate the proposed scheme. The land use assessment considers both permanent and temporary land-take, definitions of which are provided in the following paragraphs.

7.2.7 For the purpose of this assessment, permanent land-take is considered to be areas directly required for the long-term operation of the proposed scheme and includes land required for environmental mitigation such as landscape planting. Temporary land-take is considered to be areas temporarily required to construct but not operate the proposed scheme, such as land required for materials storage or construction access.

Baseline Data Gathering

7.2.8 This assessment considers the potential impact of the proposed scheme on the following receptors:

- Local communities in relation to their ability to access local services and facilities and connect to other communities.
- Residential, commercial and industrial property and associated land such as gardens, garages and parking areas.
- Community facilities including those facilities provided by public authorities and commercial organisations for use by the whole community e.g. doctors' surgeries, schools, hospitals, post offices and general stores.
- Community land including areas that provide an established public recreational resource, such as playing fields, country parks, or areas identified as Open Space within Local Plans.
- Land allocated for development through the ALDP and planning applications.

7.2.9 For the purposes of this assessment, where a community facility is provided by a privately-owned business (e.g. a local general and convenience shop) and is considered a commercial business, this has been assessed as a community facility with any potential impacts being reported under this heading. Community facilities include:

- post offices;
- doctors' surgery/hospitals;
- libraries;
- general and convenience stores;
- dentists;
- schools;
- sports centres;
- residential homes;
- cemeteries; and
- churches.

7.2.10 In relation to retail shops, only general and convenience stores have been considered as community facilities. Convenience stores are very important to some members of the community,

particularly vulnerable groups such as the elderly, who may depend on local stores for their groceries and may not be physically capable of accessing large out of town supermarkets. Other retail outlets are considered as commercial businesses.

7.2.11 Baseline conditions for residential, commercial and community uses were determined through a review of Ordnance Survey (OS) maps, Geographical Information System (GIS) data, information from the design team and a site survey on 24 July 2014.

Development Land

7.2.12 For the purposes of this assessment, development land relates to areas allocated for development as identified in the development plan for ACC, as well as relevant planning applications lodged with the planning authorities.

7.2.13 Potential development land was identified using land allocations set out in the relevant development plan documents consisting of the Aberdeen City and Shire Strategic Development Plan (SDPA, 2014) and the ALDP (Aberdeen City Council, 2012a).

7.2.14 Consultation with ACC was undertaken to identify consented planning applications submitted between 20 December 2011 and 20 December 2014. Section 58 of the Town and Country Planning (Scotland) Act 1997 was amended on 3 August 2009 to reduce the standard duration of planning permission from five to three years. Accordingly, applications prior to 20 December 2011 have been discounted since they would have either been implemented or planning permission would have lapsed.

7.2.15 Planning applications excluded the following:

- householder applications for improvements/extensions;
- local commercial and business applications for minor improvement works and alterations;
- change of use;
- applications for advertisement consent;
- enforcement actions; and
- applications that have been withdrawn or refused.

Consultations

7.2.16 Consultations were undertaken with a number of statutory and non-statutory bodies to inform the assessments reported in the Environmental Statement (ES), refer to Chapter 6 (Consultation and Scoping). This included consultation with ACC for information on planning applications and development land in the study area.

Impact Assessment

7.2.17 The significance of impacts on residential, commercial, community land uses were assessed taking into account receptor sensitivity and impact magnitude. A different approach was applied to the assessment of development land and business viability as standard significance terms are not appropriate.

Residential, Commercial and Community Land/Facilities

7.2.18 The assessment of impacts on residential, commercial and community land considers the direct impacts caused by demolition and land-take on landowners and lease holders as a consequence of the proposed scheme. Impacts on vehicular access to residential, commercial and community land has also been considered in the assessment. Assessment of each impact has been undertaken by determining the sensitivity and magnitude according to the criteria in Table 7.1 and Table 7.2. The impact significance was then determined using Table 7.3. The assessment of magnitude,

sensitivity and resultant significance of impact is based upon indicative criteria and the professional judgement of specialists as DMRB does not provide specific detailed guidance on how this should be assessed.

Sensitivity

7.2.19 As shown in Table 7.1, the sensitivity of community land/facilities is defined by the geographical scale at which visitors are attracted (i.e. local, regional or national). Although cemeteries are generally used by the local community, they are considered to have high sensitivity. The loss of residential or commercial property through demolition or where buildings become uninhabitable is also assessed as high sensitivity. Land-take from residential or commercial property is considered less sensitive, so is assessed as medium sensitivity with derelict/unoccupied buildings the least sensitive.

Table 7.1: Sensitivity Criteria for Residential, Commercial and Community Land/Facilities

Sensitivity	Description
High	• Residential, community or commercial buildings. • Property or land used by the community (e.g. schools, community halls). • Community land that attracts users nationally (e.g. national parks). • Cemeteries.
Medium	• Residential or commercial land e.g. gardens. • Land used by the community on a regional scale (e.g. Country Parks, forests and other land managed in such a way as to attract visitors from a regional catchment).
Low	• Derelict or unoccupied buildings. • Locally used community land (e.g. local parks and playing fields).

Impact Magnitude

7.2.20 As indicated in Table 7.2, the magnitude of impacts was determined based on the degree of change from baseline conditions in terms of land-take and/or access severance.

Table 7.2: Impact Magnitude Criteria for Residential, Commercial and Community Land/Facilities

Magnitude	Description
High	Demolition of property, >50% loss of land and/or complete severance of access due to land-take.
Medium	Between 15% and 50% loss of land and/or major severance of access due to land-take.
Low	<15% land loss and/or partial severance of access due to land-take.
Negligible	Very slight change from the baseline condition. Change hardly discernible, approximating to a 'no change' in conditions.

Impact Significance

7.2.21 The overall impact significance was determined taking into account sensitivity and magnitude, as set out in Table 7.3. It should be noted that as this assessment included a wide range of considerations the final significance category was adjusted in some instances using professional judgement. Where such an adjustment was made, an explanation is provided within the assessment. Impacts are considered adverse, unless otherwise stated.

Table 7.3: Impact Significance Matrix for Residential and Commercial and Community Land

Magnitude / Sensitivity	Negligible	Low	Medium	High
High	Slight	Slight / Moderate	Moderate / Substantial	Substantial
Medium	Negligible / Slight	Slight	Moderate	Moderate / Substantial
Low	Negligible	Negligible / Slight	Slight / Moderate	Moderate

Likely Future Business Viability

7.2.22 DMRB Volume 11, Section 3, Part 6 (Highways Agency et al., 2001) guidance requires an assessment of the likely impacts on future viability of individual businesses affected by the proposed scheme.

7.2.23 A qualitative assessment of impacts on the viability of individual businesses was undertaken using the following criteria:

- Beneficial Impact: the business is likely to be able to continue trading and developing as planned and the proposed scheme may make a beneficial contribution to business development.
- Neutral Impact: the business is affected by the land-take requirements of the proposed scheme, but no impacts on viability have been identified and the business is likely to be able to continue trading.
- Adverse Impact: the business may have to reduce its activities, relocate or close completely.

7.2.24 The qualitative assessment of business viability was based on professional judgement and consultation with Aberdeen and Grampian Chamber of Commerce (refer to Appendix A6.2: Summary of Consultation Responses), with any impacts on business viability assigned into one of the three categories above. It should be noted that this DMRB assessment does not provide more detailed analysis of the scale of beneficial or adverse impact on business viability.

7.2.25 In the event of the loss of any residential or commercial land, the potential provision of financial compensation would be assessed by the District Valuer and was therefore not considered as part of the assessment of business viability process. This ensured that a worst-case approach was taken.

Development Land and Planning Applications

7.2.26 The assessment of impacts of the proposed scheme on development land is based upon the professional judgement of suitably qualified and experienced specialists as DMRB does not provide specific detailed guidance on how this should be assessed. As noted in paragraph 7.2.14 consultation was also undertaken with ACC to identify consented planning applications and development land allocations. The assessment of impacts on development land and planning applications was undertaken using the following criteria:

- Beneficial: the land would still be available for the proposed use and the development of the proposed scheme would improve the viability of the site for the proposed development (generally through improved access). Impacts on the amenity of the site would not interfere with its proposed use or the impact on the amenity would be beneficial, in that the proposed scheme would improve the site's appropriateness for its proposed use.
- Neutral: the land would still be available for the proposed use and there would be no discernible impact on the viability of the site for the proposed development. There would be no impact on the amenity of the site that would interfere with its proposed use.
- Adverse: some of or the entire site would no longer be available for the proposed use and the proposed scheme would reduce the viability of the development taking place or would impact the amenity of the site in such a way as to interfere with its proposed use.
- Mixed: assessment of potential impacts includes some adverse and some beneficial factors.

Community Severance and Local and Wider Socio-Economic Impacts

Community Severance

7.2.27 Community severance is defined in DMRB as '*the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows'*. The construction of new roads, or even relatively minor changes to existing roads, can result

in significant changes to travel patterns within a community. A road may act as a barrier deterring people from using certain community facilities, or conversely, a diversion of road traffic away from a busy road may make an existing road easier to cross, thereby reducing community severance. A reduction in traffic levels is referred to as severance relief as community facilities are more accessible to the community.

7.2.28 The assessment of community impacts considers the degree of potential severance experienced by the community (i.e. the degree to which communities are separated from facilities and services they use within their community). It should be noted that the DMRB guidelines on assessing severance are in relation to 'pedestrians and others'. Therefore, within this assessment the criteria were applied to all users, including vehicles as all users may still be deterred from making journeys which require them to negotiate additional roads and/or junctions. Reference should also be made to Chapter 15 (Effects on All Travellers).

Existing Severance

7.2.29 Existing severance is considered to be the severance of communities from their facilities, as caused by the existing road network. Significance of impacts arising from severance relief was assessed using professional judgement, with reference to the DMRB criteria shown in Table 7.4.

Table 7.4: Significance Criteria for Relief from Existing Severance

Significance	Criteria	
	Built-Up/Urban Area	**Rural Area**
Substantial (beneficial)	When existing traffic levels are reduced by more than 60%.	When existing traffic levels are reduced by more than 90%. However, if the existing road substantially bisects a village or small town, 60% was used.
Moderate (beneficial)	When existing traffic levels are reduced from > 30% to 60%.	When existing traffic levels are reduced from > 75% to 90%. However, if the existing road substantially bisects a village or small town, the above figures are >30% to 60%.
Slight (beneficial)	When existing traffic levels are reduced by approximately 30%.	When existing traffic levels are reduced from 60 to 75%. However, if the existing road passes through a village or on the perimeter of a built-up area, 30% was used.

New Severance

7.2.30 New severance is severance of pedestrians and others from community facilities resulting from the proposed scheme. New severance was assessed using professional judgement, with reference to the DMRB criteria shown in Table 7.5.

Table 7.5: Significance Criteria for New Severance

Significance	Description
Substantial (adverse)	Local residents are likely to experience considerable hindrance or be deterred from making trips to the extent that routes are changed, for example: • pedestrian at-grade crossing of a new road carrying >16,000 vehicles AADT in the opening year; or • an increase in journey distance of over 500m; or • three or more of the hindrances set out under 'Slight' or two or more set out under 'Moderate'.
Moderate (adverse)	When some local residents (particularly elderly or children) are likely to be dissuaded from making trips or where trips would become longer or less attractive, for example: • pedestrian at-grade crossing of a new road carrying between 8,000-16,000 vehicles AADT in the opening year; or • journey distance would be increased by 250-500m; or • two or more of the hindrances set out under 'Slight' applying to single trips.
Slight (adverse)	When some local residents (particularly elderly or children) may be dissuaded from making trips or where trips would become longer or less attractive, for example: • pedestrian at-grade crossing of a new road carrying <8,000 vehicles AADT in the opening year; or • an increase in journey distance by up to 250m; or • one hindrance (e.g. a new bridge or subway) would need to be negotiated.

Local & Wider Area Socio-Economic Impacts

7.2.31 This assessment qualitatively considers the beneficial and adverse socio-economic impacts on the local and wider area as a result of the proposed scheme. This includes consideration of changes to amenity and also how the surrounding communities may benefit or disbenefit during the construction and operation of the proposed scheme. Impacts have been assessed as temporary or permanent and assigned as either 'Beneficial' or 'Adverse' through professional judgement and consultation as DMRB does not provide specific detailed guidance on how socio-economic impacts should be assessed.

Limitations to Assessment

7.2.32 The locations of temporary construction compounds would depend on the appointed contractors, taking into account constraints identified by this ES. Whilst these may be included within the land of the CPO, it is possible that the Contractor would seek planning consent for temporary use of land beyond the CPO. This would be subject to approvals and cannot be assessed at this stage.

7.2.33 DMRB Volume 11, Section 3, Part 6 (Highways Agency et al., 2001) recommends user access surveys to help identify the value of community land. However, in Scotland, the more recent Land Reform Act (Scotland) 2003 states that *'it is the duty of the local authority to assert, protect and keep open and free from obstruction or encroachment any route, waterway or other means by which access rights may reasonably be exercise.*' It is therefore considered that regardless of levels of use and types of user, all routes should be maintained and/or improved where practicable, and surveys to determine usage levels were not required. The sensitivity of community land/facilities has been defined using professional judgement and by taking into account the scale of use/importance determined through consultation with ACC and Middlefield Regeneration Group, along with NMU information provided in Chapter 15 (Effects on all Travellers)..

7.2.34 DMRB Volume 11, Section 3, Part 6 (Annex II) (Highways Agency et al., 2001) identifies the potential for 'blight' to occur as part of a road scheme, though does not require its assessment. Blight can manifest as the reduction in property prices and/or the partial dereliction of an area. Property prices are not a material consideration in the planning process and therefore were not assessed as part of the EIA; however, factors that may contribute to blight are considered in the context of amenity (e.g. noise, visual disturbance and community impacts) and are included within the relevant chapters of this ES: Chapter 11 (Landscape and Visual); Chapter 13 (Air Quality); and Chapter 14 (Noise and Vibration).

7.3 Baseline Conditions

Local Community and Wider Area Population and Demographics

7.3.1 The following information is provided for reader information about the demographics and employment for the areas that fall within 500m of the proposed scheme. According to the 2011 Census (Aberdeen City Council, 2011a), the population of the Local Authority area of ACC is 222,793, approximately 4.2% of the population of Scotland.

7.3.2 A population profile is provided in Table 7.6. This shows the demographic profile of the settlements in the study area in relation to the region and Scotland as a whole.

Table 7.6: Population Profile

Age / Area	0-15	16-24	25-44	45-59	60-74	75+	Total
Woodside	752	846	1,882	826	508	353	5,167
	14.6%	16.4%	36.4%	16.0%	9.8%	6.8%	**n/a**
Hilton	942	963	2,016	1,228	1,026	637	6,812
	13.8%	14.1%	29.6%	18.0%	15.1%	9.4%	**n/a**
Heathryfold	332	205	441	376	274	86	1,714
	19.4%	12.0%	25.7%	21.9%	16.0%	5.0%	**n/a**
Middlefield	785	434	936	503	224	62	2,944
	26.7%	14.7%	31.8%	17.1%	7.6%	2.1%	**n/a**
Northfield	1,132	683	1,483	1,264	784	319	5,665
	20.0%	12.1%	26.2%	22.3%	13.8%	5.6%	**n/a**
Cummings Park	522	312	558	416	257	81	2,146
	24.3%	14.5%	26.0%	19.4%	12.0%	3.8%	**n/a**
Aberdeen City Council	32,135	35,849	67,826	42,498	28,696	15,789	222,793
	14.4%	16.1%	30.4%	19.1%	12.9%	7.1%	**n/a**
Scotland	916,331	632,488	1,402,081	1,117,647	818,314	408,542	5,295,403
	17.3%	12.0%	26.4%	21.1%	15.5%	7.7%	**n/a**

Source: Census 2011, sourced from Neighbourhood Statistics Aberdeen City (Aberdeen City Council, 2011a) and Release 2 Aberdeen City (Aberdeen City Council, 2011b)

7.3.3 Housing statistics indicate that data zone areas of Woodside, Hilton, Heathryfold, Middlefield, Northfield and Cummings Park contain a total of 8,678 dwellings (Aberdeen City Council, 2011a).

Employment

7.3.4 The Job Seeker Allowance (JSA) claimant count, which represents the number of people claiming unemployment-related benefits in an area, gives an idea of the health of the local and regional economy. In this case, the areas of Woodside, and Heathryfold & Middlefield, have respective rates of 6.1% and 4.6%, greater than the national rate of 3.8%. The levels and rates are shown in Table 7.7.

Table 7.7: JSA Claimant Count, June 2013 (population aged 16 to 64)

Settlement / Areas	Claimant Counts	
	Total	Rate (%)
Woodside	159	6.1
Hilton	50	1.4
Heathryfold & Middlefield	134	4.6
Northfield	121	3.6
Cummings Park	55	2.6
Aberdeen City Council	2,762	1.8

Settlement / Areas	Claimant Counts	
	Total	Rate (%)
Scotland	132,569	3.8

Source: Unemployment in Aberdeen Briefing Paper 2013/03 (Aberdeen City Council, 2013a)

7.3.5 The areas of Woodside, Hilton and Heathryfold & Middlefield all have median household incomes of less than £500 per week. Heathryfold & Middlefield and Woodside, respectively, have the second and third highest percentage of households in the ACC local authority area considered materially deprived[1]. Data on household incomes for the aforementioned areas are provided in Table 7.8.

Table 7.8: Household Incomes for the areas of Woodside, Hilton and Heathryfold & Middlefield

Settlement/Areas	Median Gross total household income per week	% of working age households materially deprived
Woodside	£391	26%
Hilton	£480	17%
Heathryfold & Middlefield	£442	29%

Source: Income and Earnings in Aberdeen City and Aberdeenshire Briefing Paper 2013/03 (Aberdeen City Council, 2013b)

7.3.6 Data on occupational status are only available at the Local Authority level as presented in Table 7.9. These data can be interpreted to give an indication of important industries in the ACC area.

7.3.7 The largest differences between Aberdeen City and Scotland as a whole are in the sectors of 'Mining, Quarrying & Utilities' and in 'Professional, Scientific & Technical'. These two sectors support a greater proportion of employment in Aberdeen City than in Scotland as a whole.

Table 7.9: Employment Profile (2009)

Employment Sector	Aberdeen City Council		Scotland	
Total Employees	175,900	-	2,382,500	-
Agriculture, Forestry & Fishing	100	0.06%	33,800	1.42%
Mining, Quarrying & Utilities	22,400	12.73%	61,700	2.59%
Manufacturing	12,000	6.82%	187,800	7.88%
Construction	6,700	3.81%	132,200	5.55%
Motor Trades	2,400	1.36%	40,200	1.69%
Wholesale	4,900	2.79%	73,600	3.09%
Retail	12,900	7.33%	237,500	9.97%
Transport & Storage (incl. Postal)	7,700	4.38%	102,500	4.30%
Accommodation & Food Services	12,200	6.94%	173,400	7.28%
Information & Communication	3,600	2.05%	57,000	2.39%
Finance & Insurance	2,200	1.25%	93,500	3.92%
Property	1,700	0.97%	27,300	1.15%
Professional, Scientific & Technical	23,600	13.42%	149,000	6.25%
Business Administration and Support Services	13,200	7.50%	177,800	7.46%
Education	10,200	5.80%	195,900	8.22%
Health	26,700	15.18%	383,400	16.09%
Public Administration & Defence	7,900	4.49%	153,000	6.42%
Other Services	5,500	3.13%	102,900	4.32%

Source: Scottish Neighbourhood Statistics, www.sns.gov.uk

[1] Material deprivation refers to the inability for individuals or households to afford those consumption goods and activities that are typical in a society at a given point in time, irrespective of people's preferences with respect to these items.

Residential and Commercial Land

7.3.8 To determine the land uses potentially affected by the proposed scheme, an overview of the main residential areas, community facilities (including educational and health facilities), businesses and transport infrastructure is provided below.

Residential Areas

7.3.9 There are many residential properties in the vicinity of the proposed scheme, split between Woodside, Northfield and Bucksburn and Newhill Community Councils. The Community Council boundaries are shown on Figure 7.1. The majority of properties in the immediate vicinity of the Haudagain Roundabout are owned by ACC, notably along Manor Avenue, Manor Drive, Manor Walk, Logie Place and Avenue located within the area of Middlefield.. A further area of residential properties is located to the north of the A90(T) Mugiemoss Road, and situated in the vicinity of Hutcheon Low Drive.

7.3.10 The Scottish Index of Multiple Deprivation (SIMD) identifies small area concentrations of multiple deprivation across all of Scotland, allowing for effective targeting of policies and funding. The 2012 SIMD ranked Northfield, Middlefield, Heathryfold and Cummings Park as areas of significant deprivation (<20% of the Scottish population).

Commercial Activities

7.3.11 The main concentrations of commercial and industrial properties within the study area are located along the A96(T) Auchmill Road, the A96 Great Northern Road (The Haudagain Retail Park), and the B986 Clifton Road. Haudagain Retail Park is located to the south-east of the existing Haudagain Roundabout and contains a Carphone Warehouse, a KFC, a Maplin, and an American Golf store. An Esso/Spar petrol station and bridal wear shop ('A Big Day') are located to the south-west of the existing Haudagain Roundabout. There are individual units west of the existing Haudagain Roundabout that include a Pizza Hut Delivery, a Majestic Wine Warehouse, Active Office Interiors, Enterprise Rent-a-Car and also a number of additional industrial units located to the north-west (A90(T) Mugiemoss Road). To the east of the existing Haudagain Roundabout, along A96 Great Northern Road, there is a Torq/Hursts petrol station, a Farmfoods, a bar ('White Horse Bar'), and a hotel (Zinn Apartments) which fall within the study area. Manor Park Caravan Park is also situated at the north end of Manor Drive. The identified commercial facilities are shown on Figure 7.2.

7.3.12 Business statistics were unavailable at the data zone level, so are presented for the Local Authority level in 2010.

7.3.13 Table 7.10 shows the number and percentage of different types of businesses in the ACC area and in Scotland as a whole. Aberdeen City has a lower rate of businesses in the 'primary industries' sector, and a higher rate in the 'finance intermediation, real estate, renting and business activities' sector.

Table 7.10: Business Profile (2010)

Employment Sector	Aberdeen City Council		Scotland	
Total business sites	9,475	-	185,060	-
Primary Industries	280	2.96%	20,025	10.82%
Manufacturing	550	5.80%	10,210	5.52%
Construction	580	6.12%	17,445	9.43%
Wholesale, retail and repairs	1,650	17.41%	38,005	20.54%
Hotels and restaurants	695	7.34%	15,630	8.45%
Transport, storage and communication	405	4.27%	7,885	4.26%
Finance Intermediation, real estate, renting and business activities	4,165	43.96%	49,610	26.81%

Employment Sector	Aberdeen City Council		Scotland	
Education, Health and Social work	535	5.65%	11,420	6.17%
Other community, social and personal services	615	6.49%	14,830	8.01%

Source: Scottish Neighbourhood Statistics, www.sns.gov.uk

Transport Infrastructure

7.3.14 The Aberdeen to Inverness railway line passes from east to west immediately north of the existing Haudagain Roundabout. Several bus services also operate within the study area.

7.3.15 Access to public transport is covered in more detail in Chapter 15 (Effects on All Travellers).

Community Land

7.3.16 Community land within 500m of the proposed scheme and allocated 'Open Space' within the Aberdeen Open Space Strategy 2011-2016 (Aberdeen City Council, 2012b), includes public parks and gardens; play spaces; residential, business and transport amenity areas; school grounds; green access routes; allotments; golf courses; cemeteries and playing fields. The main areas of community land used for recreation/amenity in the area are provided in Figure 7.3 and detailed below:

- Manor Park (including a children's play area, bmx track and wildlife area);
- Stewart Park;
- Sunnybank FC football ground;
- Woodside Sports Fields;
- Auchmill Golf Course;
- Grove Cemetery;
- Walled Garden to the south-east of Persley Bridge;
- Persley Crescent Gardens Playground;
- River Don;
- Heathryfold allotment garden; and
- Hilton allotment garden.

7.3.17 There are several core paths, local paths and cycle routes located within 500m of the proposed scheme. Further information regarding these footpaths and cycles routes are provided in Chapter 15 (Effects on All Travellers).

Recreational Use of the Study Area Watercourses

7.3.18 Stretches of the River Don are used for recreational rafting and for angling; however, it is not clear whether these activities take place specifically in the stretch that falls within the study area, as no consultation response was received from the River Don Trust.

Community Facilities

7.3.19 Identified community facilities within 500m of the proposed scheme include primary schools, newsagents, places of worship, community centres, leisure facilities and sports complexes. A full list of community facilities is provided in Table 7.11 and displayed on Figure 7.3.

Table 7.11: Community Facilities

Type of Community Facility	Community Facility Name
Church	Middlefield Parish Church
Community Centre and Nursery	Middlefield Community Project Office and Nursery
Community Centre	Logie Neighbourhood Services (2A & 2D Logie Place)
Charity	Pathways Services Limited
Community Centre	Middlefield Community Project Youth Flat
Health Centre	Logie Health Clinic (2B & 4A Logie Place)
Community Centre and Leisure Facilities	Lord Provost Henry E Rae Community Centre
Post Office, Convenience Store	Middlefield Post Office & Newsagent
Care Home	Woodside Care Home
Care Home	Persley Castle Care Home
Community Centre and Leisure Facilities	Sunnybank FC Club House
Youth Club and Leisure Facilities	Aberdeen Lad's Club
Convenience Store	'The Neuk' Newsagent
Convenience Store	Neil McDonald General Store
Councillor Office	Aberdeen Donside Constituency Office
Sub Station	Electricity Sub Station (east of Manor Park Caravan Park)
Sub Station	Electricity Sub Station (east of Manor Terrace)
Sub Station	Electricity Sub Station (Woodside)
Leisure Facilities	Woodside Sports Centre
Water Treatment Works	Persley Wastewater Treatment Works
Educational Facility	Manor Park Primary School
Educational Facility	Smithfield Primary School
Educational Facility	Bramble Brae Primary School

Development Land

7.3.20 Chapter 17 (Policies and Plans) provides a review of the proposed scheme in the context of local, regional and national planning policy. This assessment is concerned with specific land demarcated for the purpose of development.

7.3.21 Potential development land was identified within the ALDP (Aberdeen City Council, 2012a) covering the study area. Table 7.12 provides a summary of the development plan allocations within 500m of the proposed scheme, and there locations shown on Figure 7.4.

Table 7.12: Aberdeen Local Development Plan – Development Land Allocations

Development Plan Allocation	Overview of Allocation
H1, Residential Areas	Land allocated for residential development subject to criteria noted in the ALDP.
H2, Mixed Use	Land allocated for a mix of residential, commercial, industrial and business development.
BI1, Business and Industry	Land allocated for business and industrial uses (Class 4 Business, Class 5 General Industrial and Class 6 Storage or Distribution).
T1, Land for Transport	Land safeguarded for the Haudagain Roundabout improvements.
OP19, Haudagain Triangle (Middlefield)	Following road improvements in this area, land would become vacant and surplus. Proposal for retail park and urban green space.
OP21, Manor Walk (Middlefield)	Housing replacement following the junction improvements at the Haudagain Roundabout.
OP86, 82 to 88 Middlefield Place	Capacity for 8 residential units.
OP116, Smithfield Primary School	School would become vacant on completion of new Manor Park School. Site would be suitable for residential development.
OP135, Woodside	Site identified for 300 residential homes and sports facilities.

Development Plan Allocation	Overview of Allocation
LR1, Land Release Policy	Site reserved for residential and employment related development over three phases: Part A (Housing: 2007 to 2016; Employment: 2007 to 2013); Part B (Housing: 2017 to 2013; Employment: 2024 to 2030); and Part C (Housing: 2024 to 2030).
NE1, Green Space Network	Identifies, protects and promotes a strategic network of woodland and other habitats, active travel and recreation routes, greenspace links, water-bodies, promoting opportunities for outdoor recreation, nature conservation and landscape enhancement.
NE2, Green Belt	No development would be permitted in the green belt for purposes other than those essential for agriculture, woodland and forestry, recreational uses compatible with an agricultural or natural setting, mineral extraction or restoration or landscape renewal.
NE3, Urban Green Space	Permission would not be granted to use or redevelop any parks, playing fields, sports pitches, woods, allotments or all other areas of urban green space for any use other than recreation or sport, unless an equivalent and equally convenient and accessible area for public access is laid out and made available in the locality by the applicant for urban green space purposes.

Planning Applications

7.3.22 Four relevant planning applications (references 121763, 140280, 140835 and 141394) were identified within the study area of the proposed scheme. Application 121763 is for the extension and alteration to existing drive-thru restaurant, alterations to car park and provision of external customer seating area at Haudagain Retail Park; 140280 is for construction of a storage facility in Northfield; application 140835 is for a proposed residential and leisure development in Woodside and application 141394 is for the erection of 20 No.1 bed flats with associated car parking and landscaping.

7.3.23 Table 7.16 (in Section 7.4: Potential Impacts) provides full details of both planning applications, and the potential impacts upon them. The locations of these applications are shown on Figure 7.4.

7.4 Potential Impacts

Introduction

7.4.1 Potential impacts on community and private assets have been identified for the study area and are discussed below. These are assessed in the absence of mitigation, with residual impacts taking account of mitigation identified in Section 7.6 (Residual Impacts). Impacts assessed as Moderate or above are considered significant. This is with the exception of impacts on development land and community impacts which use different assessment criteria as outlined in Section 7.2 (Approach and Methods).

7.4.2 For all impacts relating to access, reference should also be made to Chapter 15 (Effects on All Travellers).

7.4.3 Temporary land-take may be required during construction for the likes of construction compounds, although it is the intention to return any temporary land-take to its original use following the completion of the proposed scheme. The potential impact of this would be short-term and unlikely to be significant. As locations of construction compounds are not known at this stage it is not possible to fully assess temporary land-take during the construction of the proposed scheme.

Residential Land and Property

Construction

7.4.4 Construction of the proposed scheme is likely to result in temporary change in access to several residential properties within the area of Middlefield due to traffic management and diversion measures, particularly along the following roads:

- Manor Drive;
- Manor Avenue;
- Manor Terrace;
- A90(T) North Anderson Drive;
- A96(T) Auchmill Road;
- Logie Place;
- Logie Terrace; and
- Logie Avenue.

7.4.5 Using the assessment matrix displayed in Table 7.3 the significance of this temporary change in access to residential properties during the construction period has been assessed as Slight/Moderate. This is due to the high sensitivity of residential properties and low expected magnitude of impact.

7.4.6 Significant impact on vehicular access to 73 Manor Drive is expected during construction, which would continue through to the operation phase (i.e. permanent). Significant impact on vehicular access to 438 and 440 Auchmill Road and also 871 Auchmill Road during construction is anticipated due to the creation of the link road and detention basin. The operational impacts are discussed in paragraphs 7.4.13, 7.4.14 and 7.4.15 and assessed in Table 7.13.

7.4.7 Parking provisions for properties to the west of the stopped-up area of Manor Avenue, and also for properties on Logie Avenue would be impacted during construction. The proposed scheme would compensate for this through the provision of new parking facilities, which is discussed further in paragraphs 7.4.14 and 7.4.16 and assessed in Table 7.13.

7.4.8 Additional impacts that would occur during the construction period relating to visual impacts and noise are covered in more detail in Chapter 11 (Landscape and Visual) and Chapter 14 (Noise and Vibration).

Operation

Land-take

7.4.9 The proposed scheme would result in the demolition of 124 residential properties and acquisition of a further 10 properties, which are detailed in Appendix A7.1 (Residential Land-take for Proposed Scheme) and shown on Figure 7.5. The significance of impact on these properties has been assessed as Substantial. There is communal garden land within the curtilage of the 124 properties to be demolished and 10 additional properties to be acquired, some of which will be required for the proposed scheme. This land take has been assessed as part of the demolition and acquisition works (i.e. Appendix A7.1 reports as a 100% land-take for all properties to be demolished or acquired). Where communal garden land-take is required from properties not to be demolished this is reported in the following paragraph.

7.4.10 Several residents within the Middlefield area share front and back communal gardens. For the purpose of the land-take assessment, properties have been grouped together based on proximity to these front and back garden areas and likely usage. The grouped properties that would be affected by land-take and the significance of impact is detailed in Appendix A7.1 (Residential Land-take for Proposed Scheme). Please note that three properties associated with two community facilities are present at 26B-C (Pathways Services Limited) and 28A (Middlefield Community Project Youth Flat). To prevent double counting of impacts they have been assessed within the Residential Land and Property section, as the majority of properties at 26 and 28 Manor Avenue are residential. This is further discussed in paragraph 7.4.35. 14 out of the 15 grouped garden spaces would experience significant impacts as a result of land-take of communal gardens. These include:

- 24 to 32 (even) Logie Avenue;
- 14 to 22 Logie Avenue;
- 1 Logie Gardens and 21 to 25 (odd) Logie Avenue;
- 10 Logie Avenue (Flat A to F) (communal front garden);
- 12 Logie Avenue (Flat A to F);
- 1 to 7 (odd) Manor Avenue;
- 9 to 15 (odd) Manor Avenue;
- 17 & 19 Manor Avenue;
- 26 to 28 (even) Manor Avenue (including two community facilities: Pathways Services Limited and Middlefield Community Project Youth Flat);
- 10 – 12 (even) Logie Avenue and 551 – 559 (even) North Anderson Drive (communal back garden);
- 543 & 545 North Anderson Drive;
- 539 & 541 North Anderson Drive;
- 535 & 537 North Anderson Drive; and
- 531 & 533 North Anderson Drive.

Access

7.4.11 This section presents the impacts in relation to residential properties which would experience a change in access/travel distance to a property or parking provisions directly outside a property.

7.4.12 Vehicular access to properties at 438 and 440 Auchmill Road is currently provided off Manor Drive, to the north of Manor Park Caravan Park. As a result of the land-take required for the proposed scheme and stopping-up at the north end of Manor Drive, this access into the properties for parking would be lost. The proposed scheme design incorporates a new vehicular access to the rear of the properties from the stopped-up area of Manor Drive, although direct access onto Auchmill Road would be lost. The landowners would access Auchmill Road via Manor Walk and the proposed re-aligned Manor Avenue (MC 10) and dual carriageway link road (MC 00) (refer to Figure 4.1), which would increase travel distance. The significance of the operational impact due to this change in access has been assessed as Slight/Moderate due to the high sensitivity of the receptors and slight magnitude of impact (i.e. alternative access provided, although loss of direct access to Auchmill Road and increase in travel distance).

7.4.13 The land-take associated with the stopping-up of Manor Avenue to the east and west of Wilkie Avenue would result in some residents losing their current on-road parking directly outside their property. The impact of this would be reduced through the provision of alternative on-road parking facilities, including parking bays and on-street parking, along Manor Avenue as part of the proposed scheme; although this may require some residents to park their vehicle further away from their property. The impact of this has been assessed as Slight/Moderate (due to the high sensitivity of the receptors and low magnitude of impact). The land-take associated with the stopping-up of Manor Avenue to the west of Wilkie Avenue would impact on 73 Manor Avenue as the existing direct access to their driveway would be lost. However, as part of the proposed scheme, an alternative new means of access would be provided. The significance of this impact has been assessed as Slight due to the high sensitivity of the property and Negligible magnitude of impact.

7.4.14 Vehicular access to the rear of 871 Auchmill Road is currently provided via the car park to the south of 20 to 30 Manor Drive. Land-take required for the proposed detention basin would sever this access. The proposed scheme design incorporates a new vehicular access to the property from Auchmill Road, to the east of the proposed detention basin. The significance of the

operational impact due to this change in access has been assessed as Slight due to the high sensitivity of the receptor and negligible magnitude of impact (i.e. alternative access provided).

7.4.15 Residents to the north-east of the proposed scheme along Logie Avenue would also lose parking provisions temporarily in the area as a result of required land-take. On-road parking facilities would be provided along Logie Avenue as part of the proposed scheme, although this may require some residents to park their vehicle further away from their property. The significance of this impact has been assessed as Slight/Moderate as detailed in Table 7.13.

7.4.16 The revised junction at A96(T) Auchmill Road, as part of the proposed scheme, would result in loss of the current access to properties on Manor Drive, Manor Walk, Logie Place and Logie Terrace. Vehicular access from the A96(T) Auchmill Road to these properties would instead be provided through the dual carriageway link road and re-aligned Manor Avenue (MC10) (refer to Figure 4.1). As a result, there would be an increase in travel distance for residents accessing properties in these areas via the A96(T) Auchmill Road.

7.4.17 The proposed scheme would require the stopping-up of Manor Avenue to the east and west of Wilkie Avenue. Direct vehicular access from A90(T) North Anderson Drive to properties on the existing Manor Avenue would therefore not be possible. The proposed scheme design incorporates the provision of a new access road which connects the properties to the proposed re-aligned Manor Avenue (MC10). The new access provision would result in an small increase in travel distance for residents accessing their properties on Manor Avenue and Wilkie Avenue via the A90(T) North Anderson Drive. The significance of impact has been assessed as Slight/Moderate as detailed in Table 7.13.

7.4.18 Access directly from Manor Drive and Logie Place to the remaining properties on Logie Avenue would not be possible as a result of severance from the proposed dual carriageway link road. The proposed scheme design provides Logie Avenue – west (MC 20) and proposed Logie Avenue – East (MC 50). As a result, residents accessing their properties on Logie Avenue from A96(T) Auchmill Road via the proposed dual carriageway would experience an increase in travel distance.

7.4.19 As highlighted in Chapter 5 (Overview of Assessment Process) the development of the proposed scheme design followed an iterative process in which provision for maintaining access and parking was incorporated into the design (i.e. the proposed scheme design already has 'embedded' mitigation). The magnitude and resultant significance of the identified access impacts on residential properties including 'embedded' mitigation is provided in Table 7.13.

Table 7.13: Potential Residential Access Impacts (including embedded mitigation)

Receptor	Impact	Sensitivity	Potential Impact	
			Magnitude	Significance
438 and 440 Auchmill Road	Disruption to vehicular access during construction.	High	High	Substantial
	Direct impact in vehicular access provisions to the property during operation. Alternative vehicular access would be provided as part of the proposed scheme, although direct access to A96(T) Auchmill Road will be lost.	High	Low	Slight/ Moderate
73 Manor Avenue	Disruption to vehicular access during the construction stage.	High	High	Substantial
	Direct impact on existing vehicular access to the driveway; the proposed scheme provides a new means of access.	High	Negligible	Slight
871 Auchmill Road	Disruption to vehicular access during the construction stage.	High	High	Substantial
	Severance of existing vehicular access due to the construction of the proposed detention basin. Alternative vehicular access would be provided as part of the proposed scheme.	High	Negligible	Slight
Properties to the	Temporary disruption to vehicular access to	High	Low	Slight/

Receptor	Impact	Sensitivity	Potential Impact	
			Magnitude	Significance
east and west of the stopped-up areas of Manor Avenue	these properties during construction.			Moderate
	Residents losing parking provision directly outside of their properties as a result of the stopping-up of Manor Avenue east and west of Wilkie Avenue. This would require residents to park their vehicle further away from their property; partial severance of access.	High	Low	Slight/ Moderate
Properties along Logie Avenue	Temporary disruption to vehicular access to these properties during construction.	High	Low	Slight/ Moderate
	Loss of parking provision along Logie Avenue. Alternative parking provision would be provided as part of the proposed scheme to compensate. This may require residents to park their vehicle further away from their property during operation.	High	Low	Slight/ Moderate
	Diverted road access from A96(T) Auchmill Drive; partial severance during operation.	High	Low	Slight/ Moderate
Properties at Manor Drive, Manor Walk, Logie Place and Logie Terrace	Diverted road access from A96(T) Auchmill Drive; partial severance.	High	Low	Slight/ Moderate
Properties at Manor Avenue and Wilkie Avenue	Diverted road access from A90(T) North Anderson Drive; partial severance.	High	Low	Slight/ Moderate

Commercial Land and Property

Construction

7.4.20 For the following receptors, vehicular access may be disrupted during the construction period. The potential impacts are assessed as follows:

- Slight/Moderate significance impact on Manor Park Caravan Park as a result of construction of the new A96(T) Auchmill Road – Manor Drive junction.
- Slight significance impact on Majestic Wine, Pizza Hut Delivery and Active Interiors due to construction on A96(T) Auchmill Road in close proximity.

Operation

Land-take

7.4.21 No permanent commercial land-take is required for the proposed scheme.

Access

7.4.22 Direct access to Manor Caravan Park via the existing A96(T) Auchmill Road – Manor Drive junction would not be possible due to the proposed scheme. Vehicular access from the A96(T) Auchmill Road to the caravan park would instead be provided through the dual carriageway link road and re-aligned Manor Avenue (MC 10). As a result, there would be an increase in travel distance for customers/employees accessing the caravan park via the A96(T) Auchmill Road. The significance of permanent access impacts on Manor Park Caravan Park have been assessed as Slight/Moderate.

7.4.23 No further direct permanent access issues for commercial properties are expected as a result of the proposed scheme.

Impact on Business Viability

7.4.24 During construction, there is likely to be additional spend in the local area by workers and others associated with the construction of the proposed scheme. This impact is likely to be Slight (beneficial) for businesses in the area of Middlefield.

7.4.25 During construction Manor Park Caravan Park may experience significant noise and visual impacts, as a result of the construction of the link road. By 15 years after opening, mitigation planting would have reduced the visual impact as noted in Chapter 11 (Landscape and Visual).

7.4.26 During the construction period, Majestic Wine, Pizza Hut Delivery and Active Interiors are expected to experience significant noise and visual impacts as a result of adjacent construction work. This is covered in Chapter 11 (Landscape and Visual) and Chapter 14 (Noise and Vibration).

7.4.27 During operation, Manor Park Caravan Park, Majestic Wine, Pizza Hut Delivery and Active Interiors are expected to experience an increase in noise level and visual impact although these are not considered significant. This is covered in more detail in Chapter 11 (Landscape and Visual) and Chapter 14 (Noise and Vibration). The increase in noise and visual impact is not anticipated to be detrimental to the future viability of the aforementioned businesses.

7.4.28 No other commercial land or properties have been identified as likely to be impacted by the proposed scheme during operation. The completion of the proposed scheme would result in improved traffic flows and alleviation of congestion at the existing Haudagain Roundabout, which is anticipated to be of benefit to patrons of Majestic Wine, Pizza Hut Delivery and Active Interiors.

7.4.29 The criteria for assessing commercial land and property cover direct impacts only (i.e. land-take or changes to direct access); potential impacts on future business viability are assessed qualitatively as explained in Section 7.2 (Approach and Methods). Potential impacts on commercial land and property as explained above, including future business viability, are summarised in Table 7.14. Impact of future business viability has been assessed as Neutral for Manor Park Caravan Park, Majestic Wine, Pizza Hut Delivery, and Active Interiors; no permanent land-take is required and the anticipated noise and visual impacts would be able to continue trading.

Table 7.14: Potential Business Viability and Direct Impacts on Commercial Land and Property (including embedded mitigation)

Receptor	Impact	Sensitivity	Magnitude	Significance
Manor Park Caravan Park	Temporary change to access during construction (direct impact).	High	Low	Slight/Moderate (Temporary)
	Change to access during operation (direct impact).	High	Low	Slight/Moderate (Permanent)
	Impact on future business viability: Potential significant increased noise and vibration and visual impacts during construction. Impacts are although reduced to non-significant during operation (indirect impact).	-		Neutral
Majestic Wine, Pizza Hut	Temporary changes to access during construction (direct impact).	High	Negligible	Slight (Temporary)

Receptor	Impact	Sensitivity	Magnitude	Significance
Delivery and Active Interiors	Impact on future business viability: Potential significant increased noise and vibration and visual impacts during construction. Impacts are although reduced to non-significant during operation (indirect impact). Improved traffic flows and alleviation of congestion at the existing Haudagain Roundabout, which is anticipated to be of benefit to patrons.	-		Neutral

Community Land and Facilities

Construction

7.4.30 Part of the residential amenity space to the south of 561 North Anderson Drive (approximately 0.0467ha) will be temporarily taken during construction of the proposed scheme. This area of open space will be reinstated following completion of the proposed scheme. The significance of impact on the parcel of land has therefore been assessed as Negligible.

7.4.31 During the construction phase of the proposed scheme vehicular access to the rear of Middlefield Parish Church on Manor Avenue would be disrupted. The significance of this impact on access to Middlefield Parish Church was assessed as Slight/Moderate due to the high sensitivity of community land and low magnitude of impact (partial severance). The impact of this would continue into the operation phase of the proposed scheme which is discussed below.

7.4.32 Access to Manor Park, Sunnybank FC Club House and Lord E Provost Community Centre via the existing A96(T) Auchmill Road – Manor Drive junction and Manor Walk would be disrupted during construction and would be permanently changed as a result of the operation of the proposed scheme. This is discussed further and assessed in paragraph 7.4.38.

7.4.33 Vehicular access to areas of open space, identified in the Aberdeen Open Space Strategy 2011-2016 (Aberdeen City Council, 2012b), would be temporarily disrupted during the construction phase. This includes residential amenity spaces within Middlefield including areas to the south of Logie Place and to the south of Logie Avenue. The impact significance of such disruption to access during the construction phase has been assessed as Slight (i.e. low sensitivity and low magnitude).

Operation

Land-take

7.4.34 Demolition of five properties associated with three community facilities would be required for the operation of the proposed scheme: Middlefield Community Project Office and Nursery (8 Logie Place); Logie Neighbourhood Services (2A and 2D Logie Place); and Logie Health Clinic (2B and 4A Logie Place). The impact significance of the demolitions has been assessed as Substantial.

7.4.35 Communal garden land-take is required from 26 to 28 (even) Manor Avenue which is where two community facilities are located: Pathways Services Limited (26B and 26C Manor Avenue) and Middlefield Community Project Youth Flat (28A Manor Avenue). This has already been assessed as communal garden space within the Residential Land and Property section, as they share land with residential properties. To avoid double counting of impacts it has therefore not been re-assessed within the Community Land and Facilities section. The significance of impact on the three properties associated with the two community facilities was assessed as Moderate/Substantial as noted in Appendix A7.1 (Residential Land-take for Proposed Scheme).

7.4.36 The proposed scheme would require land-take from some areas of residential amenity land identified in the Aberdeen Open Space Strategy. These areas are shown in Figure 7.6 and include

land within Middlefield and a play space at Logie Gardens. Table 7.15 details the significance of the land-take impacts on the areas of open space, as shown in Figure 7.6.

Table 7.15: Potential Impacts on Open Space

Receptor	Sensitivity	Potential Impact (unmitigated)	
		Magnitude	Significance
Residential amenity space south of A96(T) Auchmill Road (approximately 0.0695ha; 100% of total area)	Low	High	Moderate
Residential amenity space to the east of Manor Terrace (approximately 0.1965ha; 100% of total area)	Low	High	Moderate
Residential amenity space to the south of Logie Avenue (approximately 0.0268ha; 100% of total area)	Low	High	Moderate
Playspace at Logie Gardens (approximately 0.4692ha; 81% of total area)	Low	High	Moderate
Residential amenity space to the east of 529 Smithfield Drive (approximately 0.0313ha; 81% of total area)	Low	High	Moderate
Residential amenity space between Logie Terrace and Manor Terrace (approximately 0.145ha; 100% of total area)	Low	High	Moderate

Access

7.4.37 Direct access to the rear of Middlefield Parish Church from the existing A90(T) North Anderson Drive – Manor Avenue junction, and also from the A96(T) Auchmill Road – Manor Drive junction, would not be possible as a result of the proposed scheme. Access would be provided via the link road and onto the re-aligned Manor Avenue (MC10). Parking directly outside the rear of Middlefield Parish Church would not be possible due to the stopping-up of Manor Avenue to the west of Wilkie Avenue. Patrons of the church would now be required to park their vehicle to the east or west of the stopped-up area and walk the remainder of the way, or alternatively, park on Fowler Avenue accessing the church from the front entrance. The significance of this change in access to the rear of Middlefield Parish Church has been assessed as Slight/Moderate.

7.4.38 As noted in the construction section, access to Manor Park, Sunnybank FC Club House and Lord Provost Henry E Rae Community Centre via the existing A96(T) Auchmill Road – Manor Drive junction and Manor Walk would not be possible as a result of the proposed scheme. Through the proposed scheme design, access would instead be provided via the link road and the re-aligned Manor Avenue (MC10). The change in access via the link road and the re-aligned Manor Avenue (MC10) would result in a small increase in journey length and partial severance. The impact of this increase in distance and partial severance has been assessed as Slight/Moderate.

Development Land and Planning Applications

7.4.39 The proposed scheme supports regional and local plans to develop the area, as it improves local and regional connectivity between two key strategic trunk roads (A90 and A96). The potential impacts within the context of planning policy are described in more detail in Chapter 17 (Policies and Plans).

Development Land

7.4.40 The proposed scheme requires land-take from Policy T1 (Land for Transport) outlined in the ALDP. Policy T1, safeguards land for the Haudagain Roundabout improvements. This allocation emerged as a consequence of the Scottish Transport Appraisal Guidance (STAG) assessment (SIAS Limited, 2008) previously undertaken to consider road improvements in the area, which identified a preferred route very similar to the proposed scheme. As Policy T1 has been designated for the Haudagain Roundabout improvement works the impact of required land-take for the proposed scheme is considered Neutral.

7.4.41 Land referred to as the 'Haudagain Triangle, Middlefield' has been identified in the ALDP as an Opportunity Site (OP19) for a retail park and urban green space. Land in the vicinity of Manor Walk, Middlefield has also been identified as an Opportunity Site (OP21) for replacement housing. The proposed scheme requires permanent land-take from OP19. Land identified under Policy OP19 and OP21 would be made available following road improvements in the area, with Policy OP21 noting that housing replacement would be undertaken following *'junction improvements at the Haudagain.'* Taking into consideration the land-take required from OP19, in combination with the benefit of allowing for development within OP19, the overall impact of the proposed scheme on this allocation is considered Mixed. In relation to OP21, the benefit of the proposed scheme's allowance for OP21's development outweighs the minor land-take required and has therefore been assessed as Beneficial.

7.4.42 The proposed scheme requires permanent land-take from areas designated under Policy H1 (Residential Areas) within the ALDP. For non-residential development Policy H1 notes that applications would be approved only if "*they are considered complementary to residential use; or it can be demonstrated that the use would cause no conflict with, or any nuisance to, the enjoyment of existing residential amenity*". As demonstrated in paragraph 7.4.41 the proposed scheme would complement Opportunity Site (OP21) for replacement housing and also ACC's overarching regeneration plans for the Logie/Manor area of Middlefield. In addition, the proposed scheme would provide mitigation to minimise/prevent impacts which would adversely affect enjoyment of existing residential amenity. Such mitigation measures are summarised in Chapter 19 (Schedule of Environmental Commitments) of this ES. The impact of the proposed scheme on Policy H1 is considered Mixed.

7.4.43 The locations of temporary construction compounds are not known at this stage therefore, it is not possible to assess the potential impacts of temporary land-take or access arrangements concerning development land, however, it is not predicted that this would have a significant impact.

Planning Applications

7.4.44 Table 7.16 summarises the relevant planning applications within 500m of the proposed scheme that were considered in this assessment. Figure 7.4 shows the location of the application sites in relation to the proposed scheme.

7.4.45 Planning application 141394 would experience adverse noise impacts, along with a new change in vehicular access to A96(T) Auchmill Road. No direct land-take of the application is anticipated as a result of the proposed scheme and is therefore unlikely to affect the overall viability of the site. The significance of impact on planning application 141394 has been assessed as Mixed due to the anticipated adverse impacts (i.e. noise and change in access) and beneficial impacts (i.e. no direct land-take or impact on site viability).

Table 7.16: Planning Applications

Application Reference	Application Site	Description of Development	Status	Significance	Type of Impact
121763	Haudagain Retail Park Unit 3 Great Northern Road Aberdeen, AB24 2BQ.	Extension and alteration to existing drive-thru restaurant, alterations to car park and provision of external customer seating area.	Approved Conditionally	Neutral	n/a
140835	Persley Den (Land at), Woodside, Aberdeen, AB21 9XU.	Proposed residential (circa 400 houses) and leisure development with associated infrastructure and landscaping works.	Pending	Neutral	n/a
140280	Granitehill Road, Northfield, Aberdeen, AB16 7AX.	Construction of a storage facility.	Approved Conditionally	Neutral	n/a
141394	18-24 Logie Place / Manor Drive Aberdeen, AB16 7TP.	Erection of 20 No.1 bed flats with associated car parking and landscaping.	Pending	Mixed	n/a

Community Severance and Local and Wider Area Socio-economic Impacts

Community Severance

7.4.46 Table 7.17 provides forecast two-directional AADT traffic flows for the Do-Minimum (without scheme) and Do-Something (with scheme) scenarios for Opening Year (2018), as informed by Aberdeen Access from the North 2012 (AAFN12) model. The table includes modelled traffic volumes for the impact of the proposed scheme on existing roads in the Haudagain area (Location References 1-7; 11-14) and also traffic volumes for the new components of the proposed scheme (Location References 8-10), which have been taken from the DMRB Stage 3 Scheme Assessment Report - Part 2: Engineering, Traffic and Economic Assessment (Jacobs, 2015). The locations of the traffic flows modelled are provided in Plate 1.

Plate 1: Location of Traffic Volumes

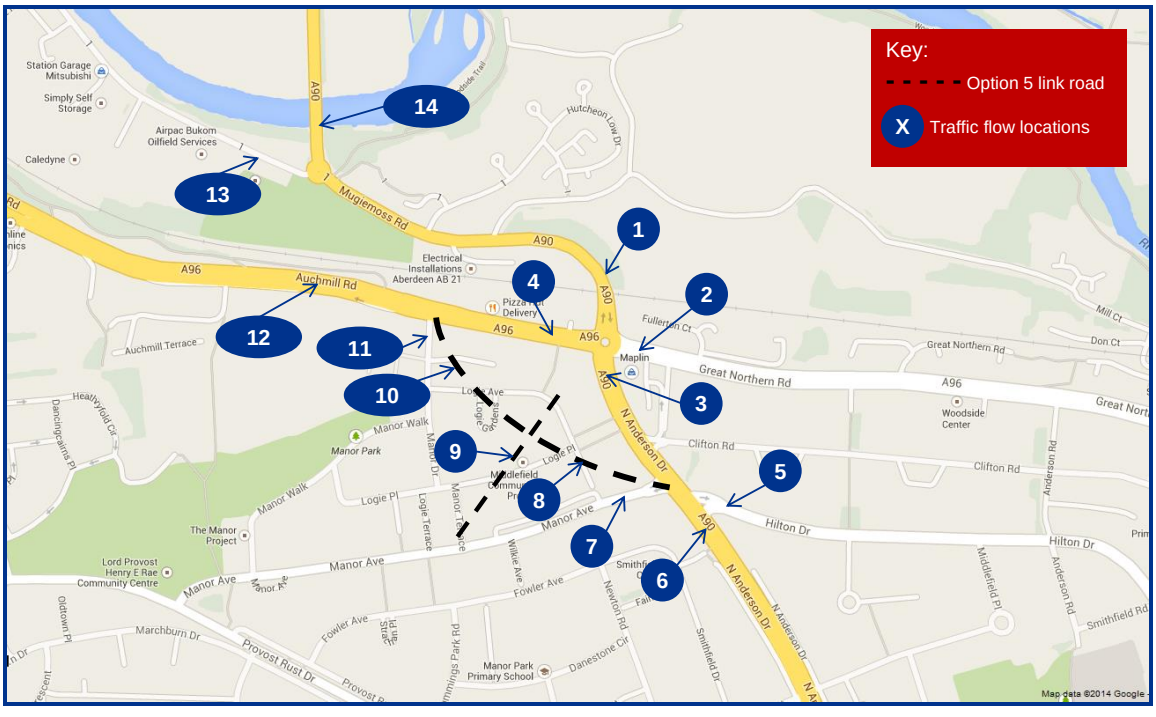

Table 7.17: Do-Minimum and Do-Something AADT Traffic Volumes (2018), Two-Way, Haudagain Area

Location Reference	Location	Do-Minimum (2018)	Do-Something (2018)	Do-Minimum vs Do-Something
1	A90(T) Mugiemoss Road at Haudagain junction	22,500	23,900	6%
2	A96 Great Northern Road at Haudagain junction	19,700	22,200	13%
3	A90(T) North Anderson Drive at Haudagain junction	44,900	21,400	-52%
4	A96(T) Auchmill Road at Haudagain junction	43,300	21,700	-50%
5	Hilton Drive	5,000	5,200	4%
6	A90(T) North Anderson Drive at Manor Avenue	37,000	33,900	-8%
7	Manor Avenue	3,800	-	-
8	Proposed Scheme Link Road at A90(T) North Anderson Drive*[1]	-	22,400	-
9	Proposed Scheme Link Road access to local road network*[1]	-	5,600	-
10	Proposed Scheme Link Road at A90(T) Auchmill Road*[1]	-	22,700	-
11	Manor Drive*[2]	1,400	-	-
12	A96(T) Auchmill Road	44,400	43,800	-1%
13	Mugiemoss Road	12,400	12,100	-2%
14	A90(T) Persley Bridge	29,400	29,900	2%

*1: No traffic volumes present for Do-Minimum as they are new components of the proposed scheme.

*2: No traffic volumes present for Do-Something as existing Manor Drive will be 'stopped up' as a result of the proposed scheme.

Relief from Existing Severance

7.4.47 Based on criteria outlined in Table 7.4 (Built Up/Urban Area) a Moderate (Beneficial) impact would be experienced for Location References 3 and 4, due to a reduction in traffic flows for the Opening Year of 52% and 50% respectively. This benefit would be to local residents accessing Middlefield Post Office and the Aberdeen Constituency Office (refer to Figure 7.3) from residential areas to the north including those on Hutcheon Low Drive crossing A96(T) Auchmill Road for access. Benefits would also be experienced by local residents accessing Neil McDonald General Store from Middlefield by crossing A90(T) North Anderson Drive.

7.4.48 No further relief from existing severance is anticipated as a result of the proposed scheme as change in traffic volumes for existing roads are either increased or reduced by <30%.

New Severance

7.4.49 Based on criteria outlined in Table 7.5, derived from DMRB, a Substantial (Adverse) impact is indicated for Location References 8 and 10 due to new experienced traffic volumes of >16,000 AADT. However, given the embedded mitigation outlined in Chapter 15 (Effects on all Travellers) which includes provision of signalised pedestrian crossing points at chainages 020, 250 and 500 (refer to Figure 4.1) and designated footpath/cycle routes adjacent to the new link road and associated local roads (refer to Figure 15.3), impacts on journey lengths would be Negligible and safety for NMUs accessing community facilities to the east and west of the proposed scheme would be improved. On the basis of professional judgement, following implementation of the embedded mitigation outlined in Section 15.2 (Approach and Methods), the overall significance of new severance has been assessed as Moderate (Adverse).

7.4.50 The embedded mitigation was developed through consultation with the Haudagain Access Panel, which is composed of the Aberdeen Disability Advisory Group (DAG), Aberdeen Action on Disability (AAD), and Mobile Access Committee Scotland (MACS).

Local and Wider Area Socio-economic Impacts

7.4.51 As previously noted, during the construction phase of the proposed scheme, there would be temporary impacts on the local community and the wider area due to disturbance resulting from construction activities. These impacts would potentially result from increased noise and vibration, air quality emissions, and landscape/visual impacts, as shown in Table 7.18. For additional information refer to Chapter 11 (Landscape and Visual), Chapter 13 (Air Quality) and Chapter 14 (Noise and Vibration).

7.4.52 The proposed scheme would also give rise to potential temporary economic benefits as a result of construction employment and as a result of workers spending money at local businesses.

7.4.53 During operation, the proposed scheme would result in significant impacts associated with noise and vibration and landscape and visual impacts; these impacts are considered separately and reported in the relevant chapters of this ES.

7.4.54 Upon completion, it is considered that the proposed scheme would improve journey times for vehicular travellers using Haudagain Roundabout (refer to Chapter 15: Effects on all Travellers).

Table 7.18: Potential Impacts on Local and Wider Socio-economics

Receptor	Impact	Significance
Local area	Construction disturbance including noise and vibration, air quality emissions, and landscape and visual disturbance.	Adverse (Temporary)
Wider area	Increased employment during construction phase.	Beneficial (Temporary)
Local area	Construction workers' spend in local businesses.	Beneficial (Temporary)
Local area	Operational changes to noise and vibration and landscape and visual disturbance.	Adverse (Permanent)
Wider area	Improved journey times for vehicular travellers using Haudagain Roundabout.	Beneficial (Permanent)

7.5 Mitigation

7.5.1 Temporary and permanent land-take would occur where it is considered necessary for the purposes of constructing and operating the proposed scheme and/or for associated mitigation measures such as landscape planting and drainage proposals.

7.5.2 The proposed scheme design includes embedded mitigation to provide access to residential land and property with revised access arrangements and tie-ins to the road network. This includes the proposed tie-ins to Logie Avenue and Manor Avenue, which would maintain access to the A96(T) Auchmill Road and A90(T) North Anderson Drive. These have been discussed with ACC and local residents during organised drop-in sessions and exhibitions as part of the consultation process (refer to Chapter 6: Consultation and Scoping), and their inclusion in the design is considered embedded mitigation.

7.5.3 Embedded mitigation relating to the alleviation of severance for NMUs is described in detail in Chapter 15 (Effects on All Travellers) and shown in Figures 15.2 and 15.3.

7.5.4 Planned mitigation to reduce landscape and visual impacts and noise and vibration impacts during both construction and operation is described in more detail in Chapter 11 (Landscape and Visual) and Chapter 14 (Noise and Vibration).

7.5.5 Further mitigation is proposed in this section to reduce the identified potential impacts on community and private assets where practicable.

Residential Land and Property

7.5.6 During construction, there would be temporary disturbance on access to/from properties adjacent to the proposed scheme. To mitigate this, access to/from properties would be maintained throughout the construction period by means of diversions where necessary. The Contractor would also be required to ensure the local community, including affected tenants and home owners, are aware of the estimated duration and locations of diversions in advance of them being put in place (**Mitigation Item CP1, CP2**).

7.5.7 As noted previously, several residential properties would be acquired to accommodate the proposed scheme. Landowners, tenants and occupiers would be given appropriate notice of the acquisition, including through the issue of a CPO notice.

7.5.8 Private land would also be acquired to accommodate the proposed scheme. Landowners, tenants and occupiers would be given appropriate notice of the acquisition, including through the issue of a CPO notice.

Commercial Land and Property

7.5.9 Manor Park Caravan Park would require adequate access to be maintained throughout construction of the proposed scheme. Measures would be taken to reduce disturbance during construction including provisions of adequate signage and ensuring access is maintained by means of diversions if necessary (**Mitigation Item CP1, CP2**).

7.5.10 Access to Majestic Wine, Pizza Hut Delivery and Active Interiors, located just to the north of the proposed A96(T) Auchmill Road – Manor Drive junction, would not be significantly affected, however, adequate access would be maintained throughout construction (**Mitigation Item CP1, CP2**).

Community Land and Facilities

7.5.11 Significant impacts on seven community facilities would occur as a result of demolitions and communal garden land-take. These are Middlefield Community Project Office and Nursery, Logie Neighbourhood Services, Logie Health Clinic, Pathways Services Limited, and Middlefield Community Project Youth Flat. The facilities/land would be acquired to accommodate the proposed scheme and affected parties would be given appropriate notice of the acquisition, including through the issue of a CPO notice.

7.5.12 Access to Middlefield Parish Church, Manor Park, Sunnybank FC Club House, and Lord E Provost Community Centre in Middlefield should be maintained throughout the construction period (**Mitigation Item CP1, CP2**).

7.5.13 Access to residential amenity spaces in Middlefield should be maintained throughout the construction period (**Mitigation Item CP1, CP2**).

7.5.14 The proposed scheme would significantly impact six areas of allocated Public Open Space (Aberdeen City Council, 2012b). The provision of exchange land would be provided as part of the proposed scheme in agreement with ACC (**Mitigation Item CP3**).

Development Land and Planning Applications

7.5.15 Mixed impacts on two development land allocations OP19 and Policy H1 (Residential Areas) are predicted as a result of land-take. As noted in Section 7.4 (Potential Impacts), the proposed scheme would however allow for the development of both allocations, through provision of

upgraded road infrastructure in the case of OP19. No mitigation for development land has therefore been proposed.

Community Severance and Local and Wider Area Socio-economic Impacts

7.5.16 Chapter 11 (Landscape and Visual), Chapter 13 (Air Quality) and Chapter 14 (Noise and Vibration) set out proposed mitigation measures to reduce predicted adverse impacts during construction and operation, which would also reduce impacts on the local community.

7.5.17 The impact of the proposed scheme during construction on employment in the area is predicted to be positive and therefore no mitigation measure is necessary.

7.5.18 Provision of new NMU routes and signalised crossings to improve safety and reduce community severance has been provided as embedded mitigation as discussed in Chapter 15 (Effects on all Travellers).

7.6 Residual Impacts

7.6.1 Residual impacts for residential, commercial, community and development land are presented in Table 7.19. It should be noted that following implementation of mitigation the magnitude of impact on a receptor may be reduced but not to an extent whereby the magnitude threshold / significance is changed.

Table 7.19: Residual Impacts of Construction and Operation

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
Residential properties on Manor Drive; Manor Avenue; Manor Terrace; A90(T) North Anderson Drive; A96(T) Auchmill Road; Logie Place; Logie Terrace; and Logie Avenue..	Potential temporary changes to access during construction.	CP1, CP2	Slight	n/a
124 residential properties detailed in Appendix A7.1 (Residential Land-take for Proposed Scheme).	Acquired and demolished.	n/a	n/a*	Substantial
24 Manor Avenue (Flats A – F) 30 Manor Avenue (Flats A – D) Total of 10 residential properties.	Acquired but no required demolition.	n/a	n/a*	Substantial
24 to 32 (even) Logie Avenue	Communal garden land-take. Approximately 0.2502ha of land-take; 56% of total area.	n/a	n/a*	Moderate /Substantial
1 Logie Gardens and 21 – 25 (odd) Logie Avenue	Communal garden land-take. Approximately 0.0823ha of land-take; 100% of total area.	n/a	n/a*	Moderate /Substantial
10 Logie Avenue Flat A to F	Communal front garden land-take. Approximately 0.0218ha of land-take; 80% of total area.	n/a	n/a*	Moderate /Substantial
26 to 28 (even) Manor Avenue (including three properties associated with two community facilities: Pathways Services Limited and Middlefield Community Project Youth Flat)	Communal garden land-take. Approximately 0.1604ha of land-take; 70% of total area.	n/a	n/a*	Moderate/Substantial
539 & 541 North Anderson Drive	Communal garden land-take. Approximately 0.0221ha of land-take; 46% of total area.	n/a	n/a*	Moderate

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
535 & 537 North Anderson Drive	Communal garden land-take. Approximately 0.0122ha of land-take; 32% of total area.	n/a	n/a*	Moderate
531 & 533 North Anderson Drive	Communal garden land-take. Approximately 0.0107ha of land-take; 33% of total area.	n/a	n/a*	Moderate
14 to 22 (even) Logie Avenue	Communal garden land-take. Approximately 0.0640ha of land-take; 19% of total area.	n/a	n/a*	Moderate
543 & 545 North Anderson Drive	Communal garden land-take. Approximately 0.0099ha of land-take; 21% of total area.	n/a	n/a*	Moderate
12 Logie Avenue Flat A to F	Communal garden land-take. Approximately 0.0021ha of land-take; 24% of total area.	n/a	n/a*	Moderate
17 & 19 Manor Avenue	Communal garden land-take. Approximately 0.0068ha of land-take; 18% of total area.	n/a	n/a*	Moderate
9 - 15 (odd) Manor Avenue	Communal garden land-take. Approximately 0.0098ha of land-take; 17% of total area.	n/a	n/a*	Moderate
1 - 7 (odd) Manor Avenue	Communal garden land-take. Approximately 0.0087ha of land-take; 15% of total area.	n/a	n/a*	Moderate
10 -12 Logie Avenue and 551-559 North Anderson Drive	Communal back garden land-take. Approximately 0.0087ha of land-take; 40% of total area.	n/a	n/a*	Moderate
551 & 553 North Anderson Drive	Communal front garden land-take. Approximately 0.0019ha of land-take; 12% of total area.	n/a	n/a*	Slight
438 and 440 Auchmill Road	Disruption to vehicular access during construction.	CP1, CP2	Moderate / Substantial	n/a
	Direct impact in vehicular access provisions to the property during operation. Alternative vehicular	n/a	n/a	Slight/Moderate

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
	access would be provided as part of the proposed scheme, although direct access to A96(T) Auchmill Road will be lost.			
73 Manor Avenue	Disruption to vehicular access during construction.	CP1, CP2	Moderate / Substantial	n/a
	Direct impact on existing vehicular access to the driveway; the proposed scheme provides new means of access.	n/a	n/a	Slight
871 Great Northern Road	Disruption to vehicular access during the construction stage.	CP1, CP2	Moderate / Substantial	n/a
	Severance of existing vehicular access due to the construction of the proposed detention basin. Alternative vehicular access would be provided as part of the proposed scheme.	n/a	n/a	Slight
Properties to the east and west of the stopped-up areas of Manor Avenue	Temporary disruption to vehicular access to these properties during construction.	CP1, CP2	Slight	n/a
	Residents losing parking provision directly outside their properties. Alternative parking provisions would be provided as part of the proposed scheme to compensate. This may although require residents to park their vehicle further away from their property during operation.	n/a	n/a	Slight/Moderate
Properties along Logie Avenue	Temporary disruption to vehicular access to these properties during construction.	CP1, CP2	Slight	n/a
	Loss of parking provisions along Logie Avenue. Alternative parking provisions would be provided as part of the proposed scheme to compensate. This may although require residents to park their vehicle further away from their property during operation	n/a	n/a	Slight/Moderate

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
	Diverted road access from A96(T) Auchmill Drive; partial severance of access during operation.	n/a	n/a	Slight/Moderate
Properties at Manor Drive, Manor Walk, Logie Place and Logie Terrace	Diverted road access from A96(T) Auchmill Drive; partial severance of access.	CP1, CP2	Slight	Slight/Moderate
Properties at Manor Avenue and Wilkie Drive	Diverted road access from A90(T) North Anderson Drive; partial severance .	CP1, CP2	Slight	Slight/Moderate
Manor Park Caravan Park	Change in vehicular access to the caravan park via the existing A96(T) Auchmill Road – Manor Drive junction as a result of the new A96(T) Auchmill Road – Manor Drive junction.	CP1, CP2	Slight	Slight/Moderate
	Impact on future business viability.	n/a	n/a	Neutral
Majestic Wine, Pizza Hut Delivery and Active Interiors	Temporary change to vehicular access during the construction of the proposed scheme	CP1, CP2	Negligible / Slight	n/a
	Impact on future business viability.	n/a	n/a	Neutral
Middlefield Parish Church	Change in vehicular access to the rear of Middlefield Parish Church.	CP1, CP2	Slight	Slight/Moderate
Residential amenity spaces within Middlefield	Potential temporary disruption of vehicular access to residential amenity spaces during construction.	CP1, CP2	Negligible / Slight	n/a
Middlefield Community Project Office and Nursery (8 Logie Place)	Acquired and demolished.	n/a	n/a*	Substantial
Logie Neighbourhood Services (2A and 2D Logie Place) Total of two properties.	Acquired and demolished.	n/a	n/a*	Substantial
Logie Health Clinic (2B and 4A Logie Place) Total of two properties.	Acquired and demolished.	n/a	n/a*	Substantial
South of 561 North Anderson Drive (approximately 0.0467ha)	Approximately 0.0467ha of land-take, although will be reinstated to its	n/a	n/a*	Negligible

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
	original use.			
Residential amenity space south of A96(T) Auchmill Road	Approximately 0.0695ha of land-take; 100% of total area.	CP3	n/a*	Negligible / Slight**
Residential amenity space to the east of Manor Terrace	Approximately 0.1965ha of land-take; 100% of total area.	CP3	n/a*	Negligible / Slight**
Residential amenity space to the south of Logie Avenue	Approximately 0.0268ha of land-take; 100% of total area.	CP3	n/a*	Negligible / Slight**
Playspace at Logie Gardens	Approximately 0.4692ha of land-take; 81% of total area.	CP3	n/a*	Negligible / Slight**
Residential amenity space to the east of 529 Smithfield Drive	Approximately 0.0313ha of land-take; 81% of total area.	CP3	n/a*	Negligible / Slight**
Residential amenity space between Logie Terrace and Manor Terrace	Approximately 0.0145ha of land-take; 100% of total area.	CP3	n/a*	Negligible / Slight**
Manor Park, Sunnybank FC Club House and Lord E Provost Community Centre	Change in vehicular access to the community facilities via the existing A96(T) Auchmill Road – Manor Drive junction.	CP1, CP2	Slight	Slight/Moderate
Land under Opportunity Site 19 (OP19) – retail park and urban green space	Permanent land-take. The proposed scheme would allow for the development of OP19.	n/a	Mixed	
Land under Opportunity Site 21 (OP21) – replacement housing	The proposed scheme would allow for the development of OP21.	n/a	Beneficial	
Land under Policy H1 (Residential Areas)	Permanent land-take. The proposed scheme would be complementary to residential use (OP21) and ACC's regeneration plans.	n/a	Mixed	
Planning Application 141394	Adverse noise impacts and change in access, although no direct land-take.	n/a	Mixed	
Local residents specified in Section 7.4.	Relief from existing reference at Location Reference 3 (A90(T) North Anderson Drive at Haudagain junction) and Location Reference 4 (A96(T) Auchmill Road at Haudagain junction).	n/a	n/a	Moderate (Beneficial)
Local residents specified in Section 7.4.	New severance at Location Reference 8 (Proposed Scheme Link Road at A90(T) North Anderson Drive) and Location Reference 10 (Proposed Scheme Link Road at A90(T) Auchmill	n/a	n/a	Moderate (Adverse)

Receptor	Impact	Mitigation Item	Significance (Construction)	Significance (Operation)
	Road)			
Businesses in Middlefield	Temporary beneficial impacts during construction, due to construction workers' spend in local businesses.	n/a	Beneficial (Temporary)	n/a
Local Areas	Construction disturbance including noise and vibration, air quality emissions, and landscape and visual disturbance. Operational changes to noise and vibration and landscape and visual disturbance.	n/a	Adverse (Temporary)	Adverse (Permanent)
Wider Area	Increased employment during construction. Improved journey times for vehicular travellers using Haudagain Roundabout.	n/a	Beneficial (Temporary)	Beneficial (Permanent)

*Land-take and demolition would occur prior to construction. Impact is therefore attributed to operation.

** Reduction to Low magnitude of impact following provision of exchange land.

7.7 References

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8 Geology, Contaminated Land and Groundwater

This chapter presents an assessment of the potential impacts of the proposed scheme on existing geology, contaminated land and groundwater within the study area during both construction and operational phases. It outlines measures for mitigating these impacts where possible and describes any residual impacts that may occur with mitigation in place.

The nature and extent of existing geology, contaminated land and groundwater (in terms of quality and quantity) was characterised using a desk based review of available resources, such as British Geological Survey (BGS), Ordnance Survey (OS), Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) and local authority data sets. Several technical reports related to the remediation of the Denhead gas works were also consulted. The desk-based review was augmented by information from intrusive ground investigation works conducted between November 2014 and January 2015.

During the desk based review the potentially most significant contamination sources were identified as Denhead gas works, Persley, Torq and North Anderson Drive petrol stations and dry cleaners adjacent to Manor Drive.

The 2014-2015 ground investigation showed no levels of contamination of concern to human health but elevated levels of some metals were detected in groundwater at concentrations above UK drinking water standards and Environmental Quality Standards in the boreholes within the study area.

A number of proposed cuttings are expected to intercept shallow groundwater which has the potential to cause differential settlement of adjacent buildings and infrastructure, and to draw potentially contaminated shallow groundwater into some cutting areas.

Mitigation measures include potential treatment prior to discharging abstracted groundwater and geotechnical assessment of potential differential settlement issues with implementation of additional mitigation measures if required. Any residual risk from unidentified contamination can be managed through visual inspection during works, safe systems of work and the use of personal protective equipment to minimise direct interaction with any potential contaminated soil, contaminated groundwater and asbestos.

With the implementation of appropriate mitigation measures, residual impacts on geology and groundwater are considered to be of Neutral to Slight significance, at the exception of a Slight/Moderate impact on groundwater flow within granular drift deposits and associated indirect impact on the adjacent Scatter Burn (Slight/Moderate). The implementation of mitigation measures in relation to contaminated land issues is expected to reduce potential impacts to a Low significance of effect during the construction phase and Very Low significance of effect during the operational phase.

8.1 Introduction

8.1.1 This chapter presents the DMRB Stage 3 assessment of the likely impacts of the proposed scheme in relation to geology, groundwater and contaminated land.

8.1.2 The assessment includes a description of the following:

- baseline conditions within the study area relating to bedrock and drift geology, mineral extraction, contaminated land, groundwater and location of private water supplies;
- potential impacts of the proposed scheme with regard to the identified baseline conditions;
- identification of mitigation measures; and
- residual impacts taking into account mitigation measures.

8.2 Approach and Methods

8.2.1 This assessment has been undertaken using the guidance contained in DMRB Volume 11 Section 3 Part 11 'Geology and Soils' (Highways Agency et al., 1993), taking into account updated guidance on contaminated land risk assessment where appropriate, and DMRB Volume 11 Section 3 Part 10 HD 45/09 'Road drainage and the water environment' (Highways Agency et al., 2009).

8.2.2 Despite some land barriers identified as capable of agricultural development, no farming interest currently exists within the study area. Consequently, with the exception of contaminated land, impacts on natural soils are not assessed in this chapter. Potential impacts on made ground are included in the assessment of contaminated land.

8.2.3 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to geology, contaminated land and groundwater has been undertaken and is detailed in Appendix A17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Study Area

8.2.4 The assessment covers a study area around the proposed scheme, as shown on Figure 8.1.

Baseline Data

8.2.5 Baseline conditions were determined through a desk-based assessment and consultation with statutory and non-statutory bodies. This was augmented by intrusive ground investigation works.

8.2.6 Baseline conditions cover the following aspects of ground conditions:

- bedrock and drift geology;
- mineral extraction;
- groundwater environment and associated receptors; and
- contaminated land.

Desk-based Assessment

8.2.7 The desk-based assessment included a review of the following information:

- British Geological Survey (BGS) data including BGS Drift and Bedrock Geological Maps (BGS, 2014), BGS Hydrogeological and Groundwater Vulnerability Maps (BGS, 1995) and other relevant BGS publications;
- Ordnance Survey (OS) historical maps dating back to 1869 for information on former land use, any potential contamination and physical hazards and information on private water supplies;
- Scottish Environment Protection Agency (SEPA) Groundwater Vulnerability Maps and the interactive River Basin Management Plan (SEPA, 2014);
- Scottish National Heritage designation database (SNH, 2014);
- Soil Survey of Scotland Soils and Land Capability for Agriculture maps;
- Manor Caravan Park, Manor Drive, Aberdeen - Summary Remediation Completion Statement (Aberdeen City Council, 2011); and
- Aberdeen City Hydrogeological Study Integrated Summary Report, (Halcrow 2009).

8.2.8 Consultations were undertaken with a number of statutory and non-statutory bodies in Scotland in order to assess geological, hydrogeological and contaminated land impacts. These included the following:

- Aberdeen City Council for information on former contaminated land use, Part IIA determinations, private water supplies, licensed fuel storage and any additional relevant information;
- SEPA for information on licenced groundwater abstractions (via Controlled Activities (Regulations) 2001) and on former and current contaminated land use; and

- Scottish Natural Heritage (SNH) for information on the location and extent of environmental or historical sensitivities in the vicinity of the proposed scheme and to establish any future development constraints.

Intrusive Ground Investigation

8.2.9 Soil Engineering undertook a ground investigation, designed by Jacobs, between November 2014 and 11th January 2015. The investigation consisted of 14 No. cable percussive boreholes, 6 No. competitor boreholes and 5 No. trial pits. The investigation positions were located across the route area. Samples of soils and encountered groundwater were collected and sent to Scientific Analysis Laboratories Ltd for chemical analysis.

8.2.10 10 No. boreholes were completed with groundwater monitoring installations and groundwater level data were collected during December 2014 and January 2015. Soil Engineering carried out permeability testing (slug tests) in 5 No. boreholes and provided an initial analysis.

8.2.11 The final Factual Ground Investigation Report was not available at the time of writing. This assessment is based on draft data (including borehole logs, in-situ testing and laboratory analysis data) originating directly from the site team.

Geology

8.2.12 For bedrock and drift geology, features of geological importance and mineral extraction, the sensitivity and magnitude criteria in Table 8.1 and Table 8.2 were used. The significance of effect was then determined using Table 8.3.

Table 8.1: Sensitivity Criteria - Geology

Sensitivity	Description
High	Areas containing unique or rare geological or geomorphological features considered to be of national interest e.g. Sites of Special Scientific Interest (SSSI).
Medium	Areas containing features of designated regional importance considered worthy of protection for their educational, research, historic or aesthetic importance e.g. Regionally Important Geological Sites (RIGS). Geological resources of national/regional importance.
Low	Features not currently protected but that may require specific protection in the future e.g. Geological Conservation Review (GCR). Geological resources of local importance.
Negligible	Features not currently protected and unlikely to require specific protection in the future. No exploitable geological resources.

Table 8.2: Magnitude Criteria – Geology

Magnitude	Description
Major	Partial (greater than 50%) or total loss of a site, or where there would be complete severance of a site such as to affect the value of the site.
Moderate	Loss of part (between approximately 15% and 50%) of a site, major severance, major effects to the setting, or disturbance such that the value of the site would be affected, but not to a major degree.
Minor	Small effect on a site (up to 15%) or a medium effect on its setting, or where there would be a minor severance or disturbance such that the value of the site would not be affected.
Negligible	Very slight change from baseline condition. Change hardly discernible, approximating to 'no change' conditions.

Table 8.3: Matrix for determination of Significance of Effect - Geology

Sensitivity / Magnitude	Negligible	Low	Medium	High
Major	Slight	Moderate	Large	Very Large
Moderate	Neutral/ Slight	Slight/Moderate	Moderate	Large
Minor	Neutral	Neutral/Slight	Slight/Moderate	Moderate
Negligible	Neutral	Neutral	Neutral/Slight	Slight

Contaminated Land

8.2.13 In line with industry norms, the assessment focuses on the potential for impacts on receptors as a consequence of encountering contaminated land using a conceptual site model (CSM) developed for the proposed scheme. A receptor can be a person (including construction workers), the water environment, flora, fauna or buildings/structures. The CSM represents a network of relationships between potential sources within the study area and exposure of the receptors through different pathways. The potential receptors and pathways have been compiled based on the legal definitions used in Part IIA of the Environment Protection Act 1990, as provided in the Statutory Guidance (Scottish Executive, 2006).

8.2.14 Historical sources of contaminated land have been identified in the baseline information.

8.2.15 The pollutant pathways and receptors used within the assessment are provided in Table 8.4, with individual references for linkages, PP1 to PP22.

Table 8.4: Potential Pollutant and Pathways

Pollutant Pathway	Receptor	Pathway
Construction		
PP1	Human Health (Construction)	Ingestion, inhalation and dermal contact with soils, soil dust, deep and shallow groundwater and surface water.
PP2		Migration of ground gases into shallow pits or site buildings.
PP3	Off Site Receptors (Local residents, transient traffic (foot, road and rail traffic) in the surrounding area.)	Ingestion, inhalation and dermal contact with wind-blown dust created during excavation works.
PP4		Migration of ground gases into homes or workplaces through preferential pathways created during construction posing a potential asphyxiation/explosion risk.
PP5	Groundwater – superficial aquifers	Leaching and migration of contaminants.
PP6	Groundwater – bedrock aquifers	Migration of contaminants or contaminated shallow groundwater into the deeper bedrock aquifer.
PP7	Surface waters	Migration of contaminated shallow groundwater through drift deposits or made ground.
PP8		Run-off from contaminated source(s).
PP9		Migration of contaminated bedrock groundwater towards surface water receptor.
PP10		Discharge of intercepted contaminated groundwater during passive or active dewatering.
PP11	Ecological Receptors (water dependant habitats and agricultural land/livestock.)	Inhalation, ingestion and direct contact with contaminated soils / water.

Pollutant Pathway	Receptor	Pathway
Operational		
PP12	Human Health (Operational)	Ingestion, inhalation and dermal contact with soils, soil dust, deep and shallow groundwater or surface water in the long term during routine maintenance activities e.g. drainage inspections.
PP13		Migration of ground gases into confined spaces, e.g. service pits or accommodation buildings, creating an asphyxiation / explosion risk.
PP14	Off Site Receptors	Ingestion, inhalation and dermal contact with wind-blown dust from contaminated soils reused within road features such as embankments and landscaped areas.
PP15		Migration of ground gases into homes or workplaces through preferential pathways remaining following construction, thus posing a potential asphyxiation / explosion risk.
PP16	Groundwater – superficial aquifers	Leaching and migration of contaminants.
PP17	Groundwater – bedrock aquifers	Migration of contaminated shallow groundwater into the deeper bedrock aquifer.
PP18	Surface water	Migration of shallow groundwater through drift deposits or made ground.
PP19		Run-off from contaminated source(s).
PP20		Migration of contaminated shallow groundwater through drainage channels and associated granular bedding materials or engineered structures.
PP21		Discharge of intercepted contaminated groundwater.
PP22	Ecological Receptors	Inhalation, ingestion and direct contact with contaminated soils / water.

8.2.16 For the purposes of this assessment, the CSM disregards those pathways that are incomplete and therefore cannot pose a risk to any of the identified receptors. Where a source, pathway and receptor combination exists this is referred to as a complete pollutant linkage and a generic qualitative risk assessment has been undertaken.

8.2.17 In accordance with established current practice and guidance provided in 'Contaminated Land Risk Assessment – a good guide to practice' (CIRIA, 2001), potential impacts are assessed in terms of likelihood (Table 8.5) and magnitude (Table 8.6). The Generic Qualitative Assessment is then undertaken based on the Table 8.7 matrix.

Table 8.5: Likelihood Criteria – Contaminated land

Likelihood	Definition
High likelihood	There is a complete pollution linkage of an event that either appears very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is a complete pollution linkage and all the elements are present and available, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over a long-term.
Low likelihood	There is a complete pollution linkage and the circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 8.6: Magnitude (Consequence) Criteria – Contaminated land

Magnitude	Definition
Severe	Short-term (acute) damage to human health (significant harm). Pollution of sensitive water resources as a result of short-term exposure. Damage to a particular ecosystem as a result of acute exposure. Catastrophic damage to buildings/property.
Medium	Long-term (chronic) damage to human health (significant harm). Pollution of sensitive water resources as a result of chronic exposure.
	A significant change in a particular ecosystem, or organism forming part of such an ecosystem.
Mild	Pollution of non-sensitive water resources. Damage to sensitive buildings/structures/services or the environment.
Minor	Harm (not necessarily significant), which may result in financial loss or require expenditure to resolve. Non-permanent health effects to human health. Easily reparable damage to buildings, structures and services.

Table 8.7: Matrix for determination of Significance of Effect - Contaminated land

Likelihood / Magnitude	Unlikely	Low likelihood	Likely	High likelihood
Severe	Moderate/low	Moderate	High	Very high
Medium	Low	Moderate/low	Moderate	High
Mild	Very low	Low	Moderate/low	Moderate
Minor	Very low	Very low	Low	Moderate/low

Groundwater

8.2.18 The assessment considers groundwater sensitivity in the context of hydrogeological conditions including groundwater resources. Criteria for the definition of groundwater sensitivity and magnitude are reported in Tables 8.8 and 8.9.

8.2.19 The assessment of the magnitude of impact on the quality and yield of groundwater abstractions and other secondary receptors are based primarily on the type of road profile (e.g. cutting, embankment or transition cutting-embankment) facing the receptor. However, where appropriate, the vulnerability of groundwater flow to sub-surface disruptions is also considered to refine the assessment of magnitude of impact.

8.2.20 The significance of effect for groundwater aspects was then determined using the same matrix as for geology/geomorphology, as shown in Table 8.3.

Table 8.8: Sensitivity Criteria - Groundwater

Sensitivity	Description
High	Local aquifer(s) constitutes a valuable resource because of its high quality and yield, or extensive exploitation for public, private domestic and/or agricultural (i.e. feeding ten or more properties) and/or industrial supply. Designated sites of nature conservation dependent on groundwater.
Medium	Local aquifer(s) are of limited value either because of some quality impairment or because exploitation of local groundwater is not extensive (i.e. private domestic and/or agricultural supply feeding less than 10 properties). Local areas of nature conservation known to be sensitive to groundwater impacts.
Low	Poor groundwater quality and/or low permeability make exploitation of groundwater unlikely. Changes to groundwater not expected to have an impact on local ecology.

Sensitivity	Description
Negligible	Very poor groundwater quality and/or very low permeability make exploitation of groundwater unfeasible. No known past or existing exploitation of this water body. Changes to groundwater are irrelevant to local ecology.

Table 8.9: Magnitude Criteria - Groundwater

Magnitude	Description
Major	Major permanent or long-term change to groundwater quality or available yield. Existing resource use is irreparably impacted upon. Changes to quality or water table level would have an impact upon local ecology.
Moderate	Changes to the local groundwater regime are predicted to have a slight impact on resource use. Minor impacts on local ecology may result.
Minor	Changes to groundwater quality, levels or yields do not represent a risk to existing resource use or ecology.
Negligible	Very slight change from groundwater baseline conditions approximating to a 'no change' situation.

Limitations to Assessment

8.2.21 The accuracy and level of detail of documented sources is key to the assessment. For example, the identification of potential contamination sources relies on the accuracy of historical mapping and previous technical reports available on the Denhead Gas Works.

8.2.22 Limited soil (made ground) and groundwater sample analysis results are available at the time of writing. A groundwater and gas monitoring programme is ongoing.

8.2.23 Soil (made ground) and groundwater results available at the time of writing from the 2014-15 ground investigation have been compared against generic assessment criteria for the protection of human health and environmental quality standards at this stage. No gas monitoring is available at the time of writing.

8.2.24 All 2014-15 ground investigation data available at this time is in draft form as provided by the site team and the final Factual Ground Investigation Report has not been received.

8.2.25 Assessment of historical quarrying activity is based on a desk-based review of Ordnance Survey maps. It is possible that quarrying works could have been undertaken and the void backfilled between the recorded years of mapping, such that no map evidence exists.

8.3 Baseline Conditions

8.3.1 The baseline conditions are reported for the overall study area.

Geology

Designated Geological Receptors

8.3.2 No designated Geological Receptors, Geological Conservation Review sites or Local Geodiversity Sites are present within the study area.

Bedrock Geology

8.3.3 Bedrock geology at the site is made up of the Aberdeen Pluton Granite, an igneous intrusive rock from the Ordovician period that forms part of the North-East Grampian Granitic Suite. Depth to bedrock is thought to be in the region of 10m or greater based upon limited existing borehole information from an adjacent area, outwith the study area (Halcrow, 2009). Recent on-site ground investigation works (2014-15) support this finding with none of the boreholes or trial pits

encountering bedrock, the deepest of which extended to 12 metres below ground level (mbgl). Bedrock is defined as being of negligible sensitivity as per Table 8.1.

Drift Geology

8.3.4 Superficial geology in the study area is composed of made ground, alluvium, river terrace deposits and Devensian aged glacial till and sands and gravels. The limited existing borehole evidence suggests variable thicknesses of topsoil and made ground overlying Quaternary deposits of 10m thickness or more (Halcrow, 2009).

8.3.5 Made ground is expected to be relatively widespread within the study area, given the urban nature of the area. In particular, it is expected to be present in areas of existing railway and road embankments, as well as in-filled historic mineral extraction sites, and areas of reworked and benched ground.

8.3.6 Recent ground Investigation works (2014-15) confirmed made ground to be present in each of the 14 cable percussive boreholes completed on site, with thicknesses generally ranging from 0.4m to 3m, and potentially extending up to 4.9m. Made ground composition included road surface tarmac, concrete and brick, asphalt hardcore and granite boulders and reworked gravelly sands and clays.

8.3.7 Alluvium is fluvially deposited and is present in relatively small areas within 300m of the study area beneath the flood plain of the River Don. It is described as being normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. River terrace deposits are relatively limited within the study area, located in the vicinity of the River Don. They are generally described as containing sand and gravel, with local lenses of silt, clay or peat.

8.3.8 The Devensian glacial deposits comprise the Banchory Till and the Lochton Sand and Gravel Formation. The Banchory Till is recorded to cover much of the southern portion of the study area and comprise gravelly and sandy diamicton composed principally of decomposed Neoproterozoic metamorphic rocks and Caledonian igneous rocks.

8.3.9 The Lochton Sand and Gravel Formation is located in the north of the study area and contains sand and gravel composed predominantly of clasts of Neoproterozoic metamorphic rocks and Caledonian igneous rocks. The formation is interpreted by BGS to be a glacial outwash deposit and extends over much of the northern portion of the study area.

8.3.10 As per definitions provided in Table 8.1, all drift deposits are of negligible sensitivity.

Soils

8.3.11 Soils within the study area are indicated as ‘Not classified’ on Soil Survey of Scotland mapping. Land Capability Classification for Agriculture mapping shows the study area as ‘Built-up area’. No natural soil resources are therefore expected to be encountered. Natural soils are therefore not considered further.

Mineral Extraction

8.3.12 The area has been exploited for sand mineral extraction and a now in-filled sand pit was identified during the review of historical OS maps. This feature is identified as C6 in Table 8.10 and on Figure 8.1. The study area has been almost entirely developed for residential and commercial purposes and as such it is considered unlikely that future mineral extraction will take place. As per definitions provided in Table 8.1, mineral resources are considered to be of low sensitivity.

Contaminated Land

8.3.13 Twenty six potential contamination sources have been identified within the study area. Details of identified contamination sources are provided in Table 8.10 and locations are shown on Figure 8.1.

Table 8.10: Potentially Significant Contamination Sources

ID	Description
C1	Denhead Gas Works – associated with 2 gas holders in operation until approx. 1970. Further information is provided in paragraph 38.
C2	Unknown Works – Present from 1928 until circa 1990.
C3	Persley Service Station - Five tanks removed in 2001.
C4	Torq Petrol Station (Shell) – Five tanks installed in 1992 – still operational. SEPA granted a CAR Licence (PPC/N/30076) in March 2005 for four petrol storage tanks and one diesel tank, which is believed to be for this site as the coordinates correlate with source reference C4. However it should be noted that the location map within the CAR Licence points to a different location and therefore an uncertainty remains.
C5	North Anderson Drive Petrol Station (ESSO) – Eight tanks installed in 1991 - still operational. SEPA granted a CAR Licence (PPC/B/1008786) in October 2007 for petrol storage tanks, delivery hose and vapour return hose connection point, vapour recovery system, pressure vacuum relief devices and vents.
C6	Infilled sand pit – First marked in 1902 and last recorded in 1981-1987 – potentially infilled with contaminated material.
C7	A90 embankment - Present from at least 1869 - containing infill of unknown origin.
C8	Railway - Noted as Great North of Scotland Railway between 1869 and 1902; then noted as the London and North Eastern Railway from 1928 to 1938 and currently also known as Inverness and Kittybrewster railway line –potential contamination from fuel and oil spillages.
C9	Railway embankment - Comprising unknown fill material located east of study area and present from 1869 to present.
C10	Cemetery – Present from 1902 onwards.
C11	General Made Ground across the study area.
C12	Electricity Substation – First noted in 1973.
C13	Electricity Substation – First marked in 1956.
C14	Electricity Substation – Constructed circa 1993.
C15	Electricity Substation – First marked in 1973 up to 1993.
C16	Electricity Substation – Marked in 1982 to present - potentially localised source of PCBs.
C17	Dry Cleaners - Industrial land use with potential for use of contaminative materials including solvents, dyes and printing fluids.
C18	Car Body Repairs – potential source of solvents, paints, fuels and hydrocarbons.
C19	Tyre Dealers - potential source of fuels and hydrocarbons.
C20	Car Dealers - potential source of solvents, paints, fuels and hydrocarbons.
C21	Lift Manufacturer – potential source of solvents, metals, fuels and hydrocarbons.
C22	Lifting Equipment - potential source of solvents, metals, fuels and hydrocarbons.
C23	Printers – potential source of solvents, dyes and printing fluids.
C24	Laboratory – potential for ground contamination subject to storage protocols and volumes.
C25	Photographic Processors – potential source of solvents, dyes and printing fluids.
C26	Cleaning Services - potential source of solvents, dyes and printing fluids.

8.3.14 The earliest record of the Denhead Gas Works is from 1866, and operations continued until approximately 1970, following which the site was remediated in 2011 (Aberdeen City Council, 2011). A thickness of 200mm of material was removed from areas covered by existing or future hardstanding and a thickness of 600mm was removed from landscaped areas, totalling 450 tonnes of material. At least 220 tonnes of clean import material was used as infill and site improvement works, including for the construction of a road and several concrete caravan bases.

8.3.15 Chemical testing of soils (made ground) undertaken prior to remediation recorded elevated levels of Polycyclic Aromatic Hydrocarbons (PAH) and BTEX compounds along with elevated levels of lead, cadmium and nickel. Soil leachate testing recorded elevated levels of copper and PAH (Remedios, 2006; 2007).

8.3.16 The sources of contamination within the study area that have the potential to cause the greatest impacts, including the various petrol stations and the former Denhead gas works, are shown on Figure 8.2.

8.3.17 Soil (made ground) and groundwater samples collected during the 2014-2015 ground investigation and analysed against generic assessment criteria for the protection of human health showed no levels of contamination that would be of concern.

Hydrogeology

8.3.18 The BGS Hydrogeological Map of Scotland (BGS, 1988) classifies the local hydrogeological characteristics of the study area as intrusive rocks (Aberdeen Pluton Granite) generally without groundwater except at shallow depth. However, where areas where Quaternary sands and gravels (i.e. Lochton Sand and Gravel Formation and granular Alluvium) are present, they are classified as locally important aquifers and characterised by intergranular flow.

8.3.19 The SEPA River Basin Management Plan (RBMP) Viewer (SEPA, 2014) regroups these two units into the "Lower Don bedrock and localised sand and gravels aquifer". The study area falls within a Drinking Water Protected Area.

8.3.20 Baseline Scotland: groundwater chemistry of Aberdeenshire (BGS, 2009) states that groundwater in both bedrock and superficial deposit aquifers are typically highly vulnerable to pollution from surface activities. The area is also designated as a Nitrate Vulnerable Zone. However, the RBMP's 2008 classification for groundwater in both bedrock and superficial deposit aquifers is Good with High confidence for both quantity and quality, with no trend of pollutants.

8.3.21 Groundwater flow direction within the superficial deposits is expected to be controlled by local topography and directed towards the surface watercourses, primarily the River Don. This is confirmed by the draft GI and monitoring results. The direction of bedrock groundwater flow is unknown.

8.3.22 The hydrogeological characteristics of drift and bedrock units within the study area are summarised in Table 8.11.

Table 8.11: Hydrogeological characteristics of drift and bedrock units

Geological Unit	Geological Characteristic	Hydrogeological Characteristic	Sensitivity
Made Ground	Composed of road surface tarmac, concrete and brick, asphalt hardcore and reworked gravelly sands and clays (predominantly engineered fill).	Very poor groundwater potential due to surface/close surface location and possible low permeable nature.	Low
Alluvial Deposits	Composed of variable sediments including clay, silt, sand, gravel and peat.	Local groundwater potential. Groundwater system is expected to be hydraulically connected to surface water.	Medium
River Terrace	Sand and gravel, locally with lenses of silt, clay or peat	Local groundwater potential. Groundwater system is expected to be hydraulically connected to surface water.	Medium
Banchory Till	Heterogeneous deposits.	Poor groundwater potential due to generally low and variable permeability.	Low
Lochton Sand and Gravel Formation	Sand and gravel deposits.	Local groundwater potential. Groundwater system is expected to be hydraulically connected to surface water.	Medium
Aberdeen Pluton Granite	Granite block.	Poor groundwater potential except through fractures.	Low

8.3.23 The results of permeability testing of superficial deposits within the study area in 2014-2015 ground investigation boreholes are summarised in Table 8.12. These results show a single order of magnitude variation and are representative of moderate to low permeability deposits.

Table 8.12: Permeability testing results in superficial deposits

Borehole ID	Slug Test date	K estimate range (m/s)	K estimate range (m/d)
BH03	16-18/12/2014	1.1E-07 – 2.7E-07	9.50E-03 – 2.33E-02
BH04a	05-07/01/2015	3.4E-07 - 1.6E-06	2.94E-02 – 1.38E-01
BH05	05-07/01/2015	3.7E-10 – 5.5E-07	3.20E-05 – 4.75E-02
BH09a	12/01/2015	6.8E-07 – 7.6E-07	5.88E-02 – 6.57E-02
BH12	16-18/12/2014	1.5E-07 - 1.8E-07	1.30E-02 – 1.56E-02

Groundwater Abstraction and Discharge Consents

8.3.24 No springs or wells (licensed or unlicensed) were identified within the study area or the surrounding 300m buffer zone.

8.3.25 Nine discharge consents were recorded in the Envirocheck information within the study area: four for surface water sewers, one for a surface water outfall, two for storm overflow, one for a discharge of other matter/surface water and one of an unknown type.

Groundwater Monitoring

8.3.26 Groundwater level data exists for a six month period in 2007/2008 (Halcrow, 2009). The monitoring network comprises five boreholes within or close to the study area. Two of these were screened in superficial deposit (Manor Walk and Logie Avenue) and the remaining boreholes screened within the granite bedrock (Middlefield School).

8.3.27 Groundwater levels within the superficial deposits were reported to range between 2.3m and 3.6m below ground level. Groundwater levels within the bedrock are not disclosed but are stated as “generally stable” and were considered to indicate no significant flow of groundwater within the bedrock.

8.3.28 The Halcrow report discusses the potential contribution of groundwater to flooding issues known to exist in the area. Although uncertainties remain, flooding appears to be linked with surface water run-off issues. Flooding is discussed and assessed in Chapter 9.

8.3.29 Groundwater monitoring data collected during the recent ground investigation works cover a six week period from 05/12/14 to 16/01/15. Groundwater levels within the superficial deposits range across the site from 0.66m to 6.9m below ground level. The shallowest levels were recorded towards the southern end of cutting 1 and vicinity of cutting 2. The deepest levels were recorded at the northern end of cutting 1 and SUDS area. Monitoring boreholes and cuttings locations are shown in Figure 8.3.

8.3.30 Bedrock was not intercepted in these boreholes and therefore bedrock groundwater levels are unknown.

Groundwater Quality

8.3.31 Baseline Scotland: groundwater chemistry of Aberdeenshire (BGS, 2009) indicates that groundwater within the pluton bedrock is generally poorly mineralised with low salinity and low bicarbonate concentrations, but marked enrichment in lead and fluoride. The study area lies within a Nitrate Vulnerable Zone, with available baseline data suggesting that igneous bedrock in the region contains groundwaters at or above the drinking water limit for nitrogen.

8.3.32 The chemical analysis of groundwater samples collected during the 2014-2015 ground investigation up until 05/02/2015 has identified concentrations of some metals in all the boreholes at slightly elevated concentrations relative to UK drinking water standards and Environmental Quality Standards.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

8.3.33 No GWDTE sites are located within the study area.

Surface Water Features (SWFs)

8.3.34 Three surface water features have been identified within the study area: River Don, Scatter Burn and Woodside Burn. The River Don is afforded protection status as salmonid waters. The Scatter Burn is culverted over much of its length (Halcrow, 2009). The Woodside Burn is located in the eastern part of the study area. All surface waters are considered to be of medium sensitivity to hydrological flow changes based on the determination provided in Chapter 9 (Road Drainage and the Water Environment).

8.4 Potential Impacts

8.4.1 Generic potential impacts are presented below, followed by specific potential impacts for the proposed scheme.

8.4.2 The potential construction and operational impacts are assessed together, as the majority of the construction effects (such as excavation and removal of material or dewatering effect due to road cuttings) would extend throughout the operational phase.

8.4.3 It is emphasised that the potential impacts presented in this section are assessed assuming no mitigation and hence represent the worst-case scenario. Potential mitigation is identified and described in Section 8.4 (Potential Mitigation).

Generic Construction and Operational Impacts

8.4.4 There are a variety of ways in which road development schemes can impact on geological resources, as follows:

- excavating or masking exposures of rocks or superficial geological deposits of specific scientific interest can represent a significant impact if the features of interest are not reproduced elsewhere in the area;
- impacts on the existing or potential commercial exploitation of resources;
- impacts on underlying groundwater aquifers both during construction and operation, for example, through the dewatering of aquifers as a result of construction works involving excavation;
- risk of spillage or leakage of fuel or oil from storage tanks or construction plant, which without suitable mitigation measures, can enter aquifers;
- groundwater flow or quality changes may also impact on secondary receptors such as groundwater abstractions, surface water or groundwater dependant terrestrial ecosystems;
- during operation, runoff from the surface may contain elevated concentrations of pollutants such as oils, suspended solids, metals (e.g. copper and zinc) and, in winter, salt and antifreeze agents (e.g. ethylene glycol), leading to pollution of the aquifers; and
- ground conditions can also impose constraints on a proposed road scheme, for example, where land has become unstable due to mining or has been contaminated by previous land uses.

Specific Impacts

8.4.5 A key aspect of the impact assessment is to identify areas of temporary or permanent excavations. Information on proposed excavated areas is provided in Table 8.13 and shown on Figure 8.2. It should be noted that only cuttings deeper than 1m are included. Table 8.13 indicates the likelihood that identified excavations will intercept bedrock and groundwater.

Table 8.13: Cutting Areas

Name	Approximate Chainage	Maximum Excavation Depth (mbgl)	Groundwater Levels recorded in vicinity (mbgl)	Likelihood to intercept Bedrock	Likelihood to intercept Groundwater
Cutting 1	0 - 200	1.69	0.66 – 4.97	Unlikely	Low likelihood
Cutting 2	295 – 470	2.40	0.93 – 1.1	Unlikely	Low likelihood
Cutting 3	25 - 190	2.70	0.96 – 3.08	Unlikely	Likely
SUDS	n/a	6.5	3.26 – 4.62	Unlikely	Likely

Geology

Superficial Geology

8.4.6 Superficial deposits (negligible sensitivity) within the study area are likely to be affected by the proposed construction and associated earthworks of the proposed scheme. The reduction in the extent of these superficial deposits as a result of construction of the proposed scheme is considered to be of minor magnitude for all superficial deposits resulting in a potential Neutral significance of effect.

Bedrock Geology

8.4.7 Given the shallowness of the proposed cuttings listed in Table 8.13, bedrock (of negligible sensitivity) is unlikely to be affected. Any impact is expected to be of negligible magnitude and Neutral significance of effect.

Mineral Extraction

8.4.8 Mineral extraction within the study area no longer occurs and would be unlikely to occur in the future within the footprint of the proposed scheme given that it is located in a residential area. The magnitude of impact on any sand and gravel resource (low sensitivity) is expected to be negligible resulting in a potential Neutral significance of effect.

Hydrogeology

Groundwater Quality

8.4.9 Impacts on groundwater quality in relation to historical and current land uses are assessed in the contaminated land section below.

8.4.10 In the event of accidental spillage during the construction or operational phases, potential contamination may migrate through the upper unsaturated zone reaching the shallow drift aquifer and impair groundwater quality, unless appropriate measures for control of discharge and drainage are taken.

8.4.11 The potential significance of effect from accidental spillages on these aquifers is summarised in Table 8.14 and has been undertaken taking into account expected depth to groundwater and the expected water body extent.

Table 8.14: Impact for accidental spillages on key hydrogeological units

Hydrogeological Unit	Sensitivity	Magnitude	Significance
Superficial Aquifers – Banchory Till, Made Ground	Low	Moderate	Slight/Moderate
Superficial Aquifers – Alluvium, River Terrace deposits, Lochton Sand and Gravel Formation	Medium	Moderate	Moderate
Bedrock – Aberdeen Granite Pluton	Low	Minor	Slight

Groundwater Flow

8.4.12 Table 8.13 indicates that three road cuttings and the SUDS detention basin have the potential to intercept groundwater within the superficial deposits. Although this is only considered to be likely in cutting 3 and the SUDS basin. This is expected to create a local dewatering effect within superficial deposits around these locations, which are of low to medium sensitivity. Based on the draft GI data, the potential impact is assessed as being of minor magnitude which results in an overall potential significance of effect of Neutral/Slight to Slight/Moderate. The SUDS basin will be lined and weighted to prevent groundwater interaction. Therefore, no impact is expected during operation.

8.4.13 The construction of embankments may result in localised compaction of superficial deposits. The SUDS basin will intrude below the water table and will be lined to prevent groundwater interaction. These would result in localised potential impacts of negligible magnitude for groundwater flow and have therefore been assessed as having a Neutral/Slight significance of effect.

8.4.14 No impact is expected on the bedrock groundwater.

Differential settlement

8.4.15 Differential settlement has been identified as potentially occurring as a result of local groundwater dewatering during construction of the road cuttings. In the absence of mitigation measures, this could impact on the stability of local infrastructure and buildings.

Abstractions

8.4.16 There are no known abstractions within the study area.

Surface Water Features

8.4.17 Impaired groundwater quality has the potential to indirectly affect on the quality of surface waters.

8.4.18 Effects on groundwater flow and levels, in particular caused by dewatering, have the potential to indirectly reduce the groundwater baseflow contribution to surface waters. These indirect potential impacts on surface waters have been assessed based on the proximity of surface water features to areas where impacts on the groundwater environment are potentially occurring. It is assumed that a degree of hydraulic connectivity exists between the groundwater and surface water systems.

8.4.19 The River Don (medium sensitivity) lies about 275m from the proposed scheme and about 300m from the nearest cutting which could intercept groundwater. Given the distance to the nearest cutting expected to intercept groundwater, the localised dewatering effect expected and the significance of the flow associated with the River Don, any impact would be expected to be of negligible magnitude. The overall potential significance of effect is Neutral/Slight.

8.4.20 The Woodside Burn (medium sensitivity) lies about 350m from the scheme and the nearest cutting (cutting 2) which could intercept groundwater. Given the distance from the scheme and associated cutting and the localised dewatering effect expected, any impact would be expected to be of negligible magnitude. The overall potential significance of effect is Neutral/Slight.

8.4.21 The Scatter Burn (medium sensitivity) lies within 10m of the route and 5m of the nearest cutting (cutting 1). The Scatter Burn is culverted in this area, and therefore may be relatively protected against indirect dewatering effects. However, the nature and condition of the culvert are currently unknown. Based on the draft GI data, cutting 1 is considered to be unlikely to intercept groundwater and any potential dewatering effect is predicted to be of limited extent. The magnitude of the potential impact is therefore assessed as minor to negligible, resulting in a significance of effect of Slight/Moderate to Neutral/Slight.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

8.4.22 No GWDTE sites are located within the study area.

Contaminated Land

8.4.23 A number of potential pollution sources (Table 8.10), migration pathways (Table 8.4) and potential receptors that may be at risk as a result of the proposed scheme have been identified. These are discussed below.

8.4.24 A CSM assessment has been undertaken to determine the potential risks where complete pollutant linkages have been identified between contamination sources and receptors.

8.4.25 There are two potential ways in which the proposed scheme could impact contaminated land:

- direct interaction with potentially contaminated land sites (i.e. sources are within the proposed scheme footprint); and
- indirect disturbance of potentially contaminated land sites as a result of the scheme (i.e. potential pathways which exist within the footprint).

8.4.26 The only direct interaction expected to occur with the proposed scheme is with the made ground associated with the urbanisation of the area. Some areas of made ground may be removed and temporarily stored on site, which could represent a hazard to the water environment via pollutant pathways PP5 to PP9. Should made ground be re-used elsewhere in the scheme, it could result in a long term risk to the water environment (pollutant pathways PP18 to PP20). The likelihood of short term impacts is assessed as likely and for long term impacts it is assessed as low. The magnitude of impact is assessed as medium in both cases, resulting in a short term potential Moderate significance of effect and a long term potential Moderate/Low significance of effect.

8.4.27 Indirect impacts may occur where cuttings intercept groundwater, as they could draw contaminated groundwater towards the cutting. Potential sources for this contamination risk are Denhead gas works (C1) and the dry cleaners site (C17) which are respectively located about 30m and 10m west of cutting 1. The conductive Lochton Sand and Gravel Formation of the buried glacial meltwater channel potentially acts as an efficient pathway in this area.

8.4.28 The Denhead gas works (C1) has been remediated in the past, through capping and therefore isolation from the ground surface, in order to become suitable for use as a caravan park. However, the available information does not allow risks to groundwater to be fully discounted. The potential impacts from the combined effect of C17 and C1 have been assessed as follows:

- The potential for drawing in contaminated groundwater during construction from both C1 and C17, which then needs to be discharged (PP10), has been assessed as being likely with an impact magnitude of severe, resulting in a potential High significance of effect.
- Construction personal could also be at risk of coming into direct contact with contaminated groundwater from C1 and C17 during the construction phase (PP1). This event has been assessed as likely with an impact magnitude of medium. This results in a potential Moderate significance of effect.

- During the operational phase, these risks for the water environment from C1 and C17 via pollutant pathways PP12 and PP16 are expected to be of low likelihood and reduced to a potential Moderate/Low significance of effect.
- During the operational phase, these risks for human receptors via pollutant pathways PP12 and PP16 are expected to be unlikely and reduced to a potential Low significance of effect.

8.4.29 Available groundwater quality data from the recent 2014-2015 ground investigation works indicated that some metals were present in concentrations above UK drinking water standards and environmental quality standards. The locations of these samples do not point to the Denhead Gas works as being a source. However, they do point to cutting 1 and cutting 3 potentially drawing in groundwater contaminated with heavy metals. This has the potential to link, as described above, through PP1 and PP10 and represent Very low to Moderate significance of effect to the water environment and humans.

8.4.30 A significant amount of demolition is expected to take place during construction of the proposed scheme. Through this process, wastes will be generated. The risk that some of the affected properties may contain asbestos cannot be ruled out. Should asbestos be present, which is considered to be likely, this would constitute a severe magnitude of impact. The significance of effect is therefore assessed as High.

8.4.31 Impacts relating to storage, transportation and disposal of excavated material are discussed in Chapter 16 (Materials).

8.5 Potential Mitigation

8.5.1 Mitigation measures are described below for each sub heading.

Geology

8.5.2 No mitigation measures are required for geology.

Hydrogeology

Groundwater Quality

8.5.3 Chapter 9 (Road Drainage and the Water Environment), provides details on anticipated mitigation to address potential impacts on surface waters, including adherence to SEPA Pollution Prevention Guidelines (PPGs) during construction, and appropriate road drainage and runoff treatment. These measures would also mitigate against water pollution risk to groundwater by reducing the potential for pollutant release and reducing the likelihood of any contaminated runoff produced by the works entering groundwater either directly or via the unsaturated zone. These mitigation measures would also protect groundwater receptors against impacts on water quality.

8.5.4 Groundwater likely to be intercepted by each of the road cuttings may need to be treated prior to being discharged. The confirmed presence of slightly elevated levels of some metals in groundwater, at concentrations above UK drinking water standards and environmental quality standards, in the vicinity of cutting 1 and cutting 3 indicate the potential for heavy metals contamination in discharges. This would be taken into account in the preparation of discharge licensing consents in communication with SEPA (**Mitigation Item G1**).

8.5.5 SUDS basins should be lined and direct discharges to the groundwater environment from, for example, soakaways would be avoided unless it can be demonstrated by the Contractor that no water quality impacts will occur (**Mitigation Item G2**).

Groundwater Flow

8.5.6 Each of the proposed road cutting excavations are considered likely to intercept groundwater and the potential volumes will need to be considered in the context of a potential groundwater abstraction CAR licence prior to works commencing (**Mitigation Item G3**).

Differential settlement

8.5.7 A detailed geotechnical assessment would be undertaken. Should potential differential settlement risks be confirmed, required mitigation measures may include the monitoring of groundwater level variations during the construction phase and implementation of appropriate mitigation measures for affected structures (**Mitigation Item G4**).

Surface Water Features

8.5.8 No mitigation measures are expected to be required for the River Don or Woodside Burn.

8.5.9 Consultations with SEPA would be required regarding Scatter Burn should potential impacts be confirmed following receipt of further groundwater monitoring results and confirmation of the nature and condition of the culvert (**Mitigation Item G5**).

Contaminated Land

8.5.10 None of the soil or groundwater samples analysed noted levels of contamination of concern to construction workers during excavation works.

8.5.11 Any residual risks posed by unidentified contamination can be managed through visual inspection during works, safe systems of work and the adoption of personal protective equipment to minimise direct interaction with any potential contaminated soil, contaminated groundwater or asbestos. Waste management procedures shall include but not be limited to: Waste Management Licence Regulations 1994 (as amended by Waste management licensing Amendment (Scotland) Regulations 2003), Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, HSE Guideline Note MS13 Asbestos (2012), SEPA Guidance: Asbestos in Demolition Wastes (2015) (**Mitigation Item G6**).

8.5.12 To protect the water environment, excavated made ground material would be stored using bunded facilities and re-use criteria, as part of a Material Management Plan. This would be developed so as to mitigate any long term effects (**Mitigation Item G7**).

8.5.13 Measures relating to impacts, transportation and disposal of excavated material are set out in Chapter 16 (Materials). These would be considered within the Site Waste Management Plan (**Mitigation Item M3**), which includes the Zero Waste Plan, which has been developed under the guidelines of Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009) and Land Remediation and Waste Management Guidelines (SEPA, 2009).

8.6 Residual Impacts

8.6.1 Residual impacts on both drift and bedrock geology are expected to be of negligible magnitude and Neutral significance of effect.

8.6.2 Residual impacts on groundwater flow within both superficial deposits and bedrock are expected to be of minor magnitude. Residual significance of effect is expected to be Neutral/Slight for bedrock, till and low permeability drift deposits and Slight/Moderate for granular drift deposits.

8.6.3 A residual impact of negligible magnitude and Neutral/Slight significance of effect is expected on surface water in the River Don and Woodside Beck. Any mitigation measures required for Scatter Burn remain to be confirmed but the expected level of residual impact will be of minor magnitude and Slight/Moderate significance of effect.

8.6.4 The implementation of mitigation measures in relation to the protection of the water environment against pollution incident is expected to reduce potential impacts on groundwater quality and associated receptors to a Slight significance of effect.

8.6.5 The implementation of mitigation measures in relation to contaminated land issues and direct / indirect impacts is expected to reduce potential impacts to a Low significance of effect during the construction phase and Very Low significance of effect during the operational phase.

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9 Road Drainage and the Water Environment

This chapter presents an assessment of the potential impacts of the proposed scheme on the surface water environment. It outlines measures for mitigating these impacts and describes any residual impacts that may occur with mitigation in place. The assessment considers the potential impacts of the proposed scheme in terms of surface water hydrology, flood risk, water quality and drainage. Impacts on groundwater are assessed in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater).

There are three watercourses in the study area; the River Don and two of its small tributaries, Scatter Burn and Woodside Burn, which are extensively culverted within the heavily urbanised catchment. The River Don and its tributaries are classified as salmonid waters.

The baseline and impact assessments were informed by review of existing literature and desk-based assessment, consultation with the Scottish Environment Protection Agency (SEPA), hydraulic modelling and water quality calculations.

Assessment of the capacity of the A90 and railway culverts on the Scatter Burn and the railway culvert on the Woodside Burn show that they have sufficient flow capacity for the modelled design flows with the proposed scheme in place. The water quality calculations identified that 61% sediment reduction was required in order to achieve acceptable levels. Soluble pollutants and spillage risk were shown to be within acceptable levels prior to implementation of mitigation.

Mitigation during construction would include adherence to relevant SEPA and Construction Industry Research and Information Association (CIRIA) best practice including SEPA's Pollution Prevention Guidelines. The scheme design includes two levels of Sustainable Drainage Systems (SUDS) to provide adequate attenuation and treatment of road runoff from the new drainage areas. The SUDS outfall would require regular inspection and maintenance to avoid failure or sub-optimal operation of the road drainage network.

With the implementation of proposed mitigation during construction and operation, it is considered that all residual impacts on the watercourses would be reduced to Neutral significance.

9.1 Introduction

9.1.1 This chapter presents the assessment of the proposed scheme in terms of the surface water environment, which includes hydrology, flood risk, water quality and drainage. The chapter is supported by the following appendices, which are cross-referenced where relevant:

- Appendix A9.1 (Flood Risk); and
- Appendix A9.2 (Water Quality Calculations).

9.1.2 Water is a resource that is essential to all animal and plant life. It is also necessary for industry, agriculture, waste disposal, many forms of transport, recreation and sport. The maintenance and improvement of the quality of our drinking water, watercourses, groundwater resources and coastal waters is central to Scottish and UK Government and European policy.

9.1.3 This chapter sets out the assessment methods (Section 9.2: Approach and Methods), describes the baseline conditions (Section 9.3: Baseline Conditions), and identifies potential impacts that could occur in the absence of mitigation (Section 9.4: Potential Impacts). Mitigation to avoid, reduce or offset the potential impacts is then described in Section 9.5 (Mitigation) and residual impacts following implementation of this mitigation are then identified in Section 9.6 (Residual Impacts).

9.2 Approach and Methods

Structure of Assessment

9.2.1 The assessment of impacts on attributes of the surface water environment in this chapter includes:

- Hydrology and Flood Risk: potential impacts on the flow of water on or near the land surface.
- Water Quality: various attributes of a watercourse including the ecological and physico-chemical

status of various parameters (directly linked to water quality), as well as biodiversity, dilution and removal of waste products, and water supply.

9.2.2 Fluvial geomorphology has not been considered due to the lack of landforms and absence of morphological diversity of the channels due to extensive culverting throughout the study area. However, impacts of suspended sediment on watercourses associated with the proposed scheme are considered in the water quality assessment.

9.2.3 The surface water environment is intrinsically linked to groundwater and ecological receptors, considered in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) and Chapter 10 (Ecology and Nature Conservation) respectively. The specialist teams undertaking each of these assessments worked closely together to cover interactions between these topics, and cross-referencing is provided throughout this chapter where relevant.

Legislative Context

Water Framework Directive 2000/60/EC

9.2.4 The Water Framework Directive (WFD), enacted into Scottish law by the 'Water Environment and Water Services (Scotland) Act 2003 (WEWS Act), sets targets for restoring and improving the ecological status of waterbodies and preventing deterioration. Under the WFD, the status of water is assessed using a range of parameters including chemical, ecological, physical, morphological and hydrological measures to give a holistic assessment of aquatic ecological health. The objectives of the WFD are for all waterbodies to achieve or maintain an overall status of 'Good' up to 2027. Artificial or heavily modified waterbodies (AWBs and HMWBs) have less stringent criteria to meet; however, these waterbodies need to achieve a target of at least 'Good Ecological Potential' over the same timescales. To help fulfil WFD aims, a planning process called river basin planning was implemented, involving the production of a River Basin Management Plan (RBMP) for the Scotland and Solway Tweed river basin districts and supplementary Area Management Plans outlining how the water environment will be managed and improved to meet WFD objectives over time.

9.2.5 To achieve the WFD objectives, SEPA introduced a risk-based classification system in 2009. This includes five quality classes (High, Good, Moderate, Poor and Bad) and establishes a requirement to identify and monitor a range of existing pressures on waterbodies which may threaten the objectives of the WFD. These pressures are generally anthropogenic and may include point source discharges, diffuse source pollution, abstractions and morphological alterations such as culverts, impoundments and channel straightening. SEPA has identified a number of improvement measures in order for failing waterbodies to meet WFD objectives over time.

Controlled Activities Regulations

9.2.6 A key tool in achieving the WFD objectives is the Water Environment (Controlled Activities) (Scotland) Regulations 2011 and the Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 (together referred to as CAR) (Scottish Government, 2011 & 2013). This legislation controls engineering works within inland surface waters, as well as point source discharges, abstractions and impoundments. There are three different levels of authorisation under CAR: General Binding Rules (GBR), Registration and Licence (either Simple or Complex). The level of regulation increases as the activity poses a higher risk to the integrity and ecological status of the water environment. The level of authorisation under CAR for the proposed scheme would depend on the specific activities involved; however, is likely to include road drainage through a sustainable drainage system (SUDS), and groundwater abstraction associated with road cuttings. Activities requiring CAR authorisation would be determined by SEPA prior to the start of construction.

Scottish Planning Policy

9.2.7 Scottish Planning Policy (SPP) (Scottish Government, 2014) requires planning authorities to consider all sources of flooding (coastal, fluvial, pluvial (surface water), groundwater, sewers and

blocked culverts) and their associated risks when preparing development plans and reviewing planning applications. This legislation has come into place as a result of the Flood Risk Management (Scotland) Act (2009). The aims of SPP in relation to flooding are:

- to prevent developments which would be at significant risk of being affected by flooding;
- to prevent developments which would increase the probability of flooding elsewhere;
- to define the 'active' floodplain extent (generally greater than the 0.5% Annual Exceedance Probability (AEP) (1:200 year return period)) in any given year; and
- to provide a risk framework from which to identify a site's flood risk category and the related appropriate planning response.

9.2.8 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to the surface water environment has been undertaken and is detailed in Appendix 17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Baseline Conditions

9.2.9 The baseline study area for this assessment extends 500m either side of the centreline of the proposed scheme. The study area, including identified water features, is shown on Figure 9.1.

9.2.10 Baseline conditions were identified through a combination of consultation, desk-based assessment and site surveys.

Consultation

9.2.11 Consultations of particular relevance to this assessment were undertaken with regulatory bodies and key stakeholders including SEPA, Network Rail and Aberdeen City Council (ACC); this included agreement on the approach and requirements for the drainage, water quality and flood risk assessments, and SUDS provision.

9.2.12 Consultation information received from SEPA during the Design Manual for Roads and Bridges (DMRB) Stage 2 and Stage 3 process has been used to inform the baseline assessment; including water quality monitoring data for the River Don, species of concern, flood risk and existing permits/licenses in the study area.

9.2.13 Advice and guiding principles from SEPA have been taken into consideration during the design and assessment stages (EIA consultation letter responses dated 25 July 2014 and 25 August 2014; flood modelling scope response dated 28 August 2014). In addition, drainage design consultation meetings were held with SEPA on 2 October 2013 and 19 August 2014. The requirements for SUDS provision to achieve appropriate sediment removal associated with the drainage outfall was also discussed with SEPA at the latter meeting. Details of the consultation process are provided in Chapter 6 (Consultation and Scoping) and Appendix A6.2 (Summary of Consultation Responses).

Desk-based Assessment

9.2.14 Data were collated from the following sources:

- Ordnance Survey (OS) Explorer Map 406: Aberdeen and Banchory.
- Flood Estimation Handbook (FEH) CD-ROM v.3 (CEH, 2009).
- SEPA Flood Maps (SEPA, 2014a).
- SEPA Technical Flood Risk Guidance for Stakeholders, v8 (SEPA, 2014b).
- SEPA RBMP Interactive Map (SEPA, 2011) and associated information sheets (SEPA, 2014c).
- SEPA CAR Practical Guide, v7.2 (SEPA, 2015).

9.2.15 Previous assessments were also taken into account. These sources included:

- A90/A96 Haudagain Improvement: DMRB Stage 2 Scheme Assessment Report (Jacobs UK Limited, 2014).
- A96 (T)/A90 (T) Haudagain Improvement – STAG Report (SIAS, 2008a).
- A96 (T)/A90 (T) Haudagain Improvement – STAG Report, Appendix B (Haudagain STAG Part 2 Environmental Report) (SIAS, 2008b).
- Aberdeen City Hydrogeological Study: Integrated Summary Report (Halcrow, 2009).
- Middlefield Hydrogeological Study: Supporting Studies (Halcrow, 2008).

Site surveys

9.2.16 Drainage surveys in the study area were carried out in January 2014. Topographical surveys of the Scatter Burn and Woodside Burn open channel sections were undertaken in June 2014 to inform the flood risk modelling. These surveys also provided an opportunity to visually inspect surface water features and existing structures to gain an understanding of the hydrological regime and to provide a photographic record.

Impact Assessment

9.2.17 The impact assessment has been carried out using the general approach outlined in Chapter 5 (Overview of Assessment Process) and in accordance with the DMRB Volume 11, Section 3, Part 10, HD 45/09 'Road Drainage and the Water Environment' (Highways Agency et al., 2009). The approach to flood risk modelling has also been informed by guidance from SEPA (SEPA response to flood risk scope, letter reference PCS/135310, dated 28 August 2014) (refer to Annex B in Appendix A9.1: Flood Risk).

9.2.18 The level of significance of an effect after implementation of mitigation has been determined based on the importance (sensitivity) of an attribute of a surface water feature combined with the magnitude of potential impact, during both construction and operation.

9.2.19 As part of the water quality assessment, routine runoff and accidental spillage risk to the watercourses proposed to receive road drainage were assessed using the Highways Agency's Water Risk Assessment Tool (HAWRAT), in line with DMRB HD 45/09 guidance (Highways Agency et al., 2009). The approach and methods used in these assessments are described in Appendix A9.2 (Water Quality Calculations).

Sensitivity

9.2.20 The sensitivity of each attribute of the water environment was categorised on a scale of 'Very High' to 'Low', in accordance with the criteria provided in Table 9.1. The sensitivity criteria have been used as a guide rather than a rigid classification tool. In certain cases, professional judgement has been used to assign a more appropriate sensitivity.

Table 9.1: Criteria to Assess the Sensitivity of Water Features (based on Table A4.3 in DMRB HD 45/09)

Sensitivity	Criteria
Very High	Attribute has a high quality and rarity on international scale. **Hydrology and Flood Risk:** A watercourse with direct flood risk (fluvial and/or pluvial) to the adjacent populated areas, with greater than 100 residential properties at risk. Civil infrastructure or other land use of great value that has been susceptible to flooding in the past or is likely to be flooded in the future. A watercourse/hydrological feature with hydrological importance to: i) sensitive and protected ecosystems of international status; ii) critical economic and social uses (e.g. water supply, navigation, recreation, amenity). A watercourse/floodplain that provides critical flood alleviation benefits. **Water Quality:** Water quality/supply: WFD overall chemical status of 'Pass'; overall water quality status of 'High'. None or a very limited number of anthropogenic pressures and/or pollutant inputs on the watercourse thereby currently meeting WFD aims. Regionally important potable water source. Dilution and removal of waste products: very high flow and pollutant dilution/dispersal capacity.

Sensitivity	Criteria
	Biodiversity: WFD overall ecological status of 'High'. Natural watercourses only; not classified as HMWBs or AWBs. Protected/designated under EC legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site). Designated as salmonid waters under WFD.
High	Attribute has a high quality and rarity on national scale. **Hydrology and Flood Risk:** A watercourse with direct flood risk (fluvial and/or pluvial) to the adjacent populated areas, with 1-100 residential properties or industrial premises at risk from flooding. A watercourse with hydrological importance to: i) sensitive and protected ecosystems of national designation; ii) locally important economic and social uses (e.g. water supply, navigation, recreation, amenity). A watercourse/floodplain providing significant flood alleviation benefits. **Water Quality:** Water quality/supply: WFD overall chemical status of 'Pass'; overall water quality status of 'Good'. A small number of anthropogenic pressures and/or pollutant inputs that do not significantly affect WFD aims. Locally important potable water source. Dilution and removal of waste products: high flow and pollutant dilution/dispersal capacity. Biodiversity: WFD overall ecological status of 'Good'. Designated as salmonid/cyprinid waters under WFD. Species protected under EC or UK legislation.
Medium	Attribute has a medium quality and rarity on regional/local scale. **Hydrology and Flood Risk:** A watercourse with a possibility of direct flood risk (fluvial and/or pluvial) to less populated areas without any civil infrastructure and/or utilisable agricultural fields. A watercourse with some but limited hydrological importance to: i) sensitive or protected ecosystems; ii) economic and social uses (e.g. water supply, navigation, recreation, amenity); iii) the flooding of property (or land use of value) with 10 or fewer industrial properties at risk from flooding A watercourse/floodplain that provides some flood alleviation benefits. **Water Quality:** Water quality/supply: WFD overall chemical status of 'Pass' and/or overall water quality status of 'Moderate' or not classified by SEPA. Likely to exhibit a measureable degradation in water quality as a result of anthropogenic pressures and/or pollutant inputs. May be subject to improvement plans by SEPA. Local potable water source. Dilution and removal of waste products: low/moderate flow and pollutant dilution and dispersal capacity. Biodiversity: WFD overall ecological status of 'Moderate' or not classified by SEPA. Likely to support a limited number of habitats and species protected up to regional/national legislation level.
Low	Attribute has a low quality and rarity on local scale. **Hydrology and Flood Risk:** A watercourse with minimal hydrological importance to: i) sensitive or protected ecosystems; ii) economic and social uses (e.g. water supply, navigation, recreation, amenity); iii) with a low probability of flooding (fluvial and/or pluvial) of residential and industrial properties and is a watercourse/floodplain that provides minimal flood alleviation benefits. **Water Quality:** Water quality/supply: WFD overall chemical status of 'Fail' and/or overall water quality status of 'Poor'/'Bad' or not classified by SEPA. Highly likely to be heavily engineered, affected by a number of anthropogenic pressures and/or pollutant inputs. Dilution and removal of waste products: low/very low pollutant dilution and dispersal capacity. Biodiversity: WFD overall ecological status of 'Poor'/'Bad' or not classified by SEPA. No species of conservation concern and no use for water supply.

Impact Magnitude

9.2.21 The magnitude of impact is influenced by timing, scale, size and duration of change to the baseline conditions, as defined in Table 9.2. Impacts are adverse unless stated otherwise. Similar to the classification of sensitivity, the magnitude criteria has been used as a guide rather than a rigid classification tool. In certain cases, professional judgement may be used to assign a more appropriate magnitude of impact.

9.2.22 For impacts on water quality, one of the aspects considered is whether the water quality in the receiving watercourse would achieve a PASS, when using the Highways Agency's Water Risk Assessment Tool (HAWRAT). As noted previously, Appendix A9.2 (Water Quality Calculations) provides details of the HAWRAT methodology.

Table 9.2: Estimating the Magnitude of the Predicted Impact on Water Features (based on Table A4.4 in DMRB HD 45/09)

Magnitude	Typical Examples
Major	Results in loss of attribute and/or quality and integrity of the attribute. **Hydrology and Flood Risk:** Major changes to flow regime (low, mean and/or high flows – at the site, upstream and/or downstream). An alteration to the total catchment area in excess of a 25% reduction or increase. Significant increase in the extent of "medium to high risk" areas (classified by the Risk Framework of SPP). There would be significantly more areas/properties at risk from flooding by the 0.5% or greater AEP (1 in 200-year return period) flow. **Water Quality:** Major shift away from the baseline conditions that result in the downgrade in WFD quality status of a feature as this does not comply with the WFD. Failure of both soluble and sediment-bound pollutants in HAWRAT and compliance failure with Environmental Quality Standards (EQS) values. Calculated risk of pollution from a spillage >2% (more frequent than 1 in 50 years) annually. Total loss or extensive change to a fishery, water supply or designated conservation site.
Moderate	Results in effect on integrity of attribute, or loss of part of attribute. **Hydrology and Flood Risk:** Moderate shift away from baseline conditions and moderate changes to the flow regime. An alteration to the total catchment area in excess of 10% but less than 25%. Moderate increase in the extent of "medium to high risk" areas (SPP). An increase in peak flood level (1% annual probability) >10mm resulting in an increased risk of flooding to >100 residential properties OR an increase of >50mm resulting in an increased risk of flooding to 1-100 residential properties. **Water Quality:** A moderate shift from the baseline conditions that may be long-term or temporary. Failure of both soluble and sediment-bound pollutants in HAWRAT but compliance with EQS values. Calculated risk of pollution from a spillage >1% and <2% (50-100 years) annually. Partial loss in productivity of a fishery or water supply.
Minor	Results in some measurable change in attributes quality or vulnerability. **Hydrology and Flood Risk:** Slight changes to the flow regime. An alteration to the total catchment area in excess of 1% but less than 10%. Slight increase in the extent of "medium to high risk" areas (SPP). An increase in peak flood level (1% annual probability) >10mm resulting in an increased risk of flooding to fewer than 10 industrial properties. **Water Quality:** Minor shift away from the baseline conditions. Equivalent to minor but measurable change within the WFD classification scheme. Failure of either soluble or sediment-bound pollutants in HAWRAT. Calculated risk of pollution from a spillage >0.5% and <1% (100-200 years) annually.
Negligible	The proposed scheme is unlikely to affect the integrity of the water environment. **Hydrology and Flood Risk:** Negligible changes to the flow regime (i.e. changes that are within the monitoring errors). An alteration to the total catchment area of less than 1% reduction or increase in area. Negligible change in the extent of "medium to high risk" areas (SPP). **Water Quality:** No perceptible changes to water quality and no change within the WFD classification scheme. No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants). Risk of pollution from a spillage <0.5% (less frequent than 200 years).

Significance of Effects

9.2.23 The significance of effect (both without and with mitigation) was determined as a function of the sensitivity of the attribute/feature and the magnitude of the impact, as outlined in Table 9.3. Potential impacts without mitigation have been fully considered in Section 9.4 (Potential Impacts) and residual impacts (i.e. with mitigation) have been summarised in Section 9.6 (Residual Impacts).

Table 9.3: Matrix for Determining Significance of Effects (reproduced from Table A4.5 in DMRB HD 45/09)

Magnitude / Sensitivity	Negligible	Minor	Moderate	Major
Very High	Neutral	Moderate/Large	Large/Very Large	Very Large
High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight/Moderate

Specific Methodologies

9.2.24 There has been regular discussion with SEPA and ACC regarding design development and environmental assessment as noted in Appendix A6.2 (Summary of Consultation Responses).

Hydrology and Flood Risk

Baseline Assessment

9.2.25 The online SEPA Flood Maps (SEPA, 2014a) were used to assess the baseline flood risk from the River Don and its two tributaries; the Scatter Burn and Woodside Burn. The Flood Maps provide a Scotland-wide indicative mapping of the areas at risk of flooding from a range of sources, including rivers (fluvial), sea (coastal) and surface water (pluvial). In line with the SPP Risk Framework, indicative flood outlines are provided for areas predicted to be at high (10% AEP or 1:10), medium (0.5% AEP or 1:200) and low (0.1% AEP or 1:1000) likelihood of flooding in any given year.

9.2.26 In addition, the Middlefield Hydrogeological Study (Halcrow, 2008 and 2009) was reviewed with regards to pluvial flood risk.

9.2.27 The two tributaries local to the development site are culverted for almost their entire reach and drain an upstream piped surface water drainage system (Figure 9.1). Some intermittent open channel sections exist downstream of the A96 crossing and at their confluence with the River Don. The hydraulic capacity of the channel reach downstream of the development site, and associated bridge crossings, has been evaluated for both watercourses using a one dimensional (1-D) hydraulic model. The model has been constructed to represent the open channel reach of both watercourses downstream of the A96 culvert to their confluence with the River Don, using ISIS v3.7 river modelling software and surveyed channel cross-sections.

Impact Assessment

9.2.28 The flood risk assessment (FRA) has been carried out in accordance with SEPA's Technical Flood Risk Guidance for Stakeholders (SEPA, 2014b) and presented in Appendix A9.1 (Flood Risk). The FRA also follows Methods E and F (Assessing Flood Impacts) in DMRB HD 45/09 (Highways Agency et al., 2009). The FRA is based on a review of SEPA Flood Maps (SEPA, 2014a), review of the previous flood studies and flood records in the area (Halcrow, 2008 and 2009) and a review of the proposed drainage strategy for the scheme.

9.2.29 In addition, an assessment of the capacity of the A90 and railway culverts on the Scatter Burn and the railway culvert on the Woodside Burn was undertaken, through the modelling of open channel reach of the two watercourses from downstream of the A96 to their confluence with the River Don. The approach to flood risk modelling has been informed by guidance from SEPA (SEPA response to flood risk scope, letter reference PCS/135310, dated 28 August 2014) (refer to Annex B in Appendix A9.1: Flood Risk).

Water Quality

Baseline Assessment

9.2.30 A range of information was used to inform the baseline water quality assessment, including:

- Biological and physico-chemical water quality monitoring data for the River Don. For the Scatter Burn and Woodside Burn, a review of previous studies, channel characteristics, potential pollution/contamination sources, any downstream ecological designations and professional judgement were used to infer existing water quality.
- A review of information contained within the online SEPA RBMP interactive map (SEPA, 2011) including the current WFD water quality classification status from the most recent 2012 Water Body Data Sheets (2010-2012 data) (SEPA, 2014c).
- A review of existing drainage information in the study area.

Impact Assessment

9.2.31 The water quality impact assessment during construction considered:

- the potential effect of silt-laden runoff and suspended solids entering watercourses as a result of exposed surfaces and earthworks;
- the potential effect of oils, fuels and other hazardous substances entering watercourses as a result of construction activities; and
- the pollution dilution/dispersal capacity of watercourses.

9.2.32 The assessment of water quality impacts during the operation was carried out based on methods set out in the DMRB HD 45/09 (Highways Agency et al., 2009). Two separate calculations have been undertaken to assess impacts to the receiving Scatter Burn from the proposed scheme drainage arrangements using HAWRAT. Refer to Appendix A9.2 (Water Quality Calculations) for detailed information on the methodologies for these assessments:

- Method A – effects of routine runoff on surface waters.
- Method D – pollution impacts from accidental spillages.

9.2.33 The proposed scheme does not include any discharges to ground and therefore Method C (effects of routine runoff on groundwater) has been omitted from the assessment. Refer to Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) for more information.

Limitations to Assessment

9.2.34 There are certain limitations with regards to the assessment of impacts on the surface water environment, as described below.

Hydrology and Flood Risk

9.2.35 The flood risk assessment is based on the SEPA Flood Maps and reference should be made to SEPA's conditions of use and limitations. The Flood Maps do not provide sufficient detail to accurately estimate the flood risk associated with individual properties or specific point locations. Local factors such as flood defence schemes, structures in or around river channels such as bridges, buildings and other local influences, which might affect a flood, have not been included.

9.2.36 As the two watercourses are culverted for almost their entire reach up to and downstream of the proposed scheme, the 1-D hydraulic model is limited to the open channel reach of these watercourses, starting from downstream of the A96 to their confluence with the River Don. However as stated above, the approach to flood risk modelling has been informed by guidance from SEPA.

Water Quality

9.2.37 No water quality information was available from SEPA for the Scatter Burn and Woodside Burn. However, water quality was inferred from a range of desk-based sources, visual assessment and professional judgement.

9.2.38 The low flow (i.e. Q95; the flow that is anticipated to be exceeded 95% of the time) estimate of the Scatter Burn used in the HAWRAT assessment, is subject to high uncertainty due to the urbanised nature of the catchment and limited availability of as-built records showing the various inputs from the surface water drainage network. As a result, a sensitivity analysis has been undertaken with a reduced low flow estimate of approximately 60% of the full Q95 estimate. The results of the water quality assessment for the full Q95 estimate are provided in this chapter only.

9.3 Baseline Conditions

Introduction

9.3.1 This section describes the baseline situation for the watercourses and surface water flooding within the study area. A summary of the existing road drainage network is also provided in this section. Table 9.4 provides a summary of the sensitivity category assigned to the attributes of each watercourse.

9.3.2 Three watercourses were identified within the study area as follows:

- River Don;
- Scatter Burn; and
- Woodside Burn.

Watercourse Descriptions

River Don

9.3.3 The River Don (Plate 9.1) is a large watercourse and has a total catchment area of approximately 1,320km^2. The watercourse flows in an easterly direction for approximately 144km from its source in the eastern Cairngorm Mountains to its tidal limit in the Seaton area of Aberdeen before discharging into the North Sea to the north of Aberdeen. The catchment is predominantly rural/agricultural in its upstream extent and urban further downstream. It is located approximately 0.25km the north of the proposed scheme at its closest extent and flows within approximately 0.4km of the existing Haudagain Roundabout (approximate NGR NJ 913 091). Scatter Burn and Woodside Burn both flow north into the River Don. Both burns are almost entirely culverted through the Middlefield, Hilton and Woodside areas in the vicinity of the proposed scheme, as discussed below.

Plate 9.1: River Don

a) Upstream view of River Don at A90 Persley Bridge within study area.

b) Downstream view of River Don at A90 Persley Bridge.

Hydrology and Flood Risk

9.3.4 The SEPA Flood Maps (SEPA, 2014a) indicate that the River Don floodplain beyond both the left and right hand river banks is at risk of flooding for the predicted 0.1% AEP (1:1000) and 0.5% AEP (1:200) flood events. However, the fluvial flood extent does not extend up to the proposed scheme. The river has direct flood risk to the adjacent populated areas (Figure 9.2).

Water Quality

9.3.5 The River Don is designated as salmonid waters under the WFD (SEPA, 2014c). Known species include Atlantic salmon, brown trout, eel and stone loach. Refer to Chapter 10 (Ecology and Nature Conservation) for further information. The river is classified as a sensitive area under the EU Urban Wastewater Treatment Directive (UWWTD) up to its tidal limit, indicating it is at risk of becoming eutrophic. The river is also within the Moray/Aberdeenshire/Banff/Buchan Nitrate Vulnerable Zone (NVZ) and is a designated District Wildlife Site (DWS) (SEPA, 2014c). SEPA has not identified any surface water abstractions from the River Don within the study area; however, the river is in the Aberdeen and Lower Don Valley Groundwater Drinking Water Protection Area (DWPA). The river has a high dilution capacity with a Q95 of approximately 5.5m^3/s (1969-2013) at the Parkhill gauging station upstream of the proposed scheme (NGR NJ 887 141) (CEH, 2014).

9.3.6 SEPA classified the River Don (Dyce to tidal limit; water body ID: 23265) as having an overall status of 'Moderate' in 2013, sub-divided into an overall ecological and water quality status of 'Moderate' and overall chemical status of 'Fail' (SEPA, 2014c). The watercourse is currently failing for priority substance octylphenol (a manufactured toxic, virtually insoluble substance used in the chemical industry) and specific pollutants (ammonium). Existing pressures on the River Don include morphological alterations from impoundments (weir/dam), diffuse source pollution from agriculture (phosphorus) and point source pollution from sewage disposal (ammonia and priority substances). With measures identified to improve the modified habitat, reduce pollution source inputs and increase treatment, the River Don has been set the target to achieve overall 'Good' status by 2027 (SEPA, 2014c).

9.3.7 In the vicinity of the proposed scheme, there are numerous sites of potential contamination that could pollute the River Don through surface or groundwater pathways. These include Denhead Gas works, petrol stations and various industrial units. Further details of potentially contaminated sites are provided in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater).

9.3.8 SEPA has provided information regarding existing discharge consents in the vicinity of the proposed scheme. There are five consents within the vicinity of the proposed scheme; however, none of these discharge directly into the River Don.

9.3.9 Despite having a WFD status of 'Moderate', chemical status of 'Fail' and subject to a number of existing pressures, the River Don is classified as salmonid waters and supports species protected under EC legislation.

Scatter Burn

9.3.10 The Scatter Burn (Plate 9.2) is a small watercourse (catchment area of approximately 1.41km^2) and is heavily modified; it is almost entirely culverted beneath the Middlefield area immediately to the north, west and south-west of the proposed scheme. The source of the watercourse may have originally consisted of a network of tributaries fed by natural springs in the Persley Crescent, Smithfield Drive and Northfield areas south and south-west of the existing roundabout (Halcrow, 2008 and 2009); however the culverted channel is now made up of numerous branches as part of the local drainage network. The watercourse daylights on either side of a culvert beneath the Aberdeen to Inverness railway line and is then culverted again beneath the A90 in a 1250mm diameter pipe before outfalling to the River Don at approximate NGR NJ 9095 0945. The catchment area of Scatter Burn in the Middlefield area is restricted as a proportion of the surface water is collected in a combined sewerage system. This surface water is conveyed to the wastewater treatment works (WWTW) to the north of the River Don and after treatment the water is discharged directly to the River Don.

Plate 9.2: Scatter Burn

a) Upstream view of Scatter Burn downstream of the railway culvert. Note: trash screen partially blocked with debris.

b) Downstream view of Scatter Burn upstream of River Don confluence.

Hydrology and Flood Risk

9.3.11 The SEPA Flood Maps (SEPA, 2014a) do not show any fluvial flood risk associated with this watercourse. They do indicate that some areas local to the Scatter Burn are at risk of pluvial flooding. This is attributed to groundwater flooding and poor drainage in these areas and not to fluvial flooding.

9.3.12 The Halcrow (2008) report identified small scale pluvial flooding across the study area, which was attributed to the insufficient coverage/capacity of the existing surface water drainage network in the area.

9.3.13 The modelling results show that for the pre-development condition, the railway culvert on the Scatter Burn passes the design 0.5% AEP (1 in 200 year) event plus 20% allowance for climate change flow in a 'free flowing' condition with an estimated freeboard of 1.25m. Although the 1250mm diameter culvert beneath the A90 road is surcharged during the design event, the upstream water level is not predicted to be 'out of bank' (refer to Figure 9.2).

9.3.14 As the Scatter Burn is culverted extensively along its reach up to the A96 culvert, in the event of an extreme flood event occurring within the Scatter Burn catchment, it is very likely that the upstream culvert system would be surcharged resulting in surface water flooding. Given the distance to the culvert entrance is at least 500m, it is considered unlikely that flooding at this location would impact the proposed development site.

Water Quality

9.3.15 The Scatter Burn is classified by SEPA as a Small Water Body; it is not classified or monitored under the WFD. However, the Scatter Burn is a tributary of the River Don and shares its designation as salmonid waters (SEPA, 2011). Previous studies have indicated that water quality is poor due to the extensive modification and culverting of the burn and numerous inputs from road drainage and wastewater connections, the locations of many of which are unknown (Halcrow, 2008 and 2009).

9.3.16 Significant quantities of debris have been reported at the outlets of culverts, caused predominantly by littering and improper waste disposal (Plate 9.2 a). The water has a cloudy appearance, which is considered to be an indication of inputs from unauthorised sewage connections (Halcrow, 2008). There are potential contamination sources in the vicinity of the Scatter Burn that could enter the drainage system and pollute the burn and downstream River Don. Refer to Chapter 8 (Geology,

Soils, Contaminated Land and Groundwater) for further information regarding potential contamination sources relating to groundwater.

9.3.17 The extensive culverting means that the burn has no morphological diversity and aquatic species are absent or scarce. The culverted burn is also likely to suffer from oxygen sags caused by the lack of light and any reduction in surface area through the culverts may also reduce atmospheric oxygenation of the water. The burn has a low dilution capacity which is controlled by the capacity of the culverts and the volume of surface water that reaches the burn through the existing drainage network. The poor water quality of the Scatter Burn is not considered to significantly affect the water quality of the River Don due to the much higher dilution capacity of the larger watercourse (Halcrow, 2008).

9.3.18 SEPA has identified two licences/permits for discharges to the Scatter Burn including an existing surface water outfall to the Scatter Burn immediately upstream of the Aberdeen to Inverness railway line (CAR/L/1002512) and an existing Combined Sewer Overflow (CSO) connection from Manor Drive (CAR/L/1026105).

9.3.19 Despite the designation as salmonid waters under the WFD, the Scatter Burn is considered to have poor water quality and supports no species of conservation concern.

Woodside Burn

9.3.20 The Woodside Burn (Plate 9.3) is a small watercourse with a catchment area of approximately 1.12km^2 which is significantly urbanised. The watercourse is almost entirely culverted along its reach to the east and south-east of the proposed scheme with some intermittent open channel sections. The watercourse daylights on either side of a culvert beneath the Aberdeen to Inverness railway line approximately 0.25km to the east of the proposed scheme at its closest extent, after which it is culverted by a 900mm pipe up to its outfall to the River Don at approximate NGR NJ 9170 0965. A short abandoned (dry) open channel section immediately downstream of the railway bridge appears to act as a bypass channel during high return period flood events, as shown on Figure 9.1.

Plate 9.3: Woodside Burn

a) Downstream view of Woodside Burn upstream of railway culvert.

b) Downstream view of Woodside Burn at railway culvert inlet.

Hydrology and Flood Risk

9.3.21 The SEPA Flood Maps (SEPA, 2014a) do not show any fluvial flooding along Woodside Burn. However some local pluvial flooding extent (low and medium likelihood) is shown along the downstream reaches of the watercourse.

9.3.22 The Woodside Burn railway culvert is predicted to be surcharged at its entrance during the 0.5% AEP (1 in 200 year) design event plus 20% allowance for climate change, although upstream water level is not predicted to be 'out-of-bank' (refer to Figure 9.2).

9.3.23 As the Woodside Burn is culverted extensively along its reach up to the A96 culvert, in the event of an extreme flood event occurring within the Woodside Burn catchment, it is very likely that the upstream culvert system would be surcharged at its inlet resulting in surface water flooding. Given the distance to the culvert entrance is at least 500m, it is considered unlikely that flooding at this location would impact the proposed development site.

Water Quality

9.3.24 The Woodside Burn is not identified or classified by SEPA under the WFD, and as such, little water quality information is available. Similar to the Scatter Burn, water quality is likely to be adversely affected by extensive culverting; the resulting lack of sunlight and oxygen severely limits biodiversity and is likely to cause oxygen sags. Any reduction in surface area through the culverts may further reduce atmospheric oxygenation of the water. The burn has low dilution capacity which is controlled by the capacity of the culverts and the volume of surface water that reaches the burn through the existing drainage network.

9.3.25 Based on surrounding land use in the vicinity of the proposed scheme, the Woodside Burn is considered likely to receive pollution from untreated road drainage from the existing urban environment in the Middlefield, Woodside and Hilton areas. There are potential contamination sources in the vicinity of the Woodside Burn that could enter the drainage system and pollute the burn and downstream River Don. Refer to Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) for further information regarding potential contaminated sites relating to groundwater.

9.3.26 SEPA has identified two licences for discharges to the Woodside Burn. This includes an existing CSO connection from the Northern District Sewer (CAR/L/1002619), and from Fowler Avenue and A96 Great Northern Road (both under CAR/L/1026105).

Existing Road Drainage Network

9.3.27 The Scatter Burn and Woodside Burn receive the majority of existing road drainage in the Middlefield and Hilton areas through the surface water drainage network. A proportion of the surface water collected in the combined sewerage system in the Middlefield area is conveyed to the WWTW on the north bank of the River Don. Both watercourses outfall to the River Don, which due to the known pressures on its WFD status (which does not include inputs from road runoff) and its size, is considered to effectively dilute any contaminated road runoff received.

9.3.28 There is an existing licensed surface water outfall to the Scatter Burn and other licensed/consented discharges to both the Scatter Burn and Woodside Burn within the study area. There are no existing measures to treat or attenuate polluted surface runoff from the local road network prior to discharge.

Summary of Watercourse Sensitivities

9.3.29 Table 9.4 summarises the sensitivity of each attribute of a surface watercourse, identified within the study area, using the criteria outlined in Table 9.1 and DMRB HD 45/09 guidance.

Table 9.4: Sensitivity of each Attribute of Surface Watercourses

Watercourse	Attribute	Quality	Sensitivity
River Don	Flood Risk	Risk of flooding for the predicted 0.1% AEP (1:1000) and 0.5% AEP (1:200) flood events and direct flood risk to the adjacent populated areas. However, fluvial flood extent does not extend up to the proposed scheme.	Medium
	Water Quality	WFD chemical status Fail; overall water quality status of Moderate (2013). A number of existing pressures on watercourse; however improvement measures identified by SEPA to achieve Good status by 2027.	Medium
	Dilution and removal of waste products	High pollution/dilution dispersal capacity. Sensitive under the Urban Waste Water Treatment Directive.	High
	Biodiversity	Designated salmonid waters and species protected under EC legislation.	High
	Water Supply	Within a Groundwater Drinking Water Protection Area.	Medium
Scatter Burn	Flood Risk	No fluvial flood risk. Localised pluvial flooding across the study area attributed to the insufficient coverage/capacity of the existing surface water drainage network.	Medium*
	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low
	Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Two CAR licences identified for discharges.	Low
	Biodiversity	No classification data available. Although classified as salmonid waters, biodiversity considered to be limited due to extensive culverting and supports no species of conservation concern.	Low
	Water Supply	None.	Low
Woodside Burn	Flood Risk	No fluvial flood risk. Some localised pluvial flooding extent (low and medium likelihood) along the downstream reaches of watercourse.	Medium*
	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low
	Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Three CAR licences identified for discharges.	Low
	Biodiversity	No classification data available. Considered to be limited due to extensive culverting and supports no species of conservation concern.	Low
	Water Supply	None.	Low

*Medium risk applied due to the risk of pluvial flooding local to this area.

9.4 Potential Impacts

Introduction

9.4.1 This section describes potential impacts on the water environment that could arise in the absence of mitigation, during both construction and operational phases of the proposed scheme. Generic potential impacts are described, followed by specific impacts on the watercourses. Residual impacts taking into account the proposed mitigation are provided in Section 9.6 (Residual Impacts). Details of the proposed scheme are provided in Chapter 4 (The Proposed Scheme) and the key construction works on or near each watercourse are summarised in Table 9.5 below.

9.4.2 The results of the HAWRAT water quality assessment are presented at the end of this section.

Table 9.5: Construction Activities on or near watercourses

Watercourse	Construction Activities
River Don	No in-channel works. Indirect impacts due to works in tributaries within study area.
Scatter Burn	Construction of new outfall. Other construction works in catchment including earthworks/excavations associated with demolition and road construction, and construction of SUDS detention basin and access road.
Woodside Burn	No in-channel works. Other construction works in catchment including earthworks/excavations associated with demolition and road construction.

Generic Construction Impacts

9.4.3 Construction impacts on the water environment are often of short-term duration, although in some cases these can have longer term indirect impacts on dependent freshwater habitats. Construction impacts are likely to be more intense than during the long-term operational phase, due to the heightened concentration of activities occurring in or near surface waters during the construction period.

Hydrology and Flood Risk

9.4.4 The construction phase may result in the alteration of runoff pathways, which may lead to increased flood risk.

9.4.5 Flow may be abstracted from watercourses during construction works for on-site activities such as dampening down haul roads during dry conditions. This may reduce the typical low flow of the watercourses. Any temporary abstractions may be subject to CAR General Binding Rules (GBRs).

9.4.6 Other potential impacts during construction of the proposed scheme could include soil compaction from works traffic which could increase surface water runoff. Temporary discharge of working area drainage to the existing drainage system could also lead to increased local flood risk. The severity of the impacts is likely to be higher during periods of intense or prolonged rainfall.

Water Quality

9.4.7 Although effects on water quality are likely to be short-term and acute during the construction phase, they could have a longer term chronic effect on aquatic ecology and groundwater resources.

9.4.8 During the construction phase, pollution from mobilised suspended solids from construction sites would present the greatest risk to the water quality of watercourses. In particular, suspended solids found in construction site runoff can lower the chemical or ecological quality of a watercourse. Sediment release could occur during in-channel works, site clearance operations (including demolition) and earthworks in the vicinity of the surface water drainage network and watercourses. The effects of sedimentation can be felt at various locations along a river, for example, larger

particles would be deposited on the stream bed closer to the source of pollution than finer sediments, which can be transported further and affect distant, downstream sections.

9.4.9 Runoff from construction sites can also contain toxic elements, which could have adverse effects on in-stream flora and fauna. Such toxic elements may build up on the stream bed and remain in situ for some time before they are degraded or dispersed. There would also be a risk from accidental spillage of fuels, lubricants and hydraulic fluids from mobile or stationary plant, which could potentially enter watercourses and cause acute pollution incidents.

9.4.10 Accidental release of concrete or unset cement into watercourses can result from the washings of plant and machinery or from a spill during concrete pouring. These materials are highly alkaline and if they enter surface waters or groundwater, have the potential to cause adverse effects on aquatic life through elevation of water pH.

9.4.11 Accidental/uncontrolled release of sewage from sewers through damage to pipelines during service diversions, or from on-site welfare facilities, can enter and pollute watercourses and groundwater.

9.4.12 Potential changes in groundwater levels associated with road cuttings, could result in the dewatering of watercourses. However, due to the distance between the River Don and the nearest cutting (approximately 0.3km), and the culverted nature of the Scatter Burn and Woodside Burn, the significance of these impacts is considered unlikely to exceed Negligible/Slight; refer to Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) for further details regarding impacts to groundwater.

Specific Construction Impacts

9.4.13 This section provides an assessment of the potential construction impacts on the River Don, Scatter Burn and Woodside Burn. This is based on the key construction works proposed on or near each of the watercourses (Table 9.5).

River Don

Hydrology and Flood Risk

9.4.14 Due to the size of the River Don and distance of the proposed works (approximately 0.25km at its closest extent), it is considered unlikely that construction activities would impact upon the existing flood risk of the River Don, resulting in an impact of Negligible magnitude and Neutral significance.

Water Quality

9.4.15 The construction activities would not directly affect the River Don. For the watercourse as a whole, pollutants and sediment in runoff received via the two tributaries are likely to be sufficiently diluted and dispersed to pose only an impact of Minor magnitude and therefore Slight significance on attributes 'Water Quality' and 'Water Supply' and Slight/Moderate significance on attributes 'Dilution' and 'Biodiversity'..

Scatter Burn

Hydrology and Flood Risk

9.4.16 The proposed scheme requires the construction of a new drainage outfall via a connection to the Scatter Burn culverted reach in the vicinity of the A96 crossing. It is considered unlikely that this construction activity could result in an increase in flood risk during the construction phase and therefore impact on flood risk is considered to be of Negligible magnitude and Neutral significance.

Water Quality

9.4.17 The proposed works could result in contaminated runoff entering the Scatter Burn due to the proximity of the works to the Middlefield surface water drainage network and ultimately the

watercourse. Contaminated run-off (principally silt) can result from exposed surfaces and areas of new temporary and permanent hardstanding. Construction works, particularly construction of a new outfall could result in increased sedimentation and spillage of fuels, chemicals and other hazardous substances into the watercourse.

9.4.18 Excavations could present a risk to the water quality of the Scatter Burn through damage to the existing culverted sections.

9.4.19 Possible disturbance of potentially contaminated sites during construction, such as the former Denhead Gas Works, could present a risk to the water quality of the Scatter Burn through re-mobilisation of contaminants. Refer to Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) for further details on potentially contaminated sites and associated impacts.

9.4.20 The watercourse is considered to have a low dilution capacity, which would limit the potential to ameliorate any increases in turbidity and pollutants in the water column. There are a number of proposed construction works in close proximity to the Scatter Burn and existing connected drainage network, which could result in an impact of Moderate magnitude and therefore Slight significance for all water quality attributes.

Woodside Burn

Hydrology and Flood Risk

9.4.21 No construction works are required adjacent to the Woodside Burn and therefore it is considered highly unlikely that construction activities would directly impact upon the flood risk of the Woodside Burn. Therefore impact on flood risk is considered to be of Negligible magnitude and Neutral significance.

Water Quality

9.4.22 Contaminated run-off (principally silt) resulting from exposed surfaces and areas of new temporary and permanent hardstanding has potential to result in increased sedimentation and spillage of fuels, chemicals and other hazardous substances into the surface water drainage network and Woodside Burn.

9.4.23 Possible disturbance of potentially contaminated sites during construction, including the petrol station on the A90(T) North Anderson Drive and tyre dealers on A96(T) Auchmill Road could present a risk to water quality of the Woodside Burn through re-mobilisation of contaminants. Refer to Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) for further details on potentially contaminated sites and associated impacts.

9.4.24 The watercourse is considered to have a low dilution capacity, which would limit the potential to ameliorate any increases in turbidity and pollutants in the water column. The proposed scheme would entail a number of construction activities within close proximity to the Woodside Burn and existing connected drainage network, which could result in an impact of Moderate magnitude and therefore Slight significance for all water quality attributes.

Generic Operational Impacts

9.4.25 Impacts on the water environment during the operational phase are often permanent and may be either acute or chronic. Operational impacts could result from changes to road drainage and increases in impermeable area affecting both water quality and quantity.

Hydrology and Flood Risk

9.4.26 Due to the nature of the proposed scheme, water consumption is not a feature and therefore has been scoped out of the impact assessment.

9.4.27 The following aspects of permanent road drainage could have an impact on the localised water environment in the vicinity of the proposed scheme:

- Impermeable areas: an increase in impermeable areas would result in an increase in the overall volume of water reaching the watercourse, as less is lost to infiltration. Surface water runoff may also reach the receiving watercourse earlier than during pre-scheme conditions, which may result in the flood response of the catchment becoming more 'flashy', increasing flood risk and stream power downstream.
- Direct discharge of road drainage to a receiving watercourse: alterations to the hydrological and flood regimes of receiving watercourses may occur if there is no suitably designed attenuation of surface water runoff.
- Altered/restricted flow path: constriction or severing of established flow paths may lead to an increased flood risk; changes to sediment regime via changes to gradient and size of watercourse leading to impacts upon geomorphology and subsequently water quality. Alterations to the flow regime could also have associated impacts on the ecological status of a watercourse.

Water Quality

9.4.28 A future increase in traffic volumes as a result of the proposed scheme could lead to an increase in the volume/frequency of contaminated road runoff and fuel spillages entering the drainage system and Scatter Burn. There are a wide range of pollutants found in road runoff which may have an effect on the receiving waters and associated ecology, including suspended solids and contaminants bound to them (such as metals and phosphorus); biodegradable organic materials (such as debris and grass cuttings); diffuse sources with high levels of nutrients (nitrogen and phosphorus); de-icing salt (chloride); and oil and related compounds.

Specific Operational Impacts

9.4.29 This section provides an assessment of the potential operational impacts on the River Don, Scatter Burn and Woodside Burn. A new drainage outfall is proposed to the Scatter Burn, as summarised in Table 9.6 below. A summary of the results of the HAWRAT water quality assessment is presented at the end of this section. Refer to Appendix A9.2 (Water Quality Calculations) for the HAWRAT methodology and calculations.

Table 9.6: Proposed Scheme Drainage Network

Receiving Water Body	Outfall Location (NGR)	Road Drainage Length (m)	Impermeable Road Drainage Area m2 (ha)
Scatter Burn	NJ 91059 09177	1,077m total length (473m dual carriageway link road, 210m Manor Avenue, 77m access to Manor Avenue, 317m Logie Avenue).	22,907 (2.2907)

9.4.30 The total development area is approximately 3.3ha, of which approximately 2.3ha is located in the Woodside Burn catchment and 1.0ha in the Scatter Burn catchment. The proposed development site would have approximately 2.3ha of impervious road area and 1.0ha of pervious area. Of the total 2.3ha of impervious area, 1.5ha is already impervious. Thus the proposed development results in an additional impervious area of 0.8ha; of which 0.2ha is located in the Scatter Burn catchment and 0.6ha is located in the Woodside Burn catchment. Although the development area is situated in both of the existing catchments, the proposed drainage from the development area is designed to outfall solely to the Scatter Burn.

River Don

Hydrology and Flood Risk

9.4.31 There will be no perceptible change on the hydrology and flood risk of the River Don, resulting in an impact of Negligible magnitude and Neutral significance.

Water Quality

9.4.32 There is potential for silt-laden and contaminated runoff to be carried downstream to the River Don. However, due to the high dilution capacity (Q95 = 5.5m^3/s) and dispersion capacity of this watercourse and distance from the proposed scheme, it is considered that impacts would be of Negligible magnitude and Neutral significance for all water quality attributes.

Scatter Burn

Hydrology and Flood Risk

9.4.33 Any increase in peak flow in the Scatter Burn due to increased surface water runoff from the development site could increase flood risk. The impact is considered to be of Minor magnitude and Slight significance.

9.4.34 Assessment of the capacity of the A90 and railway culverts on the Scatter Burn shows that the 2.4m high railway culvert has sufficient flow capacity at the design 0.5% AEP (1:200 year) event plus 20% allowance for climate change in a 'free flowing' condition, with an estimated freeboard of 1.25m, below the culvert soffit level.

9.4.35 The modelling result also showed that the 1250mm pipe culvert under the A90 surcharges at the design 0.5% AEP (1:200 year) plus climate change event. However, the upstream water level is not predicted to be 'out of bank' during this design event, and therefore is not predicted to impact the railway or the A90 road (refer to Figure 9.2).

Water Quality

9.4.36 The HAWRAT routine runoff assessment indicates a 'Pass' result for soluble pollutants prior to mitigation after Step 2 (Table 9.8). However the sediment-bound pollutants indicates a 'Fail' result and therefore sediment accumulation would be expected (Table 9.9). Further details are provided in the section below.

9.4.37 The spillage risk assessment is summarised in Table 9.7. Refer to Appendix A9.2 (Water Quality Calculations) for methodology and calculation spreadsheets.

Table 9.7: Summary of Spillage Risk Assessment (prior to mitigation)

Receiving Watercourse	Threshold of Acceptability % AEP (1:X return period)	Spillage Risk %AEP (1:X return period)	Within Acceptable Limits?
Scatter Burn	1.0% (1:100)	0.005% (1:21,600)	Yes

9.4.38 The results in Table 9.7 indicate that, before mitigation, the spillage risk is approximately 0.005% AEP (21,600 years), which is well within the threshold of acceptability of 0.1% AEP (1 in 100 years).

9.4.39 Overall, due to the failure of sediment-bound pollutants in HAWRAT, impacts are considered to be of Minor magnitude and Neutral significance, based upon the criteria in Table 9.2.

Woodside Burn

Hydrology and Flood Risk

9.4.40 The Woodside Burn would not be impacted by the proposed scheme, consequently flood risk would not be impacted.

9.4.41 Surface water runoff from the south-eastern part of the new road surface (approximately 2.3ha), which is naturally draining towards the Woodside Burn in the pre-development condition, would be

directed towards the Scatter Burn in the proposed scheme. Consequently, flow would be slightly reduced in the post-development condition and hence there would be a slightly reduced risk of flooding in the Woodside Burn. The alteration (reduction) in catchment area of the Woodside Burn is approximately 2% of the total catchment area, which corresponds to an impact on reduced flows of Minor magnitude and Slight significance.

Water Quality

9.4.42 The drainage system has been designed to outfall solely to the Scatter Burn. The redirection of drainage away from the Woodside Burn is considered to have an impact on reduced dilution capacity of Minor magnitude and Neutral significance.

HAWRAT Results – Scatter Burn

9.4.43 Tables 9.8 and 9.9 show the results of the HAWRAT routine runoff assessment on Scatter Burn. Refer to Appendix A9.2 (Water Quality Calculations) for methodology and calculation spreadsheets.

Table 9.8: Summary of Routine Runoff Assessment (Soluble Pollutants)

Water Body	Step	Pollutant (µg/l)	RST Threshold		Annual Average Conc.(µg/l)	EQS	PASS / FAIL
			24hr	6hr			
Scatter Burn	Step 1: In Runoff	Dissolved Copper	FAIL	FAIL	-	-	
		Dissolved Zinc	FAIL	FAIL	-	-	
	Step 2: In River	Dissolved Copper	PASS	PASS	0.23	1	PASS
		Dissolved Zinc	PASS	PASS	0.95	7.8	PASS
	Step 3: with mitigation	Dissolved Copper	Pass at Step 2: Not required				
		Dissolved Zinc					

9.4.44 As shown in Table 9.8, Scatter Burn returns a FAIL result at Step 1, as this is for soluble pollutant concentrations in runoff only, prior to mixing within the watercourse. The soluble pollutant assessment returns a PASS at Step 2 (i.e. after mixing) indicating that river flow is sufficient to dilute soluble pollutants to within acceptable levels, prior to any mitigation measures being implemented (i.e. Step 3).

Table 9.9: Summary of Routine Runoff Assessment (Sediment-Bound Pollutants)

Receiving Water Body	Step	Low-flow velocity (m/s)	Velocity deposition threshold (m/s)	DI value	DI threshold	PASS / FAIL	Required Mitigation (%)
Scatter Burn	Step 1: In Runoff	Not considered					
	Step 2: In River	0.0038	0.03	254	100	FAIL	61% settlement needed
	Step 3: with mitigation	0.0038	0.03	99	100	PASS	61%

9.4.45 The sediment-bound pollutant assessment is not considered at Step 1. As shown in Table 9.9, the assessment returns a FAIL result at Step 2 due to a high Deposition Index (DI) value of approximately 254, which indicates that mitigation for sediment-bound pollution would be required to achieve acceptable levels and return a PASS result (i.e. 61% settlement would be needed). With the required mitigation of 61% settlement, the DI value would be reduced to less than 100 (which would indicate sediment deposition is not extensive), resulting in a PASS result at Step 3.

9.4.46 As a result of the high uncertainty associated with the low flow (Q95) estimate of the Scatter Burn, due to the highly urbanised catchment with many drainage inputs, a sensitivity analysis was undertaken using an approximate 40% reduction (0.0024m^3/s) of the low flow value (0.0038m^3/s). With this reduced low flow estimate, the required sediment removal to achieve acceptable levels was shown to be 70% and soluble metals still achieved a PASS prior to mitigation (refer to Table 9.11). This approach has been discussed and agreed with SEPA.

9.5 Mitigation

Introduction

9.5.1 As shown in Table 9.9, mitigation is required to address the effects associated with sediment-bound pollutants. SUDS are a legal requirement in Scotland for new developments, including new and improved road schemes, and therefore SUDS proposals are considered. In agreement with SEPA, the proposed scheme includes provision for two levels of SUDS prior to road drainage discharging to the Scatter Burn, including a vortex separator and detention basin.

9.5.2 The objectives of the mitigation measures outlined in this section are to avoid/prevent, reduce or offset the potential impacts described in Section 9.4 (Potential Impacts).

9.5.3 It should be noted that in addition to the measures proposed in this section, there has been significant environmental input to the design process to help inform the most sustainable design and drainage solution. SEPA has been consulted at various stages to review the proposals and agree aspects such as the number of treatment levels required.

Construction Mitigation

9.5.4 The Contractor would be required under Section 20A and 55A of the Roads (Scotland) Act 1984 to comply with the mitigation requirements outlined in the paragraphs below.

9.5.5 Prior to construction, the Contractor would be required to prepare a Construction Environmental Management Plan (CEMP), or equivalent, which would address and mitigate risks identified in the ES (Mitigation Item W1) (refer to Chapter 19: Schedule of Environmental Commitments), and would be subject to approval by SEPA. In addition, the Environmental Site Manager or a suitably qualified member of the construction team, e.g. Environmental Clerk of Works (EnvCoW), would seek to ensure that the mitigation measures identified within the CEMP are fully implemented and activities carried out in such a manner as to prevent or reduce impacts on the surface water environment (Mitigation Item W2).

9.5.6 Measures to avoid, reduce or control pollution of surface water and groundwater would incorporate SEPA requirements and CIRIA guidelines for pollution control, including relevant Pollution Prevention Guidelines (PPGs), as listed in Section 9.7 (References) and the SEPA's Good Practice Guide: Temporary Construction Methods (SEPA, 2009) (Mitigation Item W3).

<u>Working In-stream</u>

9.5.7 The Contractor would be required to prepare construction method statements for any in-stream working for approval by SEPA prior to these specific works (Mitigation Item W4). The only in-channel works in the proposed scheme would be construction of a new outfall to the Scatter Burn culverted reach in the vicinity of the A96 crossing. The method statement would include measures to deal with flowing water appropriately and reduce the risk of mobilisation of sediments. Compliance with CAR authorisation requirements would be ensured.

Runoff from the Working Area

9.5.8 During construction of the roadway and associated works, temporary drainage systems would alleviate localised flood risk and help to prevent obstruction of surface runoff pathways (Mitigation Item W5). Temporary SUDS systems or equivalent to reduce the potential for contaminated runoff to the surface water drainage network or watercourses would be used (Mitigation Item W6). Temporary discharge consents are to be obtained from SEPA, where required (Mitigation Item W7). CIRIA C648/C649 (CIRIA, 2006a and b) and C697/C698 (CIRIA 2007a and b) would be adhered to for the construction of temporary and/or permanent SUDS.

9.5.9 Other runoff and erosion control measures (Mitigation Item W8) to include as appropriate:

- provision of wheel washes more than 10m from watercourses and appropriate disposal of dirty water;
- cleaning of roads;
- limit exposed bare areas;
- covering of stockpiles;
- use of silt fences;
- provision of peripheral cut-off ditches to intercept runoff from entering working area; and
- regular visual inspection and water monitoring of receiving watercourse(s) to be agreed with SEPA.

Sedimentation and Earthworks

9.5.10 In addition to temporary SUDS, appropriate control measures for construction site runoff and sedimentation (Mitigation Item W9) would include:

- cleaning of roads to reduce mud and dust deposits;
- limit exposed bare areas and uncontrolled runoff from newly paved areas;
- covering and bunding of soil stockpiles (if required);
- use of silt fences where appropriate;
- early covering/seeding/planting of exposed surfaces where practicable;
- where appropriate, provision of peripheral cut-off ditches or drainage system to intercept runoff from outside the working area such that it does not encroach on the working area;
- if not already present, lay suitable surfacing materials in site compound and on main access routes; and
- regular proactive visual inspection of the sedimentation measures and receiving watercourses.

9.5.11 If flocculants are considered necessary to aid settlement of fine suspended solids, such as clay particles, the chemicals used must first be approved by SEPA (Mitigation Item W10).

9.5.12 Where required, CAR authorisation would be obtained from SEPA (Mitigation Item W11).

9.5.13 The Contractor would be required to comply with the relevant sections of BS6031:2009 Code of Practice for Earthworks with respect to protection of water quality and control of site drainage including washings, dewatering, abstractions and surface water (Mitigation Item W12).

9.5.14 Where the Contractor considers the use of alternative materials to those included in the Stage 3 design stage for use as fill, e.g. in embankments, agreement with SEPA should be sought prior to use of such material, where required (Mitigation Item W13).

Oils, Fuels, and Chemical Storage, Handling and Use

9.5.15 Best practice measures associated with storage of oils and fuel would be followed in compliance with The Water Environment (Oil Storage) (Scotland) Regulations 2006, SEPA PPG02 and PPG26, and would be included within the Contractor's CEMP (Mitigation Item W14).

9.5.16 Effective mitigation for impacts associated with storage, handling and use of chemicals would be based on the following measures (Mitigation Item W15):

- PPG26 would be followed. Chemicals stored in drums will, as far as practicable, be stored within a secondary containment system. Containers without secondary containment will not be placed within 10m of an open section of watercourse or drainage gulley, which provides a direct pathway to watercourse.
- Chemical stores would be located above the 0.5% AEP (1 in 200-year return period) flood level.
- Pesticides, including herbicides, would only be used if there are no alternative practicable measures, and would be used in accordance with the manufacturer's instructions and application rates. Choice of pesticides would be those with least harm to the environment (i.e. least toxic and least persistent) suitable for the required purpose. Pesticide use near watercourses would require prior approval of SEPA.

9.5.17 Effective mitigation for impacts associated with oil/fuel leaks, spillages and refuelling will be based on the following measures (Mitigation Item W16):

- Bunded areas of sufficient storage capacity (at least 110% of maximum tank capacity) with impervious walls and floor lining for the storage of fuel, oil and chemicals.
- Appropriate measures, including site security, to avoid spillages.
- Compliance with the Pollution Incident Control Plan and SEPA PPG21 and PPG22.
- Stationary plant would be fitted with drip trays and emptied regularly; plant machinery to be properly maintained.
- Suitable spillage kits would be stored at key locations on site.

Controls for Use of Concrete, Cement and Grout

9.5.18 Concrete mixing and washing areas (Mitigation Item W17) would:

- be located more than 10m from open sections of watercourses and waterbodies;
- have settlement and re-circulation systems for water reuse;
- have a contained area for washing out and cleaning of concrete batching plant or ready mix lorries; and
- collect wash-waters and, where necessary, discharge to foul sewer (with the sewerage provider's permission) or contain wash-water for authorised disposal off-site.

Sewage Disposal

9.5.19 Sewage from site facilities would be disposed of appropriately (Mitigation Item W18) either to:

- foul sewer with the permission of Scottish Water; or
- appropriate treatment and discharge agreed with ACC and SEPA in advance of construction in accordance with PPG04.

Service Diversions and Excavation/Ground Penetration near Services

9.5.20 Service diversions, protection of utilities and local water supplies, excavations and ground penetration would be carried out according to good practice (Mitigation Item W19). Potential services would be identified using information from the service provider and through survey where

necessary. Measures would be taken to prevent damage to services and to avoid pollution during service diversions, excavation and ground penetration.

9.5.21 Where works are proposed within areas of potentially contaminated land or where potentially contaminated groundwater is present, appropriate risk management measures would be implemented to reduce the risk of pollution to an acceptably low level. Mitigation measures are identified separately in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) and not repeated here.

Programme of Works

9.5.22 The potential impact of the proposed scheme can be reduced through timely implementation of certain aspects of the construction works. In particular, the permanent SUDS (detention basin and vortex separator) would be scheduled for construction early in the programme, to allow settlement and treatment of any pollutants contained in site runoff and to control the rate of flow before water is discharged into the Scatter Burn. The SUDS would be cleaned of sediments and pollutants (using appropriate licensed disposal off-site) prior to the Contractor leaving the site (Mitigation Item W20).

Monitoring and Inspection during Construction

9.5.23 Regular inspections would be carried out by the EnvCoW to identify and recommend appropriate actions for aspects such as unacceptably high pollution risk, or any suspected incidences of pollution (Mitigation Item W21). A Pollution Incident Response Plan would be implemented, in line with SEPA PPG21 and PPG22. This would include formulation of emergency procedures to address accidental pollutant releases and spillages, and would include appropriate staff briefings, toolbox talks and other staff training, as required.

Operational Mitigation

Drainage

9.5.24 The drainage system of the proposed scheme has been designed in accordance with the following guidance:

- Control of Pollution from Highway Drainage Discharges, Report 142 (CIRIA, 1997).
- The SUDS Manual, CIRIA C697 (CIRIA, 2007a).
- SUDS for Roads (SCOTS, 2010).

9.5.25 Where it has been identified as necessary for road drainage to discharge to receiving watercourses, mitigation would be designed to limit the volume of discharge and the risk to water quality. Where required, authorisation for the road drainage discharge under CAR would be obtained from SEPA (Mitigation Item W22).

9.5.26 As noted previously, SEPA has been consulted throughout the progression of the drainage design, and has requested the provision of a minimum of two levels of attenuation and treatment for the proposed scheme prior to outfall to the Scatter Burn culvert. The proposed SUDS measures include a hydrodynamic vortex separator and detention basin.

9.5.27 The detention basin would be designed with an impermeable liner to reduce any identified risk of pollution to groundwater, unless otherwise agreed with SEPA by the Contractor (Mitigation Item W23).

9.5.28 The detention basin would be designed to attenuate the post-development peak flow to a pre-development peak flow associated with the 50% AEP (1 in 2-year return period) rainfall event prior to outflow to the Scatter Burn (Mitigation Item W24).

9.5.29 The hydraulic and water quality performance potential of each SUDS technique has informed the drainage design based on their primary functions and capabilities. SUDS have been selected to include different stages of the 'treatment train' (pre-treatment, conveyance, source, site or regional control). The primary functions and the water quality treatment processes for each SUDS technique included within the proposed scheme design is listed in Table 9.10

Table 9.10: Primary Functions and Capabilities of Proposed Scheme SUDS

SUDS Treatment System	Component	Primary functions and capabilities
Vortex Separator	Management Train Suitability	Site Control
	Water Quality	Sedimentation, Filtration
Detention Basin (dry)	Management Train Suitability	Site Control, Regional Control
	Water Quantity	Detention
	Water Quality	Sedimentation, Biodegradation

Source: CIRIA (2007a)

9.5.30 Due to the difficulties in accurately estimating the treatment efficiencies of different SUDS techniques, published guidance typically provides a pollutant reduction 'range' rather than a discrete number. Recent draft guidance from the Highways Agency in 2012 includes the following indicative treatment system performance that different SUDS techniques could be expected to remove suspended solids, dissolved copper and dissolved zinc from highway discharges. This is based on different levels of confidence depending on available information/data on the performance of each SUDS technique (Table 9.11). In addition, an indicative spillage risk reduction considered to be achievable for the SUDS is provided, taken from DMRB HD 45/09 guidance (Highways Agency et al., 2009). No data was available for the vortex separator and therefore a conservative estimate of 0% has been provided. This information has been used to inform the pollutant/spillage risk reduction efficiencies used within the HAWRAT road drainage calculations.

Table 9.11: Treatment Systems Efficiency and Design Robustness of SUDS

SUDS measure	Function	Reduction capability (%)
Vortex Separator only	Treatment for solubles	15% (zinc); 0% (copper)
	Settlement of sediments	40%
	Spillage risk reduction	0% (no data)
Detention basin (dry) only	Treatment for solubles	0%
	Settlement of sediments	50%
	Spillage risk reduction	50%
Vortex Separator and Detention Basin (in series)	Treatment for solubles	15%
	Settlement of sediments	70%
	Spillage risk reduction	50%

9.5.31 As stated in Table 9.11, the estimated efficiency of the SUDS in series prior to the Scatter Burn outfall for settlement of sediments is approximately 70%; this is higher than the required reduction of 61% to achieve acceptable levels (refer to Table 9.9).

9.5.32 As discussed above, due to the uncertainty associated with the low flow (Q95) estimate, the sensitivity analysis (40% reduction of the Q95) also indicates that the proposed mitigation highlighted in Table 9.11 is adequate.

9.5.33 In addition, the SUDS in series provide an estimated soluble pollutant reduction of 15%. Although soluble pollutants are shown not to 'fail' prior to mitigation (Table 9.8), by contributing "cleaner" water to Scatter Burn the dilution capacity will be increased thus providing a slight improvement to water quality. However, this improvement is considered to be negligible.

Maintenance of Road Drainage Network

9.5.34 To avoid failure or sub-optimal operation of the road drainage network, maintenance of its components would be necessary. Regular inspection to inform on maintenance frequency would be required, with the minimum recommended maintenance as follows (Mitigation Item W25):

- Regular maintenance of SUDS to enable efficient operation and the settlement of solids and removal of pollutants (such as hydrocarbons).

9.5.35 The drainage system will form part of the adopted road network and therefore will be subject to the maintenance regime of the ACC as roads authority.

9.6 Residual Impacts

9.6.1 Following implementation of the mitigation outlined in Section 9.5 (Mitigation), the potential for impacts on the surface water environment will be avoided/prevented, reduced or offset.

9.6.2 Residual impacts during both the construction and operational phases are summarised for each watercourse in Tables 9.12 and 9.13, respectively. It is considered that all residual impacts would be reduced to Neutral significance, due to the adoption and implementation of appropriate mitigation measures.

Table 9.12: Summary of Residual Impacts on Watercourses (Construction)

Watercourse	Potential Impact	Attribute	Quality	Sensitivity	Mitigation	Residual Impact	
						Magnitude	Significance
River Don	Changes to flood risk	Flood Risk	Risk of flooding for the predicted 0.1% AEP (1:1000) and 0.5% AEP (1:200) flood events and direct flood risk to the adjacent populated areas. However, fluvial flood extent does not extend up to the proposed scheme.	Medium	None	Negligible	Neutral
	Changes to water quality as a result of silt-laden and polluted runoff from two tributaries	Water Quality	WFD overall water quality status of Moderate (2013). A number of existing pressures on watercourse; however improvement measures identified by SEPA to achieve Good status by 2027.	Medium	Refer to individual mitigation proposals for each tributary. The high pollutant dilution/dispersal capacity of the river, as well as distance downstream of the works, is likely to further mitigate impacts.	Negligible	Neutral
		Dilution and removal of waste products	High pollution/dilution dispersal capacity. Sensitive under the Urban Waste Water Treatment Directive.	High		Negligible	Neutral
		Biodiversity	Designated salmonid waters and species protected under EC legislation.	High		Negligible	Neutral
		Water Supply	Within a Groundwater Drinking Water Protection Area.	Medium		Negligible	Neutral
Scatter Burn	Changes to flood risk	Flood Risk	No fluvial flood risk. Localised pluvial flooding across the study area attributed to the insufficient coverage/capacity of the existing surface water drainage network.	Medium	Refer to generic construction mitigation measures.	Negligible	Neutral
	Changes to water quality as a result of silt-laden, polluted and potentially contaminated runoff	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low	Contractor to prepare a CEMP and method statements to be approved by SEPA prior to commencement of works. Follow CIRIA and SEPA best practice guidance including PPGs for temporary construction, working in/near watercourses and pollution control. Installation of temporary treatment facilities, in agreement with SEPA and CIRIA guidance. Untreated sewage to be collected and disposed of appropriately in consultation with SEPA. Monitoring of water quality to be agreed with SEPA.	Minor	Neutral
		Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Two CAR licences identified for discharges.	Low		Negligible	Neutral
		Biodiversity	No classification data available. Considered to be limited due to extensive culverting and supports no species of conservation concern.	Low		Negligible	Neutral
		Water Supply	None.	Low		Negligible	Neutral

Watercourse	Potential Impact	Attribute	Quality	Sensitivity	Mitigation	Residual Impact	
						Magnitude	Significance
Woodside Burn	Changes to flood risk	Flood Risk	No fluvial flood risk. Some localised pluvial flooding extent (low and medium likelihood) along the downstream reaches of watercourse.	Medium	None.	Negligible	Neutral
	Changes to water quality as a result of silt-laden, polluted and potentially contaminated runoff	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low	Refer to mitigation outlined for the Scatter Burn	Minor	Neutral
		Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Three CAR licences identified for discharges.	Low		Negligible	Neutral
		Biodiversity	No classification data available. Considered to be limited due to extensive culverting and supports no species of conservation concern.	Low		Negligible	Neutral
		Water Supply	None.	Low		Negligible	Neutral

Table 9.13: Summary of Residual Impacts on Watercourses (Operation)

Watercourse	Potential Impact	Attribute	Quality	Sensitivity	Mitigation	Residual Impact	
						Magnitude	Significance
River Don	Changes to flood risk	Flood Risk	Risk of flooding for the predicted 0.1% AEP (1:1000) and 0.5% AEP (1:200) flood events and direct flood risk to the adjacent populated areas. However, fluvial flood extent does not extend up to the proposed scheme.	Medium	None	Negligible	Neutral
	Changes to water quality	Water Quality	WFD overall water quality status of Moderate (2013). A number of existing pressures on watercourse; however improvement measures identified by SEPA to achieve Good status by 2027.	Medium	Refer to individual mitigation proposals for each tributary. The high pollutant dilution/dispersal capacity of the river, as well as distance downstream of the works, is likely to further mitigate any impacts.	Negligible	Neutral
		Dilution and removal of waste products	High pollution/dilution dispersal capacity. Sensitive under the Urban Waste Water Treatment Directive.	High		Negligible	Neutral
		Biodiversity	Designated salmonid waters and species protected under EC legislation.	High		Negligible	Neutral
		Water Supply	Within a Groundwater Drinking Water Protection Area.	Medium		Negligible	Neutral
Scatter Burn	Changes to flood risk	Flood Risk	No fluvial flood risk. Small scale pluvial flooding across the study area attributed to the insufficient coverage/capacity of the existing surface water drainage network.	Medium	SUDS attenuation.	Negligible	Neutral
	Change in water quality; increase in future traffic volumes resulting in increased volume of contaminated runoff and risk of accidental spillages.	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low	Follow CIRIA and SEPA best practice outfall and drainage design guidance. Provision of two levels of SUDS including vortex separator and detention basin. Detention basin would be lined to prevent infiltration to groundwater. Scheme mitigation achieves a HAWRAT PASS for the routine runoff assessment and accidental spillage risk further reduced to 0.002% AEP (1:43,199 years). The SUDS provide an estimated soluble pollutant reduction of 15%. Although soluble pollutants do not 'fail' prior to mitigation, by contributing "cleaner" water	Negligible	Neutral
		Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Two CAR licences identified for discharges.	Low		Negligible	Neutral
		Biodiversity	No classification data available. Considered to be limited due to extensive culverting and supports no species of conservation concern.	Low		Negligible	Neutral
		Water Supply	None.	Low		Negligible	Neutral

Watercourse	Potential Impact	Attribute	Quality	Sensitivity	Mitigation	Residual Impact	
						Magnitude	Significance
					to Scatter Burn the dilution capacity will be increased thus providing a slight improvement to water quality.		
Woodside Burn	Changes to flood risk	Flood Risk	No fluvial flood risk. Some localised pluvial flooding extent (low and medium likelihood) along the downstream reaches of watercourse.	Medium	None	Negligible	Neutral
	Changes to water quality and reduced dilution capacity as a result of redirection of drainage away from the Woodside Burn	Water Quality	No classification data available. Highly modified due to extensive culverting and receiving numerous inputs from urban catchment.	Low	No operational drainage to Woodside Burn	Negligible	Neutral
		Dilution and removal of waste products	Low pollutant dilution/dispersal capacity. Three CAR licences identified for discharges.	Low		Negligible	Neutral
		Biodiversity	No classification data available. Considered to be limited due to extensive culverting and supports no species of conservation concern.	Low		Negligible	Neutral
		Water Supply	None.	Low		Negligible	Neutral

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10 Ecology and Nature Conservation

This chapter presents an assessment of the potential impacts of the proposed scheme on terrestrial and freshwater species and habitats. It outlines measures for mitigating these impacts where possible and describes any residual impacts that may occur with mitigation in place.

The assessment was carried out in accordance with all relevant legislation and guidelines with the approach based on Design Manual for Roads and Bridges (DMRB) and Institute of Ecology and Environmental Management (IEEM[1]) guidance.

An ecological impact assessment has been undertaken of the effects of the proposed scheme on receptors present within a 500m buffer zone around the extent of the proposal. Terrestrial and aquatic ecological receptors were identified through desk study, consultation and site surveys. An assessment was then carried out to determine their ecological importance, assess the likely impacts, and establish the significance of such impacts of the proposed scheme on the ecological status of the area.

Surveys and assessments were carried out according to best practice guidance and requirements including the Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006) and SNH guidance on EIA (SNH, 2013a).

Semi-natural habitats within the study area comprise mainly amenity and other types of grassland with broadleaved woodland also present. Most of the remaining area comprised built-up, hardstanding and gardens. The River Don is the main watercourse in the area. Evidence was found for a range of protected species in the area including badger, bats and otter. Salmonid fish and lamprey species were identified as present in the River Don.

Bats were identified as the main receptor to be potentially impacted as a result of the proposed scheme and detailed assessments were undertaken to determine their presence in the area.

No bat roosts were confirmed within the surveyed buildings or trees and bat activity within the area was considered low. Impacts from the proposed scheme would be considered minor concerning the population of bats utilising the area.

No potential impacts of Major significance were identified. With the implementation of proposed mitigation, it is considered that there would be no significant residual impacts on the ecology and nature conservation of the area.

10.1 Introduction

10.1.1 This chapter presents an ecological impact assessment of the proposed scheme on terrestrial and freshwater species through both construction and operation.

10.1.2 The proposed scheme involves the upgrade of a busy junction in an urban situation. This means that many of the potential impacts on ecological receptors normally associated with road operations are already experienced by the species and habitats in the area. However, there are potential additional impacts which require mitigation.

10.1.3 This chapter is supported by the following appendices, which are cross-referenced in the text where relevant:

- Appendix A10.1 (Legislation and Conservation Status);
- Appendix A10.2 (Detailed Terrestrial Ecology Methods);
- Appendix A10.3 (Confidential – Badger and Otter); and
- Appendix A10.4 (Bat Survey Results).

[1] CIEEM was IEEM until April 2013; therefore references to CIEEM publications and guidance before this date will say IEEM.

10.1.4 Appendix A10.3 (Confidential – Badger & Otter) is a confidential report not provided with the ES due to the potential risk to protected species from locational data being publicly available, but these data are submitted to Scottish Natural Heritage (SNH) and Transport Scotland.

10.1.5 Ecology is defined as the scientific study of the distribution and abundance of organisms and the processes that influence these and the interactions between those organisms and their environment. Nature conservation is the maintenance of viable populations of fauna and flora and the habitats and communities to which they belong.

10.1.6 The objectives of nature conservation are:

- maintenance of diversity and landscape character, including wildlife communities and important geological and physical features; and
- maintenance of viable populations of native species throughout their traditional distribution range, and the improvement of the status of rare or endangered species.

10.1.7 The aims of this ecology assessment are to:

- identify the presence and status of habitats, flora and fauna (ecological receptors) of conservation significance within the study area through consultation, desk-based research and field surveys;
- evaluate the importance of ecological receptors in terms of their nature conservation value;
- identify anticipated potential impacts;
- present potential mitigation measures to ameliorate the identified impacts; and
- assess the residual impacts following the successful implementation of mitigation.

10.2 Approach and Methods

Overview of Approach

10.2.1 An assessment of terrestrial and aquatic ecology was undertaken in accordance with the requirements of DMRB Volume 11, Section 3, Part 4: Ecology and Nature Conservation (The Highways Agency et al., 1993) and taking cognisance of other relevant guidance, such as: Scottish Transport Appraisal Guidance (STAG) (Transport Scotland, 2008); best practice guidance for ecological assessment, including the Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006); and SNH guidance on EIA (SNH, 2013a). It should be noted that whilst the principles of IEEM have been followed, standard impact assessment terms have been used where appropriate to provide consistency with the other assessments reported in this ES.

10.2.2 The following framework, provided by IEEM (2006), identifies which ecological features or resources (receptors) within the study area are both of sufficient value to be included in the assessment and vulnerable to significant impacts arising from a project:

- identification of ecological receptors;
- identification of key attributes of the receptor;
- identification of the level of importance of the receptor;
- identification of legal protection offered to the receptor;
- identification of activities in the proposal that may impact on the receptors;
- characterisation of the potential impacts;
- assessment of the significance of the impact to the nature conservation of the receptor;
- assessment of the legal implications of actuating the impact;
- outline the proposed mitigation measures; and

- assessment of the residual impacts of the proposals.

10.2.3 The ecological impact assessment of the proposed scheme has been carried out in accordance with the above guidelines, with the following exceptions or clarifications to ensure consistency with this ES and with DMRB guidance:

- the Zone of Influence referred to in IEEM guidelines has been informed by the DMRB study area guidelines;
- the scope was informed by DMRB guidance and information obtained during the general EIA consultation (Chapter 6: Consultation and Scoping) rather than the use of threshold values;
- the legal implications of the proposed scheme in terms of ecology and nature conservation are considered in Appendix A10.1 (Legislation and Conservation Status); and

10.2.4 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to ecology and nature conservation has been undertaken and is detailed in Appendix 17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Consultation and Literature Review

10.2.5 Consultation was undertaken with statutory and non-statutory consultees with regard to ecology and nature conservation to obtain data and to identify key issues. Responses are summarised in Appendix A6.2 (Summary of Consultation Responses).

10.2.6 The consultee responses were taken into account in the preparation of the ecological impact assessment.

10.2.7 Where information was provided by consultees regarding baseline conditions, it is summarised under the relevant receptor heading within Section 10.3 (Baseline Conditions) of this chapter.

10.2.8 A detailed review was undertaken of relevant literature, including internet sources, to characterise species and habitats within the study area with regards to abundance, distribution and susceptibility to impacts. In particular, reference to the following was made:

- Aberdeen Western Peripheral Route (AWPR) Environmental Statement (Jacobs, 2007);
- National Biodiversity Network (NBN) Gateway website (NBN, 2014);
- Scottish Biodiversity List (SBL), (22 April 2013 version) (Scottish Government, 2013); and
- Scottish Environment Protection Agency (SEPA) River Basin Management Plans Interactive Map (SEPA, 2014).

Field Surveys

Study Area

10.2.9 For the DMRB Stage 2 Assessment, the study area for all ecological receptors extended to 500m from the extent of the proposed scheme (i.e. a 1km wide study area) which is consistent with best practice guidance (The Highways Agency et al., 1993). For the DMRB Stage 3 assessment this was refined to comprise only those receptors determined to be present within 500m of the proposed scheme and where a potential effects pathway could be envisaged. Ad hoc surveys were also undertaken upon the receipt of incidental receptor information. For further details see Appendix A10.2 (Detailed Terrestrial Ecology Methods).

10.2.10 As a result of the DMRB Stage 2 Assessment (Jacobs, 2014), it was considered that formal surveys of aquatic receptors and breeding birds were not required.

Survey Methods

10.2.11 A detailed description of the survey methods used to establish baseline conditions, on which to inform a subsequent evaluation and ecological impact assessment, are presented in Appendix A10.2 (Detailed Terrestrial Ecology Methods).

10.2.12 An extended Phase 1 habitat survey (Joint Nature Conservation Committee (JNCC), 2010a) was undertaken in 2013, to inform a DMRB Stage 2 Assessment (Jacobs, 2014), with an update survey undertaken in 2014. The 2013 survey included a check for presence of potentially suitable habitat and incidental field signs of protected species, to inform whether further targeted species surveys were required.

10.2.13 The DMRB Stage 2 Assessment (Jacobs, 2014) did not find any evidence of suitable habitat or evidence for the presence of great crested newt (*Triturus cristatus*), pine marten (*Martes martes*) and water vole (*Arvicola amphibius*) within the study area. The assessment did identify the need to undertake detailed bat surveys within the vicinity of the proposed scheme, full details of which can be found in Appendix A10.2 (Detailed Terrestrial Ecology Methods). The extended Phase 1 habitat survey, bat surveys and DMRB Stage 2 assessment were carried out and reviewed by experienced Jacobs ecologists, holding survey licences (these are required for certain protected species) where necessary.

10.2.14 Details of the legislative context for protected habitats and species are included in Appendix A10.1 (Legislation and Conservation Status).

Criteria Used to Evaluate Ecological Receptors

10.2.15 The following definitions are used in undertaking the evaluation of baseline conditions:

- an ecological receptor is the habitat, species or community within the receiving environment that might be influenced by the change; and
- the value or sensitivity of the ecological receptor refers to its importance in terms of its nature conservation value and susceptibility to impact.

10.2.16 The value or sensitivity of an ecological receptor was determined by consultation, desk-based studies, field survey information, legal protection/conservation status and professional judgement. Reference was also made to the Ratcliffe Criteria, where applicable, as used in the selection of biological Sites of Special Scientific Interest (SSSIs) (Ratcliffe, 1977).

10.2.17 A value was assigned to each ecological receptor using the framework shown in Table 10.1.

Table 10.1: Criteria Used to Evaluate Ecological Receptors

Importance	Attributes of Ecological Receptor
International European	**Habitats** • An internationally designated site or candidate site (i.e. SPA, provisional SPA (pSPA), SAC, candidate SAC (cSAC), Ramsar site, Biogenetic/Biosphere Reserve, World Heritage Site or an area which meets the published selection criteria for such designation). • A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat that are essential to maintain the viability of a larger whole. • Any river classified as excellent A1 (SEPA), not at significant risk– 2.a and 2.b Water Framework Directive (WFD) and known to support a substantial salmonid population. • Any river with a Habitat Modification Score (HMS) indicating that it is Pristine or Semi-Natural (and within an internationally designated site). **Species** • Any regularly occurring population of an internationally important species, which is threatened or rare in the UK (i.e. a UK Red List species or listed as occurring in 15 or fewer 10km squares, of uncertain conservation status or global conservation concern). • A regularly occurring, nationally significant population/number of any internationally important species.

Importance	Attributes of Ecological Receptor
National Scottish	**Habitats** • A nationally designated site (i.e. SSSI, National Nature Reserve (NNR), or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines)). • A viable area of a priority habitat identified in the UKBAP, or of smaller areas of such habitat that are essential to maintain the viability of a larger whole. • Any pond with PSYM results in the top category for 'good' ecological quality (PSYM result ≥75%) indicative of a priority pond. • Any river classified as excellent A1 (SEPA), not at significant risk– 2.a and 2.b (WFD) and likely to support a substantial salmonid population. • Any river with a HMS indicating that it is Pristine or Semi-Natural. • Habitat of high value based on its ecological function. • LEAFPACS score indicating at least high habitat value (≥0.8). **Species** • A regularly occurring, regionally or county significant population/number of an internationally/nationally important species. • Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see LBAP). • A species identified as a priority species listed in the SBL. • A species listed on 1994 or 2001 International Union for the Conservation of Nature (IUCN) criteria as at least Near Threatened or at least Rare on the Red List based on pre-1994 IUCN guidelines; species listed as Nationally Scarce, Nationally Notable A or Notable B (rare and scarce species not based on IUCN criteria). • CCI of very high conservation value (conservation score >20.00).
Regional North-East Scotland	**Habitats** • Sites which exceed the county-level designations but fall short of SSSI selection criteria. • Viable areas of key habitat identified in the regional BAP or smaller areas of such habitat that are essential to maintain the viability of a larger whole. • Viable areas of key habitat identified as being of regional value in the appropriate SNH Natural Heritage Future area profile. • Any pond with PSYM results in the top category for 'good' ecological quality (PSYM result ≥75%) • indicative of a priority pond. • Any river classified as excellent A1 or good A2 (SEPA), not at significant risk– 2.a and 2.b (WFD) and capable of supporting salmonid population. • Any river with a HMS indicating that it is 'obviously modified' or better. • Habitat of medium to high value based on its ecological function. • LEAFPACS score indicating at least high habitat value (≥0.8). **Species** • Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK or in a regional BAP or relevant SNH Natural Heritage Future area on account of its regional rarity or localisation. • A regularly occurring, locally significant population/number of a regionally important species. • Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county. • Species listed as 'indeterminate' or 'insufficiently known' on the Red Listing pre-1994 IUCN guidelines or species listed on the 1994 IUCN guidelines as data deficient or species listed on the 2001 Red Listing as 'lower risk – least concern'. • WFD classification of high based on invertebrates. • CCI of high conservation value (conservation score ≥15.00-20.00).
Authority area Aberdeen City Council	**Habitats** • Sites recognised by local authorities (e.g. Sites of Interest for Nature Conservation (SINC). • County/district sites that the designating Authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves (LNR). • A viable area of habitat identified in county/district BAP or in the relevant SNH Natural Heritage Future area profile. • A diverse and/or ecologically valuable hedgerow network. • Semi-natural ancient woodland greater than 0.25ha. • Any pond with PSYM results in the top category for 'good' ecological quality (PSYM result ≥75%) indicative of a priority pond. • Any river classified as good A2 or fair B (SEPA), not at significant risk– 2.a and 2.b (WFD) (and likely to support a cyprinid/coarse fishery).

Importance	Attributes of Ecological Receptor
	• Any river with a HMS indicating that it is 'significantly modified' or above. • Habitat of at least medium value. • LEAFPACS score indicating at least good habitat value (≥0.6). **Species** • Any regularly occurring, locally significant population of a species that is listed in a county/district BAP on account of its regional rarity or localisation. • A regularly occurring, locally significant population of a county/district important species (particularly during a critical phase of its life cycle). • Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. • Sites/features scarce within the county/district or which appreciably enrich the county/district habitat resource. • WFD classification of high based on invertebrates. • CCI in full of fairly high conservation value (conservation score ≥10.00-15.00).
Local e.g. Woodside	**Habitats** • Areas of habitat considered to appreciably enrich habitat resource e.g. species-rich hedgerows, ponds. • Sites that retain other elements of semi-natural vegetation that due to their size, quality or the wide distribution of such habitats within the local area are not considered for the above classifications. Semi-natural ancient woodland smaller than 0.25ha. • Any pond with PSYM results in the category for 'moderate' ecological quality (PSYM result 51-75%). • Any river classified as fair B or poor C (SEPA), not at significant risk– 2.a and 2.b (WFD) and unlikely to support coarse fishery. • Rivers with a HMS indicating that it is 'severely modified' or above. • Habitat of low to medium value based on its ecological function. • LEAFPACS score indicating at least good habitat value (≥0.6). **Species** • Populations/assemblages of species that appreciably enrich the local biodiversity resource. • Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations. • WFD classification of good based on invertebrates. • CCI of moderate conservation value (conservation score 5.00-10.00).
Less than Local Limited ecological value	**Habitats** • Sites that retain habitats and/or species of limited ecological importance owing to their size, species composition or other factors. • Any pond with PSYM results in the category of less than 'poor' ecological quality (PSYM result ≤50%). • Any river classified as impoverished D (SEPA), not at significant risk– 2.a and 2.b (WFD) and/or and with a HMS indicating that it is 'severely modified'. • Habitat of low to medium value. • LEAFPACS score indicating moderate or less habitat value (<0.6). **Species** • WFD classification of moderate or below based on invertebrates. • CCI of low conservation value (conservation score <5.00).

Impact Assessment

Identification of Impacts

10.2.18 Knowledge and assessment of construction methods and operational activities, together with professional judgment by experienced ecologists has been used to identify the potential impacts of the proposed scheme on ecological receptors. The activities that could have a potential ecological impact were reviewed and assessed for each ecological receptor individually and in terms of cumulative effects. Potential impacts that might affect an ecological receptor are summarised in Table 10.2.

Table 10.2: Potential Impacts of the Proposed Scheme

Potential Impact	Activity/Cause		
Direct loss	• Land-take • Water pollution	• Dust and air pollution • Changes to hydrology	
Direct mortality	• Land-take • Collision with traffic	• Non-native species transfer • Disease transfer (e.g. red leg disease in amphibians)	• Water pollution
Habitat Fragmentation	• Land-take	• Noise and vibration	• Effects of temporary construction lighting
Loss of diversity	• Non-native species transfer (botanical)* • Dust and air pollution	• Effects of road spray • Water pollution	• Changes to hydrology
Disturbance	• Noise and vibration	• Effects of temporary construction lighting	• Land-take

*Non-native species are those not native to UK and have an invasive nature that reduces ecological diversity of habitats (e.g. Japanese knotweed (*Fallopia japonica)*, Himalayan balsam[2] (*Impatiens glandulifera)*, giant hogweed (*Heracleum mantegazzianum*)). Not to be confused with injurious weeds (Weeds Act, 1959) that are invasive, but native to UK (e.g. spear thistle (*Cirsium vulgare*), creeping or field thistle (*Cirsium arvense*), ragwort (*Senecio jacobaea*)). Examples of non-native faunal species include American mink (*Neovison vison*).

Impact Magnitude

10.2.19 For the purposes of this assessment, the term 'impact magnitude' is taken to represent the overall characterisation of positive or negative impacts in accordance with IEEM (2006), including:

- impact extent/scale;
- direct or indirect impact;
- reversibility of impact;
- frequency of impact (single-event, recurring or constant);
- duration of impact (short-term, medium-term, long-term or permanent); and
- likelihood of occurrence (certain/near certain, probable, unlikely or extremely unlikely).

10.2.20 Impact magnitude was identified as shown in Table 10.3 as negligible; low; medium or high, taking into account the above impact characterisation approach.

Table 10.3: Impact Characterisation Translated into Impact Magnitude

Impact Character	Magnitude
A permanent or long-term effect on the distribution and/or abundance of a habitat, species assemblage/community or population. If negative this would have implications for the integrity of the receptor and its conservation status, and if positive would result in an improvement to the conservation status of the receptor.	High
A permanent or long-term effect on the distribution and/or abundance of a habitat, species assemblage/community or population. If negative this would have negligible implications for the integrity of the receptor or its conservation status and if positive would not alter the conservation status of the receptor.	Medium
A short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/ community or population and within normal fluctuations observed within the ecology of the receptor.	Low
A short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population unlikely to be detectable by monitoring.	Negligible

[2] Also known at Indian balsam (Stace, 2010).

Impact Significance

10.2.21 Once potential impacts were understood and receptor value determined, professional judgement was used to focus the assessment on impacts requiring mitigation. For example, an area of amenity grassland would be evaluated as of less than local value and would not progress through the assessment process. However, an impact on a SSSI valued at a national level would progress through the assessment process, require mitigation as appropriate and the residual impacts would be assessed.

10.2.22 IEEM (2006) states that:

> *'if an ecological resource or feature is likely to experience a significant impact, the consequences in terms of development control, policy guidance and legislation will depend on the level at which it is valued. Significant impacts on features of ecological importance should be mitigated (or compensated for) in accordance with guidance derived from policies applied at the scale relevant to the value of the feature or resource. Any significant impacts remaining after mitigation (the residual impacts), together with an assessment of the likelihood of success in the mitigation, are the factors to be considered against legislation, policy and development control in determining the application'.*

10.2.23 In accordance with IEEM (2006), a significant impact is an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats and species. It is based on consultation, research and experience from other projects, professional judgment and the available information on the impact and receptor. In the context of reporting in this chapter, the specific impact tables provided in Section 10.4 (Potential Impacts) contain information regarding all potential impacts considered to be significant.

10.2.24 The impact magnitude and receptor importance are applied to a matrix to determine the significance of an impact (Table 10.4). Impacts can be positive or negative, either decreasing or improving the health, ecological status or viability of a population, species or habitat.

Table 10.4: Impact Significance (significant impacts in bold)

Magnitude / Importance	High Negative	Medium Negative	Low Negative	Negligible	Low Positive	Medium Positive	High Positive
International	**Major**	**Major**	**Moderate**	Negligible	**Moderate**	**Major**	**Major**
National	**Major**	**Major**	**Moderate**	Negligible	**Moderate**	**Major**	**Major**
Regional	**Major**	**Moderate**	Minor	Negligible	Minor	**Moderate**	**Moderate**
Authority area	**Moderate**	**Moderate**	Minor	Negligible	Minor	**Moderate**	**Moderate**
Local	Minor	Minor	Minor	Negligible	Minor	Minor	Minor
Less than Local	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

10.2.25 The impact significance terms are explained below in Table 10.5 and take cognisance of DMRB, IEEM (2006) and SNH (2013) guidance.

Table 10.5: Description of Significance Categories

Significance Category	Typical Description
Major	Associated with receptors of international, national or regional importance. Likely to be a damaging impact or loss of resource integrity. Effects likely to be permanent and irreversible resulting in a loss of structure and/or function. If beneficial, they will have a significant positive effect on the international or national receptor.
Moderate	Associated with receptors of international, national, regional or authority area importance. Likely to be a damaging impact or loss of resource integrity. However, the impact character is less substantive due to, for example, their extent, duration, reversibility, timing and/or degree of certainty. If beneficial, they will have a significant positive effect on the international or national receptor.

Significance Category	Typical Description
Minor	Associated with receptors of regional, authority area, local or less than local importance. Likely to be a damaging impact or loss of resource integrity. However, the impact character is less substantive due to, for example, their extent, duration, reversibility, timing and/or degree of certainty. If beneficial, they will have a significant positive effect on the international or national receptor.
Negligible	No effects or those that are beneath the levels of perception. Effects may also be within the normal bounds of variation for a receptor.

Mitigation and Residual Impacts

10.2.26 In general, a hierarchical approach to mitigation has been adopted for the proposed scheme, which seeks to avoid adverse impacts in the first instance through an iterative approach to design (e.g. informing road alignment to avoid sensitive receptors where possible). In areas where avoidance is not possible, measures are proposed to prevent or reduce potentially significant negative impacts.

10.2.27 Mitigation was identified to meet the requirements outlined in the Environmental Impact Assessment (Scotland) Regulations 1999 (as amended) which require *"a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment"* to be provided (Scottish Government, 2007).

10.2.28 Any significant impacts that may remain after implementation of proposed mitigation are reported in Section 10.6 (Residual Impacts).

Limitations to Assessment

10.2.29 Security concerns in the study area limited the amount of bat activity assessments that were undertaken. In addition, access was not taken to the roof spaces of buildings as it was not possible to ascertain the presence, if any, of asbestos or any other hazardous substance.

10.3 Baseline Conditions

10.3.1 The baseline conditions described in this section have been determined through a combination of desk-study, review of historical biological data sources, consultation and field surveys.

10.3.2 An extended Phase 1 habitat survey was undertaken on 29 August 2013. Update surveys for all habitats and species were carried out in conjunction with bat habitat and activity surveys between June and September 2014.

Habitats and Vegetation

Designated Sites

10.3.3 Designated nature conservation sites are illustrated on Figure 10.1 and described below.

10.3.4 No statutory designated sites were present within the study area. The nearest site was the Scotstown Moor Site of Special Scientific Interest (SSSI) (Figure 10.1). The site covers 12.7ha and is designated for wetland habitat (springs including flushes). It lies 3.1km from Haudagain Roundabout. Scotstown Moor is also a Local Nature Reserve (LNR) and a Local Nature Conservation Site (LNCS) (Aberdeen City Council, 2013).

10.3.5 The nearest Natura 2000 sites were the River Dee SAC and the Loch of Skene SPA and Ramsar site, which were approximately 3.8km and 12.2km from the existing Haudagain Roundabout respectively. Neither site was hydrologically connected to the area of the proposed scheme.

10.3.6 No Local Nature Reserves (LNRs) were present within the study area; the nearest LNRs to the existing Haudagain Roundabout were Donmouth LNR and Scotstown Moor LNR (Table 1, Figure

10.1). Both sites were approximately 3km from Haudagain Roundabout. Due to their distance from the proposed scheme these sites and the SSSI are not considered further in this assessment.

Table 10.5: LNRs adjacent to the Study Area. Information from SNH Sitelink

Designated Site	Designation Date	Size (ha)	Distance from Haudagain Roundabout (km)	Main Habitats
Donmouth	25/11/1992	36.0	2.9	Mudflats, saltmarsh and sand dunes, scrub grassland and woodland.
Scotstown Moor	29/04/1994	34.0	3.1	Grassland, wetland, heathland and woodland

10.3.7 Two LNCSs are present within the study area; the Aberdeen to Inverness Railway Line LNCS and the River Don Valley LNCS. Both traverse the study area with only a small part of their total length within it (Figure 10.1) (1.4km of 19.0km and 0.7km of 21.6km respectively).

10.3.8 The Aberdeen to Inverness Railway Line LNCS lies approximately 70m from Haudagain Roundabout and comprises railway embankments with tall grassland which in some places are being colonised by trees and shrubs. The line provides a "green corridor" through part of the city (Aberdeen City Council, 2013).

10.3.9 The River Don Valley LNCS lies approximately 400m from Haudagain Roundabout and comprises a fast flowing river with a number of weirs forming pools. The river has rich marginal vegetation in parts and also has steep sided wooded banks. The water quality has previously been a problem but has shown considerable improvement (Aberdeen City Council, 2013). The River Don is classed as salmonid water (SEPA, 2009) and has been determined to have an overall ecological status of Moderate and overall chemical status of Fail (SEPA, 2010). For further information on the presence of freshwater species, see paragraphs 10.3.48 to10.3.52 below.

Ancient Woodland Inventory and Native Woodland Survey of Scotland

10.3.10 Ancient Woodland Inventory (AWI) and Native Woodland Survey of Scotland (NWSS) (Forestry Commission Scotland, 2014) areas are illustrated on Figure 10.1 and described below.

10.3.11 Two areas of woodland within the study area are listed on the AWI as Long-established of Plantation Origin. They are located on either side of the River Don, downstream of Persley Bridge and lie partly within the River Don Valley LNCS.

10.3.12 One area of woodland within the study area is listed on the Native Woodland Survey of Scotland (NWSS). It is located on A96(T) Auchmill Road at OS GR NJ 90558 09325 with the majority of the site outside the study area. The woodland is classed as 100% semi-natural lowland mixed deciduous woodland with a "nativeness" of 60% (Forestry Commission Scotland, 2014).

Scottish Biodiversity List (SBL) and Biodiversity Action Plans

10.3.13 The SBL (Scottish Government, 2013) is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland (for additional information see Appendix A10.1 (Legislation and Conservation Status).

10.3.14 The North East Scotland Local Biodiversity Action Plan (NES LBAP) is organised into five main Ecosystem Groups, which help deliver the aims and objectives of the North East Scotland Biodiversity Partnership. These five groups are:

- Freshwater and Wetland;
- Lowland and Farmland;
- Marine Group;

- Urban Communities; and
- Woodland.

10.3.15 The NES LBAP is currently under development and no other information on local priority species and habitats is available.

Habitats

10.3.16 The extended Phase 1 habitat survey results are illustrated on Figure 10.2 and summarised below. A summary of the habitat types recorded can be found in Table 10.7 and target notes can be found in Table 10.8.

10.3.17 To the south of the A96, the study area comprised mainly built-up land with patches of amenity grassland, woodland, scrub and scattered trees. To the north of the A96 there were greater amounts of woodland and grassland. The Aberdeen to Inverness railway line and the River Don also lie to the north of the A96.

10.3.18 Grassland made up nearly 22% of the study area with amenity grassland comprising 22.6ha (14%). Woodland habitats accounted for 5% with the majority of this being broadleaved semi-natural woodland (6.4ha, 4%). Other habitats comprised arable, cleared areas, tall ruderal and ephemeral vegetation as indicated in Table 10.7.

Table 10.7: Phase 1 Habitat Survey Results

Habitat Type (semi-natural habitats only)	Estimated Total Area (ha)	Percentage Area (%) (of study area)
Grassland		
Amenity grassland	22.6	13.9
Poor semi-improved grassland	9.3	5.7
Improved grassland	3.7	2.3
Woodland and scrub		
Broadleaved semi-natural woodland	6.4	3.9
Broadleaved plantation woodland	1.6	1.0
Dense scrub	0.2	0.1
Other		
Arable	2.3	1.4
Cleared area	1.8	1.1
Tall ruderal	0.7	0.4
Ephemeral/short perennial	0.3	0.2
Total	**48.9**	**30.0**

10.3.19 Amenity grassland in the study area was closely mown and species-poor with a low herb count, comprising species such as bent species (*Agrostis* spp.), meadow-grass (*Poa* spp.), perennial ryegrass (*Lolium perenne*), creeping buttercup (*Ranunculus repens*) and white clover (*Trifolium repens*). Occasional planted trees and/or hedges were also present in the grassland, often of non-native species. Trees (mainly sycamore, *Acer pseudoplatanus*) were mainly young with no bat potential. Mature (mainly sycamore) trees were present at Stewart Park in the south-east of the study area.

10.3.20 Other grassland types (improved and poor semi-improved) were also species-poor. The improved grassland showed evidence of management, whilst the poor semi-improved grassland was apparently unmanaged resulting in the development of tall rank vegetation including species such

as false oat-grass (*Arrhenatherum elatius*), cock's-foot (*Dactylis glomerata*) and Yorkshire-fog (*Holcus lanatus*).

10.3.21 Woodland recorded was mainly broadleaved semi-natural although this included mature woodland partly derived from plantation such as that along the River Don. The most extensive area of woodland was along the River Don east of Persley Bridge (Target note 5). This was dominated by a variety of non-native species; mainly beech (*Fagus sylvatica*) and sycamore. Steeply banked ground showed characteristics of a semi-natural ground-flora including dense areas of great wood-rush (*Luzula sylvatica*). However, the non-native plant sweet cicely (*Myrrhis odorata*) was abundant in many areas. Invasive non-native plants were also present and are noted below.

10.3.22 Broadleaved woodland and scrub was also present in the Devil's Den area, to either side of the Aberdeen to Inverness railway line, along the A96(T) Auchmill Road (Target note 13) and at Heathryfold in the west of the study area.

10.3.23 Small pockets of plantation woodland were present around the A90(T) Mugiemoss Road, within housing estates (beech or sycamore dominated, with other species including cherry, *Prunus* sp., and hawthorn, *Crataegus monogyna*) and on either side of the A90 north of Persley Bridge. These were all classified as broadleaved although the plantation woodland along the A90 contained small amounts of coniferous species (European larch, *Larix decidua* and Scots pine, *Pinus sylvestris*).

10.3.24 Scattered trees were present throughout the study area. Lines of young trees were present along the A90(T) North Anderson Drive and Provost Rust Drive. Mature trees (mainly beech and common lime, *Tilia x europaea*, Target note 12) were present along minor roads in the Woodside area, in the cemetery on A90(T) Mugiemoss Road and in Stewart Park.

10.3.25 Scattered trees were also present in the housing estates and in amenity grassland. In general these were young; however, mature trees were occasionally present, for example, along Middlefield Terrace. Mature trees provide nesting opportunities for birds and can offer roosting opportunities to bat species.

10.3.26 The main watercourse in the study area was the River Don. Invasive non-native plants were extensive along the southern bank, as reported below. Submerged aquatic plants, probably water crowfoot (*Ranunculus* sp.), were present but could not be accessed.

10.3.27 Two other minor watercourses were identified. Both were short open stretches between culverted sections. One stretch of the Scatter Burn (60m) lay east of the cemetery on A90(T) Mugiemoss Road and was heavily modified with no natural banks or vegetation present (Figure 10.1). Another watercourse, Woodside Burn, emerged from under A96 Great Northern Road to disappear again near an electricity sub-station at Woodside (Figure 10.1). It was approximately 170m long including a culvert under the railway. The watercourse was in a poor condition with scattered litter evident near the A96 Great Northern Road. Aquatic plants were not identified in either watercourse.

10.3.28 Five invasive non-native plant species were recorded in the study area:

- buddleja (*Buddleja davidii*);
- giant hogweed;
- Himalayan balsam;
- Japanese knotweed; and
- snowberry (*Symphoricarpos albus*).

10.3.29 Further information on invasive non-native species can be found in paragraphs 10.3.62 to 10.3.67.

10.3.30 Phase 1 target notes can be found in Table 10.8 below.

Table 10.8: Phase 1 Target Notes

Target Note ID	OS Grid Reference	Description
1	NJ 90712 09499	Invasive Non-native Species Three stands of Japanese knotweed on the south side of the River Don.
2	NJ 90810 09470	Invasive Non-native Species Himalayan balsam along the south side of the River Don upstream of Persley Bridge.
3	NJ 90941 09442	Invasive Non-native Species Giant hogweed in large stand by the River Don. Plants are also scattered through adjacent woodland and along footpaths.
4	NJ 91048 09484	Invasive Non-native Species Himalayan balsam along the south side of the River Don downstream of Persley Bridge.
5	NJ 91116 09505	Broadleaved Semi-natural Woodland ("Woodside") Broadleaved woodland on the south side of the River Don, listed on the AWI as Long-established of Plantation Origin. Dominated by beech with other species present including horse chestnut (*Aesculus hippocastanum*), sycamore and elm (*Ulmus* sp.). Sweet cicely (*Myrrhis odorata*) dominated the ground flora in parts of the woodland. Great wood-rush (*Luzula sylvatica*) dominated some of the very steep slopes. Wood meadow-grass (*Poa nemoralis*) was also present. Further downstream, the woodland was sycamore dominated.
6	NJ 91078 09602	Invasive Non-native Species Himalayan balsam with trees and scrub on islands in the River Don.
7	NJ 91115 09683	Invasive Non-native Species Stands of Japanese knotweed and Himalayan balsam scattered along the River Don.
8	NJ 91213 09594	Invasive Non-native Species Large stand of snowberry 30m x 4m along north side of access track.
9	NJ 91398 09539	Invasive Non-native Species Large stand of snowberry 40-50m in length along scrub line.
10	NJ 91460 09589	Potential Bat Tree Large copper beech with potential as bat tree, *c.*30m in height.
11	NJ 91504 09324	Potential Bat Tree Avenues of trees along access tracks, mainly beech and common lime. Height = 30m+, many with potential as bat roosts.
12	NJ 91609 09378	Invasive Non-native Species Large stand of Japanese knotweed, 16m x 5m. Buddleja was also present but scattered.
13	NJ 90659 09283	Scrub Woodland Thin strip of scrub woodland/tall ruderal vegetation between A96(T) Auchmill Road and railway part of which is listed on the NWSS. Large patches of mainly rosebay willowherb (*Chamerion angustifolium*) with stands of birch (*Betula* sp.), hazel (*Corylus avellana*), ash (*Fraxinus excelsior*) and dogwood (*Cornus sanguinea*).
14	NJ 90800 09040	Manor Park Community Gardens Open access area of partly managed semi-natural habitats. Includes areas of garden with ponds, scrub, tall ruderal and rough grassland. Design features such as seating areas are also present.
15	NJ 91283 09224	Structure with Bat Potential Old stone railway bridge 40 m west of the A90(T) Mugiemoss Road railway bridge. Not accessed.
16	NJ 91347 09113	Building with bat potential Semi-derelict building on the south-eastern corner of Haudagain Roundabout. A feral pigeon (*Columba livia*) roost site. Not accessed.

Protected Species

Badger

10.3.31 The presence of badger was recorded within the study area, including a badger roadkill recorded west of Haudagain Roundabout in August 2007 (Scottish Badgers, 2013). Field surveys identified the presence of badger to the north of the Aberdeen to Inverness railway line.

10.3.32 Detailed information on the presence of badger within the study area can be found in Appendix A10.4 (Confidential – Badger & Otter).

Bats

Desk study and Consultation

10.3.33 The NBN data indicated the presence of common and soprano pipistrelle bats (*Pipistrellus pipistrellus* and *P. pygmaeus*) within the study area although no date information was available. In addition, Daubenton's bat (*Myotis daubentonii*) has been recorded downstream of the study area on the River Don (NJ 9209) in 2010 and 2011.

10.3.34 The North East Scotland Biological Records Centre (NESBReC) returned two records of pipistrelle bat (*Pipistrellus* sp.) in the vicinity of Manor Avenue, Fowler Avenue and Wilkie Avenue to the south of Haudagain Roundabout. The records indicated a roost site but did not identify its exact location.

Preliminary Habitat Assessment

10.3.35 Trees with potential for bat roost opportunities were identified in the northern part of the study area (Target notes 10 and 11). The avenues of large (30m+), mainly beech and common lime trees, offered these opportunities in the form of cracks, loose bark, snags and broken branches. As the trees were in full leaf at the time and due to their height, the full potential of these trees could not be determined.

10.3.36 Within the vicinity of the proposed scheme, one tree in the car park behind flats off Logie Avenue was identified as having bat potential (see paragraphs 10.3.41 to10.3.42). Other trees were identified as unsuitable or too young.

10.3.37 A building offering bat roost potential was identified at Haudagain Roundabout on the south-eastern corner (Target note 16). The building was semi-derelict and being utilised by feral pigeons as a roost site. A stone railway bridge approximately 40m west of the A90(T) Mugiemoss Road bridge also offered potential as a bat roost. The bridge could not be adequately assessed due to lack of access. The A90(T) Mugiemoss Road bridge is of modern construction and is likely to offer limited opportunities for roosting. However, it also could not be adequately assessed due to lack of access.

10.3.38 Foraging habitat for bats includes urban habitats and gardens, tree lined roads, and along the River Don. Commuting routes exist along the roads and along the River Don.

10.3.39 Following the preliminary habitat assessment in 2013, it was deemed that further surveys should be carried out on the trees and structures considered to be at risk from development both directly and through disturbance. The findings of the subsequent surveys undertaken in June 2014 are detailed below and the survey methods adopted are explained in Section 3.3 of Appendix A10.2 (Detailed Terrestrial Ecology Methods).

10.3.40 Full details of the survey results are provided in Appendix A10.4 (Bat Survey Results) and are summarised below.

Tree Surveys

10.3.41 One tree (a common lime) adjacent to Manor Drive was assessed at Category 1 for its potential to support roosting bats (Figure 10.3).

10.3.42 Bat surveys (emergence/re-entry) for the tree were carried out in August 2014. Two dusk surveys were carried out following best practice guidance, which states that surveys should be at least 24 hours apart (Hundt, 2012). The surveys confirmed that the tree was not being used as a roost.

Man-made Structure Surveys

10.3.43 Roost assessment surveys were carried out in June 2014 on 22 blocks of properties within the proposed area of works which may be potentially impacted. All properties were assessed to have medium potential to support roosting bats (Figure 10.3). Emergence/re-entry surveys were subsequently undertaken on these structures.

10.3.44 Results for the bat surveys (emergence/re-entry) are presented in Figure 10.4. Common and soprano pipistrelles were recorded during the surveys (low activity), but no confirmed bat roosts were reported. No more than five passes by bats were recorded in a survey (2.5 – 3 hours).

Birds

Desk study and Consultation

10.3.45 Eight bird species have been recorded within the study area (NESBReC information) (Table 10.9). Kingfisher (*Alcedo atthis*) was recorded on the River Don downstream of Persley Bridge in 2004 (NJ 9109) (NESBReC information) and a peregrine (*Falco peregrinus*) was recorded in 2007, approximately 100m north of Haudagain Roundabout. Both species are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (WCA) (as amended) and on the SBL. Information on NBN is only available for these species for a 10km grid square, no finer scale information is available.

10.3.46 Of the other six bird species, two have been red listed on the list of Birds of Conservation Concern (BoCC) (Eaton et al., 2009); song thrush (*Turdus philomelos*) and starling (*Sturnus vulgaris*). Three species were amber listed; black-headed gull (*Larus ridibundus*), goldeneye (*Bucephala clangula*) and swift (*Apus apus*). Five of the remaining six species were also recorded on the SBL; black-headed gull, hooded crow (*Corvus cornix*), song thrush, starling and swift.

Table 10.9: Species of Bird Recorded and their Conservation Status.

Common Name	WCA Schedule 1	SBL	BoCC Listing
Black-headed gull	-	Yes	Amber
Goldeneye	-		Amber
Hooded crow	-	Yes	Green
Kingfisher	Yes	Yes	Amber
Peregrine	Yes	Yes	Green
Song thrush	-	Yes	Red
Starling	-	Yes	Red
Swift	-	Yes	Amber

Field Survey

10.3.47 No bird species of conservation interest were recorded during the extended Phase 1 habitat surveys.

Freshwater Fish

Desk Study and Consultation

10.3.48 Desk studies indicated that the River Don is classed as salmonid water (SEPA, 2009) and SEPA confirmed the presence of Atlantic salmon (*Salmo salar*), trout (*Salmo trutta*) and European eel (*Anguilla anguilla*) downstream of the study area.

10.3.49 According to the River Don Trust (2008) Atlantic salmon have been recorded only around the mouth of the River Don although their distribution is believed to extend to all parts of the catchment that could be accessible. Migratory sea trout and non-migratory brown trout are also present and European eel is believed to extend to all suitable areas of the catchment (River Don Trust, 2008). Atlantic salmon, trout and European eel have been recorded at the mouth of the Don (NBN).

10.3.50 Adult sea lamprey (*Petromyzon marinus*) has been occasionally noted in the lowest reaches of the Don, within 10km of the sea (River Don Trust, 2008). This would include the section of the River Don within the study area. Records for the species occur downstream of the study area in (NJ 9109 and NJ 9309).

10.3.51 Lamprey species (*Lampetra* spp.) records have been widespread. In nearly all cases the species were either identified as brook lamprey (*L. planeri*) or not identified beyond the genus (River Don Trust, 2008). River lamprey (*L. fluviatilis*) has only been positively noted once in the late 1960s or early 1970s. No specific records within the study area have been identified.

Field Survey

10.3.52 No surveys were undertaken for fish species as indicated in paragraph 10.2.10.

Otter

10.3.53 The presence of otter has been recorded in the north of the study area along the River Don.

10.3.54 Detailed information on the presence of otter within the study area can be found in Appendix A10.4 (Confidential – Badger & Otter).

Red Squirrel

Desk study and Consultation

10.3.55 Red squirrels have not been recorded within the study area, either historically or during survey work. The species has been recorded in adjacent areas along the River Don and in woodlands to the north. The nearest record to the study area (NJ 9209), approximately 1km east of the proposed scheme, is from 2008 (NBN).

10.3.56 Grey squirrels (*Sciurus carolinensis*) were introduced to parks in Aberdeen approximately thirty years ago (Grampian Squirrel Group, 2014). Records for this invasive non-native species cover the entire location of the study area and adjacent habitats and range across the period 1997 to 2012. They are also spread throughout the lower and middle reaches of the River Don catchment (see section on Invasive Non-native Species below) (River Don Trust, 2011).

Field Survey

10.3.57 No evidence for the presence of red squirrel within the study area was recorded during field surveys. However, grey squirrel control is being undertaken within the Aberdeen city area (Saving Scotland's Red Squirrels, 2014) with activities focussed on preventing further red squirrel losses. As a result, red squirrels have been recorded in a number of areas of the city including at Stoneywood and Bridge of Don which are approximately 2.5km and 3.3km from Haudagain Roundabout respectively.

10.3.58 The nearest area of mature woodland is approximately 240m from the proposed scheme on the A96 Great Northern Road adjacent to the Woodside Burn. The presence of large-masted broadleaved species such as oak and beech, and an absence of coniferous species such as Scots pine and Sitka spruce (*Picea sitchensis*) in this and other woodlands in the study area, benefits grey squirrels and disadvantages red squirrels (Bryce et al., 2005; SNH, 2012). It was therefore determined that woodland within the study area was not optimum for supporting red squirrel.

Reptiles

Desk study and Consultation

10.3.59 A desk study indicated that adder (*Vipera berus*), common lizard (*Zootoca vivipara*) and slow-worm (*Anguis fragilis*) are frequently recorded in parts of Deeside including recordings in the Aberdeen area (Jacobs, 2007).

10.3.60 The presence of adder was indicated at the 10km level only (NJ 90) which covered almost the entire area of Aberdeen city, including the study area. Slow-worm has been recorded from NJ 9350 in Aberdeen city centre, approximately 3.5km south-east of Haudagain Roundabout. Common lizard was recorded from the Scotstown Moor area (NJ 93 11), approximately 3km from Haudagain Roundabout, and from NJ 9510 in the coastal area at the Bridge of Don.

Field survey

10.3.61 No evidence for the presence of reptiles within the study area was recorded during field surveys.

Invasive Non-native Species

Desk study and Consultation

10.3.62 The River Don Trust identified ten invasive non-native species/genera (INNS) and one translocated native species within the River Don catchment (River Don Trust, 2011). Two of these INNS were mammals, two were fish and six were plants (Table 10.10).

10.3.63 Common minnow (*Phoxinus phoxinus*) is a translocated fish species presumed native to the south-east of England but now widespread across the British Isles except for the northern and western isles (Maitland, 2007).

Table 10.10: Invasive Non-native Species Identified within the River Don Catchment (River Don Trust, 2011)

Species	Distribution
Animal and Fish Species	
American mink	Present throughout the River Don catchment.
Grey squirrel	Spread throughout the lower and middle reaches of the River Don catchment, emanating from Aberdeen City.
Common minnow	Translocated species that has been introduced into the River Don catchment and is now known to be resident in many of the middle and lower tributaries of the River Don, as well as areas of the main stem tributaries.
Rainbow trout (*Oncorhynchus mykiss*)	Introduced to ponds/fisheries throughout the area for angling.
Plant Species	
Canadian pondweed, Nuttall's pondweed (*Elodea Canadensis*, *E. nuttalli*)	Present in various locations throughout the River Don catchment.
Himalayan balsam	Widespread and is present in large areas of the River Don catchment.
Giant hogweed	Widespread and present in large areas of the River Don catchment.
Japanese knotweed	Located across the River Don catchment.
Monkey flower (*Mimulus luteus, M.*	Present in many locations throughout the upper, middle and lower River

Species	Distribution
cupreus, M. guttatus & hybrids)	Don.
Rhododendron (*Rhododendron ponticum* & hybrids)	Present in many locations throughout the upper, middle and lower River Don.

Field Survey

10.3.64 As indicated in paragraph 10.3.28, five plant INNS were recorded in the study area, the majority of which were recorded by or adjacent to the River Don. The most commonly occurring species were giant hogweed, Himalayan balsam and Japanese knotweed. Other plant INNS as indicated in Table 10.10 were not recorded within the study area.

10.3.65 Giant hogweed was located mainly near the Persley Bridge (Target note 3), spreading along the woodland paths and into the adjacent woodland. Himalayan balsam was confined to the riparian zone of the River Don and was present along the length of the river in the study area mainly on the south bank, but also on small islands in the watercourse (Target notes 2, 4 and 6). Japanese knotweed also occurred along the River Don in discrete stands (Target notes 1 and 11). An additional stand was identified in the Woodside area (Target note 13).

10.3.66 Snowberry was recorded at two locations within the study area (Target notes 8 and 9), whilst buddleja was recorded near the area of Japanese knotweed at Woodside (Target note 13).

10.3.67 No evidence of animal INNS was recorded.

Evaluation of Species and Habitats

10.3.68 The evaluation presented below and in Table 10.11 is based on the approach described in Section 10.2 taking into account baseline conditions and utilises the criteria in Table 10.11, to develop an understanding of the implications for receptors that may be affected by the proposed scheme. The results of the evaluation have been used to design specific and appropriate mitigation.

10.3.69 Where the desk study and field surveys provided no evidence for the presence of a feature it was excluded from the evaluation. This included reptiles and red squirrel.

10.3.70 INNS (both plant and animal species) are also evaluated in this section as they can have detrimental effects on habitats and species.

Designated Sites

10.3.71 The Aberdeen to Inverness Railway Line LNCS provides a green corridor through a built-up area of Aberdeen. The vegetation within the study area was characteristic of unmanaged habitats, of rough grassland, tall ruderal and scrubby habitats. The site is assessed as being of local level ecological importance.

10.3.72 The River Don Valley LNCS comprises a salmonid river with a Moderate ecological status. Atlantic salmon, brown trout, European eel and lamprey species have been recorded within the catchment and the watercourse provides a habitat for otter. Rivers are also a SBL habitat. The LNCS also includes steep sided wooded banks and riparian vegetation. Lowland mixed deciduous woodland is a SBL habitat. Kingfisher has been recorded on the river, but the watercourse and the riparian zone provide a habitat for a range of INNS (plant and animal). The site is assessed as being of authority level ecological importance.

10.3.73 Manor Park Community Gardens is an area of semi-natural and actively managed habitats providing allotments, teaching and amenity facilities. The site is assessed as being of local level ecological importance.

Woodland and Trees

10.3.74 Lowland mixed deciduous woodland is a SBL habitat. However, semi-natural woodland in the study area was largely dominated by non-native species such as beech and sycamore. That along the River Don forms part of the LNCS and much of it is listed on the AWI as Long-established of Plantation Origin. However, it is also partly invaded by INNS (giant hogweed, Himalayan balsam, Japanese knotweed). Semi-natural broad-leaved woodland in the study area has been assessed as being of local level ecological importance.

10.3.75 Plantation woodland is present in patches along the A90(T) Mugiemoss Road and in the Woodside area. The habitat has low species diversity. The ground-flora is either mown or unmanaged and also has a low species diversity. The habitat type has been assessed as being of less than local ecological importance.

10.3.76 The majority of scattered trees in the study area are young and provide limited ecological value. However, mature trees are present in the Woodside area and scattered among the streets in the built-up areas. The mature trees offer potential as nesting habitat for birds and roosting habitat for bats. These features have been assessed as being of local ecological importance.

Grassland

10.3.77 Grassland across the study area (amenity, improved, poor semi-improved) is characterised by a low species diversity dominated by grasses. In addition, amenity grassland is extensive in the area. Amenity and improved grassland have been assessed as being of less than local ecological importance.

10.3.78 The poor semi-improved grassland offers foraging habitat for birds, animals and invertebrates and has been assessed as being of local ecological importance.

Protected Species

10.3.79 Badgers are protected under the Protection of Badgers Act (1992). The species is not listed on the SBL. Badger presence in the study area is low, and likely absent in the immediate vicinity of the proposed scheme. The species has been assessed as being of local ecological importance.

10.3.80 Bats are protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) and the Nature Conservation (Scotland) Act 2004 (NCSA). Both species recorded in the study area (common pipistrelle and soprano pipistrelle) are on the SBL. Current assessments for the common pipistrelle suggest that the population size in Scotland is 352,000 (SNH, 2013b) and that short-term population trend is an increase. Current assessments for soprano pipistrelle suggest that the population size in Scotland is 198,000 (SNH, 2013c) and that short-term population trend is an increase. Although the area of the proposed scheme provides roosting and commuting opportunities, no bat roosts were confirmed and only low activity was recorded. Current information indicates that the population within Aberdeen city is not large and so the area has been assessed as being of Authority importance for bats.

10.3.81 All wild birds, their nests and eggs are protected under the WCA. Birds are also protected under the Birds Directive 2009 (originally 1979) and the Habitats Regulations. Records for the presence of birds in the study area were limited and it is assumed that there would be an assemblage of birds present, typical of an urban and peri-urban environment. This assemblage has therefore been assessed as being of Authority level importance.

10.3.82 Two bird species, kingfisher and peregrine, have been occasionally recorded within the study area and are afforded the highest degree of legal protection under Schedule 1 of the WCA. Kingfisher is also a SBL species and is listed as Amber on the Birds of Conservation Concern list (Eaton et al., 2009). Peregrines are widespread in the UK and reach their highest densities in upland areas of Wales, southern Scotland and north-west England (Royal Society for the Protection of Birds (RSPB), 2014). The last such national survey (in 2002) recorded 544 peregrine pairs in Scotland

(Scottish Raptor Study Group, 2013). However, their range is now contracting in northern Scotland (RSPB, 2013). These two species have been assessed as being of national level ecological importance.

10.3.83 Otters are protected under the Habitats Regulations and the NCSA. The fourth national survey of the otter in Scotland confirmed that the species has continued to increase its population and range throughout the area (Strachan, 2007). Current assessments suggest that the population size in Scotland is >8,000 (SNH, 2013d) and that the population must be close to carrying capacity and any significant increase seems unlikely. Although evidence of otter within the study area is limited, the species is present within the River Don catchment. Otter has been assessed as being of national ecological importance.

10.3.84 Atlantic salmon is listed in Annex II of the EC Habitats Directive and is protected under the Habitats Regulations, and the Salmon and Freshwater Fisheries Act. It is also a SBL species. Current assessments suggest that the population comprises 470,329 spawning adults (SNH, 2013e). Across Scotland, there is evidence of an increase in the numbers of fish entering fresh water. However, there is greater variability locally and there may be a decline in spring salmon. Information on the species distribution and population status within the River Don is incomplete (River Don Trust, 2008) and therefore a precautionary approach has been taken and this species has been assessed as being of national ecological importance. Should additional information become available this importance may be reassessed.

10.3.85 Trout is a SBL species. The species is threatened in some areas of the UK, particularly North-west Scotland. Ancestral trout populations are under threat from habitat deterioration and stocking (JNCC, 2010b). Information on the species distribution and population status within the River Don is incomplete (River Don Trust, 2008) and therefore a precautionary approach has been taken and this species has been assessed as being of regional ecological importance. Should additional information become available this ecological importance may be reassessed.

10.3.86 European eel is a SBL species. The species is threatened in the UK (JNCC, 2010c). The widespread decline in European eels has led the European Commission to develop an Eel Recovery Plan (Council Regulation No 1100/2007). Information on the species distribution and population status within the River Don is incomplete (River Don Trust, 2008) and therefore a precautionary approach has been taken and this species has been assessed as being of national ecological importance. Should additional information become available this importance may be reassessed.

10.3.87 All lamprey species are listed in Annex II of the EC Habitats Directive and are protected under the Habitats Regulations. Lamprey are also listed on the SBL. Brook lamprey has declined in parts of the UK, although it is still widespread. This species is the most abundant and widespread of the British lampreys and is often found in the absence of the other two species. Current assessments indicate that the population trend is unknown (SNH, 2013f). River lamprey is widespread in the UK, occurring in many rivers from the Great Glen in Scotland southwards, and populations are strong. Current assessments indicate that the population trend is unknown (SNH, 2013g). The sea lamprey is reasonably widespread in UK rivers. In some places it is still common, but it has declined in parts of its range and has become extinct in a number of rivers. It appears to reach its northern limit of distribution in Scotland and does not occur north of the Great Glen. Current assessments indicate that the population trend is unknown (SNH, 2013h).

10.3.88 Brook lamprey has been positively identified from the Don catchment, sea lamprey is occasionally noted and river lamprey has been recorded once only. Information on lamprey species distribution and population status within the River Don is incomplete (River Don Trust, 2008) and therefore a precautionary approach has been taken and these species have been assessed as being of national ecological importance. Should additional information become available this importance may be reassessed.

10.3.89 SNH identify invasive species as second only to habitat loss in terms of threats to biodiversity (SNH, 2014). Furthermore, under the Convention on Biological Diversity, the United Kingdom has an international obligation to address the impacts of invasive non-native species. In 2008, the UK

Government published the Invasive Non-native Species Framework Strategy for Great Britain which aims to minimise the risk posed and reduce the negative impacts caused by invasive non-native species in Great Britain. In Scotland, the WCA is the principal legislation for dealing with INNS; it is an offence to "*cause any animal outwith the control of any person to be at place outwith its native range*"; and to "*plant or otherwise cause to grow any plant in the wild outwith its native range*" (Scottish Government, 2014). Invasive plants are extensive in the River Don corridor, especially adjacent to the river itself, and invasive animal species have been identified within the River Don and its catchment. INNS have been assessed as being of national adverse ecological importance.

Table 10.11: Nature Conservation Importance of Designated Sites and Habitats.

Ecological Resource	Designation/ Protection	Importance
Designated Sites		
Aberdeen to Inverness Railway Line	LNCS	Local
River Don Valley	LNCS, Salmonid water	Authority
Manor Park Community Gardens	-	Local
Habitats		
Woodland, semi-natural	LNCS, AWI, NWSS (partly), SBL	Local
Woodland, plantation	-	Less than Local
Scattered trees	-	Local
Amenity planting	-	Less than Local
Grassland, amenity	-	Less than Local
Grassland, improved	-	Less than Local
Grassland, poor semi-improved	-	Local
Terrestrial Species		
Badger	Protection of Badgers Act 1992	Local
Bats	Habitats Regulations, NCSA, SBL	Authority
Birds (assemblage)	Birds Directive, Habitats Directive, WCA, SBL	Authority
Birds (kingfisher)	WCA (Schedule 1), SBL	National
Birds (peregrine)	WCA (Schedule 1), SBL	National
Otter	Habitats Regulations, NCSA, SBL	National
Freshwater Habitats		
River Don	LNCS, Salmonid water	See *Designated Sites* (River Don Valley LNCS).
Freshwater Species		
Atlantic salmon	Habitats Direction (Annex II), Habitats Regulations, Salmon and Freshwater Fisheries Act, SBL	National
Trout	SBL	Regional
European eel	SBL	National
Lamprey (all species)	Habitats Direction (Annex II), Habitats Regulations, SBL	National
Invasive Non-native Species		
Plants (giant hogweed, Himalayan, balsam, Japanese knotweed)	WCA	National (adverse) detrimental to nature conservation

10.4 Potential Impacts

Introduction

10.4.1 Infrastructure projects, including roads, have a range of well-documented impacts associated with their construction and operation. This section identifies the potential risks and impacts of the proposed scheme upon terrestrial and freshwater ecological receptors in the absence of mitigation.

General Impacts

10.4.2 Potential impacts associated with this type of project, identified through reference to the DMRB guidelines and recommendations (The Highways Agency et al., 1993), include:

- direct mortality of animals on roads during construction and operation;
- behavioural changes of animals during operation;
- habitat loss through land-take;
- fragmentation of existing habitats;
- physical obstructions caused by road constructions;
- disturbance during construction;
- pollution via road drainage, runoff and spray from road traffic;
- air pollution (e.g. nitrogen or dust deposition); and
- visual and light pollution caused by construction or road lighting.

10.4.3 Although changes in air quality can be a potential impact associated with road operation due to vehicle emissions, it is concluded after the consideration of the results of the air quality assessment (Chapter 13: Air Quality) that there are no implications for designated sites or species potentially affected by changes in air quality due to the proposed scheme.

10.4.4 These impacts are also considered for species relying on aquatic resources potentially affected by watercourse crossings, piling operations and surface water runoff, with the addition of:

- increased sediment loading;
- decreased habitat complexity; and
- changes to discharge regime.

10.4.5 Full information on the surface water environment, including a consideration of surface water hydrology, flood risk, fluvial geomorphology and water quality, can be found in Chapter 9 (Road Drainage and the Water Environment). Full information on potential noise and vibration impacts can be found in Chapter 14 (Noise and Vibration).

10.4.6 It is important to recognise that potential impacts may interact (e.g. habitat loss during construction could potentially result in disturbance and habitat fragmentation) and the resulting combination of impacts may, through synergistic effects, increase the overall adverse impact of the proposed scheme (Iuell et al., 2003).

Specific Impacts

10.4.7 As explained in Section 10.2 (Approach and Methods), in the absence of mitigation, all potential impacts described below would be considered as significant in accordance with IEEM guidance (IEEM, 2006). Mitigation is proposed to avoid, reduce or offset these potential impacts in Section 10.5 (Mitigation).

10.4.8 The specific impacts likely to occur during construction and operation of the proposed scheme and the effects these impacts could potentially have on identified receptors is indicated below. The potential impacts described below are all considered to be adverse unless otherwise stated.

10.4.9 A summary of the potential impacts to receptors can be found in Table 10.12 and are also described below. As indicated in paragraph 10.2.21, ecological receptors assessed to be of Less than Local importance (which includes the loss of 0.8ha of amenity grassland) have not been taken further forward into the assessment process. The River Don LNCS is assessed under the aquatic habitats section.

Table 10.12: Impact Summary for Potential Impacts/Activities for Receptors during Construction and Operation.

Receptor	Impact/Activity	Construction	Operation
Terrestrial habitat	Habitat loss: Amenity grassland*, amenity planting*, scattered mature trees.	No impact	Potential impact
	Pollution	Negligible impact	Negligible impact
Badger	Direct mortality	Negligible impact	No impact
Bats	Direct mortality	Potential impact	No impact
	Habitat loss	Negligible impact	No impact
	Disturbance	Potential impact	No impact
Birds	Direct mortality	Potential impact	Negligible impact
Otter	Pollution	Potential impact	Potential impact
Aquatic habitat	Pollution (River Don)	Potential impact	Potential impact
Atlantic salmon	Pollution	Potential impact	Potential impact
Trout	Pollution	Potential impact	Potential impact
European eel	Pollution	Potential impact	Potential impact
Lamprey	Pollution	Potential impact	Potential impact
INNS	Transfer of species to new locations	No impact	No impact

*Receptors assessed as having less than local ecological importance.

Designated Sites

10.4.10 No likely significant effects on Natura 2000 sites could be identified. There are no sites within the vicinity of the proposed scheme, and no effects pathways such as via hydrological connections, could be discerned. Therefore no impacts to Natura 2000 sites are predicted so these are not considered further in this assessment.

10.4.11 Pollution may affect the River Don Valley LNCS (River Don). See Aquatic Habitats for more information (paragraphs 10.4.22 to 10.4.24).

Bats

Construction

10.4.12 Although no roosts were identified, a precautionary approach has been taken as it was not possible to access roof spaces due to health and safety concerns. Therefore, in the absence of appropriate mitigation measures being implemented, mortality of bats during construction could result from pre-construction tree clearance and building demolition.

10.4.13 Disturbance (noise, vibration, construction lighting) would occur during construction from demolition and other associated works.

10.4.14 These potential impacts have been assessed as being of Moderate significance.

Operation

10.4.15 No potential impacts have been predicted.

Birds

Construction

10.4.16 In the absence of appropriate mitigation measures being implemented, mortality of adult birds, their eggs and un-fledged/fledged young during construction can result from pre-construction vegetation clearance. This potential impact is assessed as being of Moderate significance.

10.4.17 Pollution of the River Don as a result of construction run-off via outfalls from the existing road drainage system may directly affect the foraging resource of kingfishers downstream of the proposed scheme. This potential impact was assessed as being of Moderate significance.

Operation

10.4.18 Habitat for breeding birds (hedges, shrubs and trees) would be lost permanently under the footprint of the proposed scheme. This potential impact was assessed as being of Minor significance.

10.4.19 Pollution of the River Don as a result of road run-off via outfalls from the existing road drainage system may directly affect the foraging resource of kingfishers downstream of the proposed scheme. This potential impact was assessed as being of Moderate significance.

Otter

Construction

10.4.20 Pollution of the River Don as a result of construction run-off via outfalls from the existing road drainage system could result in long-term damage to the productivity and diversity of nearby habitats, with an adverse impact on the otter's food supply. This potential impact was assessed as being of Moderate significance.

Operation

10.4.21 Pollution of the River Don as a result of road run-off via outfalls from the existing road drainage system could result in long-term damage to the productivity and diversity of nearby habitats, with an adverse impact on the otter's food supply. This potential impact was assessed as being of Moderate significance.

Aquatic Habitat (River Don) including Fish Species

Construction

10.4.22 Accidental pollution release can occur during the construction phase (e.g. fuel and oil from plant, concrete and fine sediment release) affecting flora and fauna within the River Don. Fish are particularly sensitive to soluble inorganic pollution with mortality observed at relatively low levels of soluble metal salts, whilst the organic constituents of runoff may include other contaminants which can result in deleterious effects on fish. Fish may avoid contaminated areas, thereby reducing available habitat area and reduced feeding and growth rates. These potential impacts were assessed as being of Moderate significance.

Operation

10.4.23 Pollutants contained within surface water runoff may reach watercourses if not removed by a Sustainable Drainage System (SuDS) affecting flora and fauna within the River Don. Routine maintenance of the drainage system during operation of the proposed scheme could also lead to the flushing of contaminants into the channels. Any spillages during operation, such as fuel or oil leakages from vehicles and machinery, could result in pollution of the watercourses. The potential impact on the River Don itself has been assessed as being of Minor significance. The potential impact on fish species has been assessed as being of Moderate significance.

10.4.24 No potential impacts of Major significance were identified. In addition, no combined effects that might result in an increase in the overall impact significance were identified.

10.5 Mitigation

Introduction

10.5.1 This section outlines mitigation measures proposed to avoid, reduce or offset the potential adverse effects of the proposed scheme in accordance with best practice guidance and UK, Scottish and local government environmental impact, planning and sustainability policies.

10.5.2 The principles and objectives for mitigation associated with the proposed scheme have been developed through an iterative process with the Jacobs design team and consultation with SNH, SEPA and other relevant stakeholders (Chapter 6: Consultation and Scoping).

10.5.3 As noted in Section 10.2 (Approach and Methods), proposed mitigation will follow a hierarchical approach to be adopted, where possible, in the following order (IEEM 2006; SNH 2013; Scottish Government, 2011):

- avoid adverse impacts in the first instance;
- where avoidance is not possible, reduce the adverse impacts; and
- where significant adverse residual impacts remain, measures to offset the adverse impacts at a site-specific level may be required.

Ecological Clerk of Works (ECoW)

10.5.4 An ECoW will be employed by the Contractor to oversee the implementation of the proposed mitigation (**Mitigation Item E1**).

Mitigation

10.5.5 Mitigation is described below in Table 10.13. Mitigation such as planting is described in Chapter 11 (Landscape) and also shown on Figure 11.2 (Landscape and Ecology Mitigation). Standard (best practice) mitigation measures required during construction and operation have been identified.

10.5.6 It will be the contractual responsibility of the appointed Contractor to ensure that mitigation is implemented during the works and that all relevant licences, should they be required, are in place prior to commencement of works.

10.5.7 It should be noted that SNH consider ecological data acquired on European Protected Species (EPS) to have a limited time frame of twelve months before becoming outdated, therefore, update bat surveys will be required assuming that construction of the proposed scheme starts in 2018.

10.5.8 Should the presence of EPS within the study area change, additional mitigation may be required.

Table 10.13: Environmental Mitigation for Habitats and Species

Receptor	Phase	Mitigation
All receptors	Construction	Pre-construction surveys for protected species and invasive non-native species under the footprint of the proposed scheme plus a 50m buffer would be undertaken and their locations communicated to construction staff in strict confidence to ensure no direct mortality of protected species during site clearance Allow for the development of additional mitigation should it be required (**Mitigation Item E2**).
All receptors	Construction	Works compounds, storage sites, access roads and any other temporary work areas would be located 30m away from any sensitive sites, such as birds' nests or smaller distances e as advised by the ECoW. Where applicable, any works to be undertaken within this distance may be subject to consultation with SNH and undertaken under licence (**Mitigation Item E3**).
All receptors	Construction	As advised by the ECoW, plant and personnel may be constrained to a prescribed working corridor through the use of temporary barriers, thereby minimising damage to habitats, such as trees to be retained, and potential direct mortality and disturbance to animals located within and adjacent to the proposed scheme working corridor (**Mitigation Item E4**).
All receptors	Construction	Site management practices to avoid or reduce the risks of secondary impacts on habitat adjacent to the proposed scheme would be adopted (**Mitigation Item E5**).
Terrestrial habitats Birds	Construction	Habitat loss would be reduced by restricting felling and vegetation clearance activities to the minimum area necessary for the safe completion of the works (**Mitigation Item E6**).
Birds	Construction	Site clearance of vegetation would be undertaken outside of the main bird breeding season where possible (typically March - August inclusive). Where site clearance works must be undertaken during the main bird breeding season, methods of exclusion and deterrent would be used to prevent birds beginning to nest in suitable areas (**Mitigation Item E7**).
Birds	Construction	Site clearance works undertaken from September - January inclusive would not be subject to any specific mitigation for breeding birds, however, the ECoW would advise all contractor staff of the residual risk of birds nesting outside of the main bird breeding season and a requirement to stop work should they be encountered (**Mitigation Item E8**).
Birds	Construction	During the bird breeding season, all cleared material is to be rendered unsuitable for nesting birds (**Mitigation Item E9**).
Bats	Construction	Tree felling would be carried out by experienced contractors according to agreed felling methods and any licensing conditions to reduce direct mortality of bats through loss of roosts. Such methods may include allowing dispersal times, exclusion of roosts, soft felling techniques, or retention of roost features in newly created areas (**Mitigation Item E10**).
Bats	Construction	Update surveys would include the internal inspection of buildings to be demolished where appropriate. If surveys confirm the presence of roosts, demolition of properties would be required to be undertaken under licence following consultation with SNH. Conditions would need to be followed to reduce direct mortality of bats through loss of roosts. Such methods may include exclusion of roosts and soft stripping of slates (**Mitigation Item E11**). Should it be required, the loss of roosts and roosting opportunities would be offset by the provision of replacement roost habitat. This provision would be developed through consultation with SNH (**Mitigation Item E12**).
Bats	Construction	Night-time working will be avoided where possible (**Mitigation Item E13**). A lighting plan will be developed for the site for low light conditions and night-time working (that undertaken between sunset and sunrise). The use of construction lighting will be according to BS 5489 requirements and following guidance on lighting (e.g. Bat Conservation Trust (2009,2014) and Institute of Lighting Engineers, 2007) including the use of directional lighting or preventative measures (e.g. installation of shields, hoods or limiting the height of lighting columns) (**Mitigation Item E14**).

Receptor	Phase	Mitigation
Badger	Construction	All trenches, holes and pits will be kept covered at night or mammal ladders will be provided for escape where necessary (**Mitigation Item E15**).
Kingfisher Otter Aquatic habitats Fish species	Construction	The Contractor will be required to abide by SEPA Pollution Prevention Guidance notes (PPGs) (**Mitigation Item E16**): • Surface and foul water will be appropriately drained and stored. These control measures must be in place before earthworks commence; • Chemicals, oils and fuels will be kept safely stored and away from drainage systems and waste will be appropriately managed; • Plant and machinery must not be fuelled in the vicinity of drainage systems; • Sites will be restored fully on completion of works and contractors will adhere to below, with respect to preventing pollution incidents near drainage systems; • Emergency procedures and spillage kits must be available and construction staff must be familiar with emergency procedures; and • Road run-off will be treated using SuDS techniques including collection in treatment facilities including petrol interceptors, silt traps and balancing ponds according to SEPA PPGs.
All receptors	Construction	Measures to avoid or reduce air pollution impacts will be implemented, so that dust, for instance, does not build up significantly on trees and scrub vegetation (**Mitigation Item E17**). These will include measures such as: dampening down construction areas and material stockpiles, especially when weather conditions are dry and windy; use of cutting equipment, e.g. abrasive disc cutters, that utilise water dust suppression; significant material stockpiles to be enclosed as far as practicable; concrete batching to be carried out only in enclosed or shielded areas; setting and enforcing appropriate speed limits on haul roads; implementing regular dampening down of unsurfaced site and access roads using water bowsers, particularly during dry, windy conditions; and provision of wheel washing facilities at site exits.
Terrestrial habitats Birds	Construction/ Operation	All areas of habitat loss due to temporary works, site compounds, easements, working areas or access roads would be reinstated following construction on a like for like basis (**Mitigation Item E18**).
Terrestrial habitats	Construction/ Operation	Loss of 0.8ha of amenity grassland would be mitigated by the creation of grassed areas along the length of the proposed scheme. Trees along either side of the proposed road would are planned, and hedgerows would be planted (**Mitigation Item E19**). Landscape planting and newly created habitat would be comprised of predominantly native species of local provenance where available, and would comprise a mixture of species, and would be aimed at enhancing the biodiversity opportunities of the area. Tree species will be small-masted where possible (**Mitigation Item E20**).
All receptors	Construction/ Operation	Sowing/planting should be undertaken as soon as possible following completion of the works to reduce the likelihood of the areas being colonised by invasive, non-native species which are of lower value to wildlife (**Mitigation Item E21**).

10.6 Residual Impacts

10.6.1 The detailed impact assessment, (impact significance, proposed mitigation and residual impacts) can be found in Tables 10.14 to 10.17.

10.6.2 Potential impacts of Negligible significance are anticipated to be fully mitigated by the implementation of mitigation measures, including adherence to environmental and species management plans, and the application of best practice and appropriate construction guidelines.

10.6.3 For remaining potential impacts identified; direct mortality of bats and birds and disturbance of bats, loss of habitat under the scheme footprint, and construction and operational pollution incidents, mitigation measures are proposed.

10.6.4 Measures include pre-construction surveys for bats, including internal inspections of buildings to inform additional mitigation should it be required, including any licence provision, to ensure their conservation status is maintained,

10.6.5 Mitigation also includes sensitive site clearance for both bats and birds and adherence to SEPA PPGs. The proposed scheme includes the provision of SuDS, which would mitigate operational pollution impacts. Landscape mitigation proposals (see Chapter 11) would mitigate for habitat loss and would include the provision of grassed areas and the planting of trees and hedgerows.

10.6.6 As a result, there are no significant residual impacts on receptors following successful implementation of proposed mitigation measures.

Table 10.14: Detailed Impact Assessment: Terrestrial Receptors – Construction

Location and Key Attribute	Potential Impact	Characterisation of impact (pre-mitigation)	Magnitude and Significance	Proposed Mitigation	Significance of Residual Impact
Terrestrial Species					
Location: Along the route of the proposed scheme Key Attribute: Badger Level of Importance: Local	Direct mortality	• Extent: Along the length of the proposed scheme • Effect: Direct negative • Reversibility: Irreversible • Frequency: Single-event(s) • Duration: Permanent • Likelihood: Unlikely	Magnitude: Medium Significance: Negligible	Pre-construction surveys for evidence of badger activity. Standard good construction practice including capping of holes or provision of escape ramps.	Not significant
Location: Along the route of the proposed scheme Key Attribute: Bats Level of Importance: Authority	Direct mortality Demolition of buildings and felling of trees with roosts	• Extent: Along the length of the scheme • Effect: Direct negative • Reversibility: Irreversible • Frequency: Single-event • Duration: Long-term • Likelihood: Unlikely	Magnitude: Medium Significance: Moderate	Update surveys to confirm that buildings for demolition do not contain roosts. Exclusion of buildings with confirmed roosts under licence.	Not significant
Location: Along the route of the proposed scheme Key Attribute: Bats Level of Importance: Authority	Disturbance	• Extent: Along the length of the scheme • Effect: Direct negative • Reversibility: Reversible • Frequency: Single-event • Duration: Long-term • Likelihood: Certain	Magnitude: Medium Significance: Moderate	Provision of directional lighting following guidance. Night-time working to be avoided where possible.	Not significant
Location: Along the route of the proposed scheme where hedges, scrub and trees are being cleared. Key Attribute: Breeding birds Level of Importance: Authority	Direct mortality Vegetation clearance during construction may lead to loss of bird's nests, eggs and fledglings	• Extent: Along the length of the proposed scheme • Effect: Direct negative • Reversibility: Irreversible • Frequency: Single-event(s) • Duration: Permanent • Likelihood: Probable	Magnitude: Low Significance: Moderate	Avoid bird breeding season where possible (March to August inclusive) or employ deterrent methods	Not significant
Location: River Don	Pollution Construction run-off resulting in pollution of	• Extent: Along the River Don • Effect: Indirect negative	Magnitude: Low Significance:	Adherence to SEPA Pollution Prevention Guidelines (PPGs)	Not significant

Location and Key Attribute	Potential Impact	Characterisation of impact (pre-mitigation)	Magnitude and Significance	Proposed Mitigation	Significance of Residual Impact
Key Attribute: Kingfisher Level of Importance: National	watercourses which could reduce availability of prey items	• Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term • Likelihood: Unlikely	Moderate		
Location: River Don Key Attribute: Otter Level of Importance: National	Pollution Construction run-off resulting in pollution of watercourses which could reduce availability of prey items	• Extent: Along the River Don • Effect: Indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term • Likelihood: Unlikely	Magnitude: Low Significance: Moderate	Adherence to SEPA PPGs	Not significant

Table 10.15: Detailed Impact Assessment: Aquatic Receptors – Construction

Location and Key Attribute	Potential Impact	Characterisation of impact (pre-mitigation)	Magnitude and Significance	Proposed Mitigation	Significance of Residual Impact
Aquatic Habitats					
Location: River Don Key Attribute: Watercourse, salmonid water Level of Importance: Authority	Pollution Potential for downstream impacts on the River Don from construction run-off	• Extent: Along the River Don • Effect: Direct negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term Likelihood: Unlikely	Magnitude: Low Significance: Minor	Adherence to SEPA PPGs	Not significant
Aquatic Species					
Location: River Don Key Attribute: Atlantic salmon, European eel and lamprey. Level of Importance: National	Pollution Potential for downstream impacts (direct and indirect) on fish species from construction run-off	• Extent: Along the River Don • Effect: Direct/indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short to medium-term Likelihood: Unlikely	Magnitude: Low Significance: Moderate	Adherence to SEPA PPGs	Not significant
Location: River Don Key Attribute: Atlantic salmon, European eel and lamprey Level of Importance: Regional	Pollution Potential for downstream impacts (direct and indirect) on fish species from construction run-off	• Extent: Along the River Don • Effect: Direct/indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short to medium-term Likelihood: Unlikely	Magnitude: Low Significance: Moderate	Adherence to SEPA PPGs	Not significant

Table 10.16: Detailed Impact Assessment: Terrestrial Receptors – Operation

Location and Key Attribute	Potential Impact	Characterisation of impact (pre-mitigation)	Magnitude and Significance	Proposed Mitigation	Significance of Residual Impact
Terrestrial Habitats					
Location: Logie Avenue Key Attribute: Mature tree(s) Level of Importance: Local	Habitat Loss Loss of mature trees	• Extent: Logie Avenue • Effect: Direct negative • Reversibility: Irreversible • Frequency: Single-event • Duration: Long-term • Likelihood: Certain	Magnitude: Medium Significance: Minor	Tree planting of native small-masted species of local provenance where possible	Not significant
Terrestrial Species					
Location: Along the route of the proposed scheme Receptor: Breeding birds Level of Importance: Authority	Habitat Loss Loss of hedges, scrub and trees (amenity planting) under the footprint of the proposed scheme	• Extent: Along the length of the proposed scheme • Effect: Direct negative • Reversibility: Irreversible • Frequency: Single-event • Duration: Long-term • Likelihood: Certain	Magnitude: Low Significance: Minor	Tree planting of native small-masted species of local provenance where possible	Not significant
Location: River Don Key Attribute: Kingfisher Level of Importance: National	Pollution Road run-off resulting in pollution of watercourses which could reduce availability of prey items	• Extent: Along the River Don • Effect: Indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term • Likelihood: Unlikely	Magnitude: Low Significance: Moderate	Provision of SuDS systems	Not significant
Location: River Don Key Attribute: Otter Level of Importance: National	Pollution Road run-off resulting in pollution of watercourses which could reduce availability of prey items	• Extent: Along the River Don • Effect: Indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term • Likelihood: Unlikely	Magnitude: Low Significance: Moderate	Provision of SuDS systems	Not significant

Table 10.17: Detailed Impact Assessment: Aquatic Receptors – Operation

Location and Key Attribute	Potential Impact	Characterisation of impact (pre-mitigation)	Magnitude and Significance	Proposed Mitigation	Significance of Residual Impact
Aquatic Habitats					
Location: River Don Key Attribute: Watercourse, salmonid water Level of Importance: Authority	Pollution Potential for downstream impacts on the River Don from road run-off	• Extent: Along the River Don • Effect: Direct negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short- to medium-term Likelihood: Possible	Magnitude: Low Significance: Minor	Provision of SuDS systems	Not significant
Aquatic Species					
Location: River Don Key Attribute: Atlantic salmon, European eel and lamprey. Level of Importance: National	Pollution Potential for downstream impacts (direct and indirect) on fish species from road run-off	• Extent: Along the River Don • Effect: Direct/indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short to medium-term Likelihood: Possible	Magnitude: Low Significance: Moderate	Provision of SuDS systems	Not significant
Location: River Don Key Attribute: Atlantic salmon, European eel and lamprey Level of Importance: Regional	Pollution Potential for downstream impacts (direct and indirect) on fish species from road run-off	• Extent: Along the River Don • Effect: Direct/indirect negative • Reversibility: Reversible • Frequency: Single event(s) • Duration: Short to medium-term Likelihood: Possible	Magnitude: Low Significance: Moderate	Provision of SuDS systems	Not significant

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11 Landscape and Visual

This chapter presents an assessment of the potential impacts of the proposed scheme on urban character areas and views from buildings and areas of outdoor recreational space (collectively referred to as receptors). Within the chapter the assessment methodology is explained, baseline conditions are described, an assessment is made of the potential impacts on the urban character of the area and the views that would result from the proposed scheme in the absence of mitigation. Proposed mitigation measures are then described and the residual impacts described during both winter year of scheme opening and summer after 15 years, when planting mitigation would have become fully established.

The assessment has identified five distinct Urban Character Areas (UCAs) within the study area, three of which would experience direct physical impacts as a result of the proposed scheme. Of these UCAs, two would be affected by significant impacts. The North Middlefield UCA would experience the greatest direct impact as the majority of the proposed scheme and all of the associated demolition would be located within this area. Here the impact would be Substantial in winter year of opening. Landscape mitigation measures are proposed including regrading, planting of avenue trees, hedges, and tree groups and grass seeding with areas of bulbs. The impact of the scheme on the North Middlefield UCA would reduce to Moderate to Substantial in summer, 15 years after opening when mitigation planting would have become established. Although the physical impact of the proposed scheme on South Middlefield UCA would be limited, the setting of this area would be affected by changes to views and Moderate to Substantial impact would occur in winter year of opening, reducing to Moderate by summer 15 years after opening. None of the remaining three UCAs would experience significant impact in either winter year of opening or summer after 15 years. Impacts would reduce over time in all three UCAs as planting and grass seeding becomes established.

With the implementation of proposed mitigation the proposed scheme would have a visual impact on a total of 43 built receptor groups and seven outdoor receptors (a public park and six stretches of existing road with associated footways). Of the built receptor groups, in the winter, year of opening 18 would experience significant visual impacts. By summer 15 years after opening, 14 would be affected by significant impact. Of the outdoor receptors, in the winter year of opening four would be affected by significant impact, reducing to three in the summer 15 years after opening.

11.1 Introduction

11.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 3 landscape and visual impact assessment of the proposed scheme for the A90/A96 junction at Haudagain Roundabout in Aberdeen. The assessment considers the changes in the character, quality and physical fabric of the urban landscape and the views experienced by people from buildings and areas of outdoor recreational space (collectively referred to as receptors) within the study area. Mitigation measures are described and the residual impacts assessed. The chapter is supported by the following appendices, which are cross-referenced where relevant:

- Appendix A11.1 (Urban Character Areas (UCA));
- Appendix A11.2 (Built and Outdoor Receptor Assessment Tables); and
- Appendix A11.3 (Urban Design Objectives).

11.1.2 This chapter sets out the assessment methods in Section 11.2 (Approach and Methods), describes the baseline conditions in Section 11.3 (Baseline Conditions) and identifies in Section 11.4 (Potential Impacts) the potential impacts that could occur in the absence of mitigation. Mitigation to avoid, reduce or offset the potential impacts is then described in Section 11.5 (Mitigation) and residual impacts following implementation of this mitigation are then identified in Section 11.6 (Residual Impacts).

11.2 Approach and Methods

11.2.1 This assessment was undertaken with reference to the guidance within the Highways Agency et al, (1993) DMRB Volume 11 Landscape & Visual, Section 3, Part 5, 1993, Interim Advice Note (IAN) 135/10, the Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA 3) (Landscape Institute and the Institute of Environmental Management and Assessment, 2013) and

Fitting Landscapes: Securing more sustainable landscapes (Transport Scotland, 2014). As the scheme falls within a largely urban area, the term townscape (i.e. the landscape within the built-up area, including buildings and the relationships between them and urban open spaces) is used in the assessment.

11.2.2 The assessment identifies and assesses the impacts of change brought about by the scheme on both the townscape and visual amenity. These two components are reported separately. The assessment of townscape impacts involves assessing the townscape as a resource in its own right and considers the impacts of the scheme on individual townscape features/elements and on townscape character. The assessment of visual impacts involves assessing impacts on specific views and on the general visual amenity experienced by people.

11.2.3 The proposed scheme impacts are assessed for the winter, year of opening and summer, 15 years after scheme opening when mitigation planting would be established. The former is intended to represent the 'worst-case scenario' and the latter the 'best-case scenario' for permanent impacts.

11.2.4 The first stage of the assessment is to establish the baseline townscape and visual amenity resources against which subsequent change can be gauged. The baseline information is then combined with an understanding of the details of the scheme, including mitigation measures, and the likely townscape and visual impacts are identified and described.

11.2.5 For the purposes of this assessment, potential impacts were considered to be adverse unless otherwise stated. Potential impacts assessed as being of Moderate or greater (i.e. significant) were considered to represent key townscape changes and mitigation would generally be required to reduce these where possible.

11.2.6 This chapter also includes a brief section on the assessment of changes to views from the road. The assessment is a comparison of existing views from the existing road network with expected views from the proposed scheme network and assessing the impact of the changes. The assessment is a qualitative assessment only, not quantitative.

11.2.7 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to landscape and visual impacts has been undertaken and is detailed in Appendix A17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Study Area

11.2.8 The study area for the townscape and visual assessment was based on a drawn Visual Envelope Map (VEM) which relates to areas and buildings that may gain a view of the scheme. This was identified through a combination of desk study and field survey to identify townscape elements that affect visibility such as woodland, topography and built structures. The study area used in the assessment is shown on Figure 11.1.

Baseline Data Gathering

11.2.9 Baseline information was collected through a desk study including the review of the following material:

- Geographical Information Systems (GIS) data;
- aerial photographs;
- 1:25,000 and 1:50,000 Ordnance Survey maps;
- Aberdeen Landscape Strategy (Aberdeen City Council, 2002);
- Haudagain STAG Part 2 Environmental Report (SIAS Ltd, May 2008);
- A90/A96 Haudagain Improvement DMRB Stage 2 Scheme Assessment Report (Jacobs, 2014); and

- Middlefield Masterplan Report (Aberdeen City Council, 2007).

Desk Study

11.2.10 The desk study entailed the following:

- a review of aerial photographs and current 1:25,000 scale and 1:50,000 scale Ordnance Survey (OS) mapping, to help identify townscape elements and patterns and the location of potential visual receptors;
- an examination of GIS data relating to townscape, archaeology, ecology, buildings and settlements to provide a thorough knowledge of conservation interests and the presence of areas of statutory designation and protection. Other human interests were established by analysing data relating to recreation and public rights of way;
- review of baseline data contained in the A90/A96 Haudagain Improvement DMRB Stage 2 Scheme Assessment Report (Jacobs, 2014); and
- consultations with statutory and other bodies as discussed in Chapter 6 (Consultation and Scoping) to supplement the desk study data collection.

11.2.11 Information of relevance to the proposed scheme was extracted from these sources and the following topics were explored:

- pattern and scale of landform, land cover and built development;
- special values including national and local landscape designations, Conservation Areas and historical and cultural associations; and
- specific potential receptors of townscape impact, including important elements of the townscape, as well as residents, visitors and travellers.

11.2.12 The study area is within the urban area of Aberdeen and as such is not covered by SNH's Landscape Character Assessment of Aberdeen, which focusses on the rural areas within the City of Aberdeen boundary. (Scottish Natural Heritage Review No 102., 1998).

11.2.13 GLVIA 3 and IAN135/10 both recognise the importance of assessing impacts of development on the landscapes of towns and cities as well as rural landscapes. Classification of the townscape of the study area into areas of distinct and recognisable character was therefore undertaken in order to divide it into local Urban Character Areas (UCAs) to assist the assessment process.

Consultation

11.2.14 Consultation was undertaken to inform the Stage 3 assessment and proposed scheme design between July 2014. and December 2014. Consultation was undertaken with statutory and non-statutory consultees, with responses summarised in Appendix A6.2 (Chapter 6: Consultation and Scoping) and taken into account in the preparation of the assessment.

11.2.15 Stage 3 EIA consultation letters were issued to consultees requesting updates to the environmental baseline and to provide them with an opportunity to comment on the scope of the EIA. Responses received were also used to inform the detailed design of the proposed scheme and environmental mitigation measures.

Field Survey

11.2.16 A field survey was carried out on the 4 September 2014. The survey was completed by two landscape architects on foot. The survey confirmed the location and extents of the UCAs, properties (built receptors) and paths and roads (outdoor receptors) that would be likely to experience a physical or visual change as a result of the proposed scheme. Data relating to townscape character and individual features and elements which contribute to it were collected using standardised checklists and photographs taken from key viewpoints identified through consultation and during initial baseline assessment.

Impact Assessment

Townscape Impact Assessment

11.2.17 Five UCAs have been defined through a combination of desk and field assessment. The UCAs are described in Appendix A11.1 (Urban Character Areas (UCA)), summarised in Table 11.10 and shown on Figure 11.1.

Sensitivity to Change

11.2.18 Once the UCAs were identified, the sensitivity of the townscape of each area to change due to the proposed scheme was assessed. As described in GLVIA 3, sensitivity is defined by the 'susceptibility to change' and 'value of the receptor'. Susceptibility is defined as the ability of the townscape receptor to accommodate the proposed scheme without undue negative consequences. Susceptibility of townscape receptors to change was assessed using the criteria detailed in Table 11.1 below.

Table 11.1: Townscape Susceptibility Criteria

Susceptibility	Criteria
High	Little ability to accommodate the proposed scheme without undue harm.
Medium	Some ability to accommodate the proposed scheme without undue harm.
Low	Substantial ability to accommodate the proposed scheme without undue harm.

11.2.19 GLVIA 3 defines landscape value as '*The relative value that is attached to different landscapes by society*'. A review of existing designations (e.g. Conservation Area) is usually the starting point in understanding value. However, establishing the value attached to undesignated areas (as applies to the study area) requires examination of individual elements of the townscape such as buildings, features of cultural heritage interest and trees, or areas of importance to the local community such as local green spaces and allotments. A number of criteria were considered to help determine value as detailed in Table 11.2 below and an overall assessment was made for each receptor in terms of high, medium and low value.

Table 11.2: Criteria for Assessing Value of Non-Designated Townscapes

Attribute	Description
Townscape Quality (Condition)	A measure of the physical state of the landscape/townscape; its intactness and the condition of individual elements.
Scenic Quality	General appeal of the landscape/townscape to the senses.
Rarity	The presence of rare elements, features or townscape types.
Representativeness	Characteristic/ feature/ element considered a particularly important example.
Conservation/ Cultural Interest	The presence of wildlife, earth science or cultural heritage interest which contributes positively to the townscape.
Recreation Value	Evidence that the landscape/townscape is valued for recreational activities where experience of the townscape is important.
Perceptual Aspects	Whilst for rural landscape perceptual qualities such as wildness and tranquillity may be of importance, in urban context qualities such as the sense of safety/ security or a perception of comfort may contribute to value.
Associations	Relevant associations with notable figures, such as writers or artists, or events in history that contribute to townscape value.

11.2.20 Table 11.3 outlines the criteria used along with professional judgement in the evaluation of townscape sensitivity. The sensitivity of townscape receptors is defined in terms of the relationship between value and susceptibility to change. The relative balance of importance of value and susceptibility in the overall evaluation of sensitivity has been determined through professional judgement rather than by strict application of a matrix, which may lead to overly simplistic outcomes.

Table 11.3: Townscape Sensitivity Criteria

Sensitivity	Criteria
High	Townscape elements of particular distinctive character, which are highly valued and considered susceptible to relatively small changes.
Medium	Townscape of moderately valued characteristics considered reasonably tolerant of change. Some ability to accommodate the proposed development without undue harm.
Low	Townscape of generally low valued characteristics considered potentially tolerant of substantial change.

Magnitude of Change

11.2.21 The magnitude of townscape change was assessed in terms of its size or scale, the geographical extent of the area influenced its duration and reversibility.

11.2.22 The size and/or scale of change in the townscape takes into consideration the following factors:

- the extent/proportion of townscape elements lost or added;
- the contribution of that element to townscape character and the degree to which aesthetic/ perceptual aspects are altered; and
- whether the change is likely to alter the key characteristics of the townscape, which are critical to its distinctive character.

11.2.23 The criteria used to assess the size, scale and geographic extents of townscape impacts are based upon the amount of change that would occur as a result of the scheme, as described in Table 11.4 below:

Table 11.4: Magnitude of Townscape Change

Magnitude	Criteria
High	Notable change in townscape characteristics over an extensive area ranging to very intensive change over a more limited area.
Medium	Minor changes in townscape characteristics over a wide area ranging to notable changes in a more limited area.
Low	Minor or virtually imperceptible change in any area or to any components of the townscape.

11.2.24 In accordance with GLVIA 3, consideration has also been given to the duration and reversibility of townscape impacts in the evaluation of magnitude.

11.2.25 The duration of impacts was judged on the following scale:

- short-term: under 1 year;
- medium-term: 1-15 years; and
- long-term: over 15 years.

11.2.26 The permanent impacts of the proposed scheme are considered to be of long-term duration and largely irreversible, thus increasing magnitude. Temporary construction phase impacts, for example from site compounds, are likely to be short-term, are often reversible and thus have a lower magnitude.

Significance of Townscape Impact

11.2.27 The following categories of significance described in Table 11.5 were used for the assessment.

Table 11.5: Townscape Impact Significance Criteria

Impact Significance	Description
Substantial	The proposed scheme would be at complete variance with the character (including quality and value) of the townscape, cause the integrity of characteristic features and elements to be lost, and cause a sense of place to be lost.
Moderate/ Substantial	The proposed scheme would be at considerable variance with the character (including quality and value) of the townscape, degrade or diminish the integrity of a range of characteristic features and elements, and damage a sense of place.
Moderate	The proposed scheme would conflict with the character (including quality and value) of the townscape, have an adverse impact on characteristic features or elements, and diminish a sense of space.
Slight/ Moderate	The proposed scheme would not quite fit the character (including quality and value) of the townscape, be at variance with characteristic features and elements, and detract from a sense of place.
Slight	The proposed scheme would generally fit the character (including quality and value) of the townscape, occasionally be at variance with characteristic features and elements, and slightly reduce from a sense of place.
Negligible	The proposed scheme would maintain the character (including quality and value) of the townscape, be in line with characteristic features and elements, and enable a sense of place.

11.2.28 Moderate or greater adverse impacts were considered to represent key townscape changes and mitigation would generally be required to reduce these where practicable.

Visual Impact Assessment

11.2.29 The visual assessment considers both built (properties) and outdoor receptors. Outdoor receptors consist of important routes that enable access within the townscape. These include roads, footpaths and open space. Where multiple built receptors are grouped together for the purposes of the assessment they are referred to as a receptor group.

11.2.30 The significance of visual impacts was determined through consideration of both the sensitivity of the visual receptors and the predicted magnitude of change as a result of the proposed scheme.

Sensitivity to Change

11.2.31 The sensitivity of visual receptors was evaluated through consideration of their susceptibility to changes in views and visual amenity and the value attached to particular views. As described in GLVIA 3 the susceptibility of different visual receptors is mainly a function of:

- the occupation or activity of people experiencing the view at particular locations; and
- the extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations.

11.2.32 Table 11.6 below (based on generic guidance in GLVIA 3) was used to help evaluate the susceptibility of different types of receptors.

Table 11.6: Visual Receptor Susceptibility to Change

Susceptibility	Receptor Type
High	Residents; People engaged in outdoor recreation, including users of public rights of way, whose attention is likely to be focussed on the townscape and on particular views; Visitors to heritage assets or other attractions where views of the surroundings are an important part of the experience; Communities where views contribute to the Townscape setting enjoyed by residents; and Travellers on scenic routes where awareness of views is likely to be particularly high.
Medium	Travellers on road, rail or other transport routes.
Low	People engaged in outdoor sport or recreation, which does not involve appreciation of views; and

	People at their place of work, whose attention may be focused on their work and where the setting is not important to the quality of working life.

11.2.33 The criteria in Table 11.7 below were used, along with professional judgement, to help determine the value of the views experienced by each visual receptor.

Table 11.7: Value of Views

Value	Views from
High	Viewpoints of national importance, or highly popular visitor attractions where the view forms an important part of the experience, or with important cultural associations.
Medium	Viewpoints of regional/ district importance or moderately popular visitor attractions where the view forms part of the experience, or with local cultural associations.
Low	Viewpoints with no designations, not particularly popular/ important as a viewpoint and with minimal or no cultural associations.

11.2.34 The sensitivity of visual receptors to changes in their views was evaluated in accordance with the criteria provided in Table 11.8, based on the receptor susceptibility to change and the value of views: The sensitivity of visual receptors is defined in terms of the relationship between value and susceptibility to change. The relative balance of importance of value and susceptibility in the overall evaluation of sensitivity has been determined through professional judgement rather than by strict application of a matrix, which may lead to overly simplistic outcomes.

Table 11.8: Visual Sensitivity Criteria

Sensitivity	Criteria
High	Receptors where the changed view is of high value and importance and/or where the receptor will notice any change to visual amenity by reason of the nature of use and their expectations (receptors where the view is important to users will be considered to be of high sensitivity).
Medium	Receptors where the changed view is incidental but not critical to amenity and/or the nature of the view is not a primary consideration of the users (receptors where users are likely to spend time outside of participation in their activity looking at the view and industrial receptors that have offices with windows that take advantage of views).
Low	Receptors where the changed view is unimportant/ irrelevant and/or users are not sensitive to change (outdoor receptors where users are unlikely to consider the views an important element of their usage of the site will generally be assessed to be of low sensitivity).

Magnitude of Visual Change

11.2.35 Evaluation of the magnitude of visual change affecting receptors was carried out by considering the following:

- the scale of the change in the view with respect to the loss or addition of features and changes in its composition, including the proportion of the receptor's available view affected by the development;
- the degree of contrast or integration of any new features or changes in the townscape with the existing townscape elements and characteristics;
- the nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpsed;
- the angle of view relative to the main activity of the receptor;
- the distance of the viewpoint from the proposed scheme;
- the extent of the area over which changes would be visible; and
- the duration and reversibility of changes.

11.2.36 The criteria used to help determine the magnitude of change are shown in Table 11.9.

Table 11.9: Magnitude of Visual Change

Sensitivity	Criteria
High	Where the proposed scheme or elements of the scheme will dominate the view and fundamentally change its character and components.
Medium	Where the proposed scheme or elements of the scheme will be noticeable in the view, affecting its character and altering some of its components and features.
Low	Where the proposed scheme or elements of the scheme will be only a minor element of the overall view that are likely to be missed by the casual observer and/or scarcely appreciated.

11.2.37 As with townscape impacts, the magnitude of visual change also takes into consideration the duration and reversibility of the impact. Short-term, reversible visual impacts from temporary construction operations are generally considered to be of lower magnitude than long-term or irreversible impacts.

Significance of Impacts

11.2.38 The significance of visual impacts was determined through consideration of both the sensitivity of the visual receptors and the predicted magnitude of effect as a result of the proposed scheme. In accordance with IAN 135/10, separate assessments have been undertaken for the construction phase, winter year of project opening (to represent the worst case scenario during operation before any planting mitigation has had time to become effective), and in summer after 15 years, when proposed mitigation planting will have become established and can be expected to have become reasonably effective.

Limitations to Assessment

11.2.39 In order to avoid infringing on the privacy of building occupants, field assessment of visual impacts was undertaken from publicly accessible external spaces close to the buildings. It was therefore necessary to estimate the potential visibility of the proposed scheme from upper floor windows using professional judgement. The assessment of the residual townscape and visual impacts was undertaken using anticipated or potential mitigation proposals rather than detailed mitigation proposals. It should also be noted that the assessment of residual impacts does not take account the potential changes to the baseline conditions which may take place in the future, for example development to Middlefield Regeneration Area which is identified in the Aberdeen Local Development Plan 2012, and which may require demolition of a number of properties that are identified as visual receptors in the assessment.

11.2.40 In relation to the study area, the VEM extents are very limited due to the urban location, the topography and the screening effect provided by existing three storey tenement blocks and other built buildings.

11.3 Baseline Conditions

11.3.1 This section classifies and evaluates the townscape resource of the study area, taking account of the geological, cultural and historical influences and identifying any designated or protected areas.

Regional Context

11.3.2 Haudagain Roundabout is located in the north-west of the city in close proximity to the River Don. The roundabout forms the crossing point between two important roads through Aberdeen, the A90 and the A96. The A96 travels in a north-western direction connecting Aberdeen to Elgin, Nairn and eventually Inverness. The A90 travels along the east coast connecting Aberdeen to Dundee in the south and to Fraserburgh in the north. The roundabout is located in close proximity to the communities of Middlefield, Woodside, Hilton and Heathryfold. Refer to Figure 11.2 for all street name references.

Geology and Soils

11.3.3 The study area lies to the south of the River Don and is underlain by alluvium, river terrace deposits and Devensian aged glacial till and sands and gravels. The Devensian glacial deposits comprise Banchory Till, found predominantly in the southern portion of the study area; and the Lochton Sand and Gravel Formation located in the north of the study area. The solid geology is predominantly made up of Aberdeen Pluton Granite, an igneous intrusive rock from the Ordovician period that forms part of the North-East Grampian Granitic Suite.

11.3.4 Given the urban nature of the study area, made ground is also expected to be relatively widespread particularly in areas of existing railway and road embankments as well as infilled historic mineral extraction sites, and areas of reworked and benched ground.

11.3.5 The geology and soils of the study area are considered in detail in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater).

Townscape Elements and Features

Landform and Drainage

11.3.6 The study area sits on the north facing slopes of the River Don valley. To the south of the river the areas of Northfield, Cummings Park and Rosehill sit at the top of an evenly rising hill. The gradient briefly plateaus along the A96 corridor, before dropping steeply towards the flat valley floor. The topography rises again to the north of the flood plain across the generally gentle slopes of the Hill of Danestone.

11.3.7 Due to the extensive urban development of the majority of the study area, there are no unculverted natural burns, rivers or streams apart from the River Don, a short stretch of the Scatter Burn north of the A96 and a mill lade at the edge of the Danestone housing area. The natural topography and urban pattern results in all drainage being directed towards the River Don.

Vegetation

11.3.8 Within the high density urban areas around the A90(T) North Anderson Drive and the Haudagain Roundabout vegetation comprises small areas of mass ornamental shrub and tree planting. Planting within public and communal space comprise a variety of densely planted well established shrubs and occasional small trees.

11.3.9 In the residential Hilton area to the south-east of the roundabout, mature beech trees create distinctive avenues along Anderson Road and the Smithfield Lane footpath. The private gardens in this area are generally well maintained, with numerous mature trees. There are also a large number of mature deciduous trees located within Stewart Park, a Victorian park at the centre of the Hilton area, and an area of mature deciduous woodland (Hilton Woods) on the southern side of Hilton Road.

11.3.10 Woodland and scrub planting has naturally regenerated between the A96(T) Auchmill Road and the railway corridor, and is well established along a footpath that runs parallel to the railway line. To the north there is semi mature woodland planting on the eastern embankment of A90(T) Mugiemoss Road and several stretches of the banks of the River Don are covered by belts of mature deciduous woodland. To the south of the river, within Grove Cemetery there are a number of older specimen trees on the rising slopes.

Settlement and Land Use

11.3.11 The study area is characterised by 19th century to present day industrial and commercial units in the north-west along the A96 corridor and mid to late 20th century pre and post war developments of housing units typically in two, three and four storey flats elsewhere. The 18th century Grove Cemetery is located to the north of the Aberdeen to Inverness railway line, forming a regular layout of burial plots. There are also 18th to 19th century rectilinear fields along the northern bank of the

River Don, which were created during the agricultural improvement era as fields were enclosed and absorbed into larger units.

11.3.12 The areas surrounding Haudagain Roundabout are mixed in character and use. To the south of the roundabout the land is predominantly residential. Directly to the south-west of the A96 Auchmill Road, the housing comprises mainly three storey tenement blocks designed around central public courtyards. Further back from the A96 Auchmill Road, there are four dwelling blocks and semi-detached cottages with front and back gardens. Recreational facilities focused around Manor Park are located to the south-west of the roundabout, and include a large area of allotments, several play parks, a bike track, a football pitch, and a community centre. Auchmill Golf Course is situated further west beyond Manor Park.

11.3.13 Directly to the north-west of the roundabout there is a mixture of industrial and commercial units, a cemetery and a memorial garden, a small modern housing estate, and a retirement home. To the north-east the Woodside Sports Complex, which comprises a number of football and rugby pitches, is situated in the River Don flood plain.

11.3.14 To the south-east and south-west of the roundabout there are a number of small retail units, including two petrol stations, a small retail park (Haudagain Retail Park), a number of individual shops and a car rental depot.

11.3.15 North of the River Don there is a large supermarket and a gymnasium as well as a waste water treatment plant. The large residential area of Danestone sits on the rising hillside to the north-east, while to the north-west the hillside is covered by a mixture of farmland and woodland.

Townscape Pattern and Urban Form

11.3.16 The urban pattern within the study area has been largely dictated by the development of the transport infrastructure, and particularly the main roads through the area. The A90(T) provides the main north to south route through Aberdeen, and at Haudagain Roundabout connects to the A96, which provides the primary road link between Aberdeen and Inverness. At the southern edge of the study area Hilton Drive and Manor Avenue provide links to the east and west of the A90 through the different urban areas.

11.3.17 The northern part of Middlefield is composed of pre world-war two (1935) tenements built to re-house residents moved from central Aberdeen. The tenement flats are designed around central semi-public communal courtyards, with a mixture of two and three storey buildings. The fronts of the properties face out towards the streets, while the back windows face the inner courtyards. The largest communal area is located at Logie Avenue and Logie Gardens where the space has been recently refurbished with a large play parkwhich acts as a central node for the North Middlefield community. Nearby, shops once reinforced this central node but are now derelict and show signs of fire damage. Pedestrian footpaths and a small public park at Manor Terrace provide additional recreational space for the community. A number of residential properties have been converted into community facilities, including a nursery and housing office for the Middlefield Community Project. A small group of semi-detached red brick houses on Logie Place, which have a more distinctive character and private gardens, provide a contrast to the higher density three storey tenements that surround them.

11.3.18 The majority of the northern part of the Middlefield area comprises pre-World War II, 4-in-a-block units with shared gardens. However the housing in the southern part, although it is from the same era, is of a wide variety of different scales and architectural styles. The area has a more diverse character than the northern part of Middlefield due to smaller roads and a greater emphasis of individual and shared gardens rather than open communal spaces. The majority of dwellings have a private front and back garden with private off street parking. There are a small number of higher density units near the eastern edge of the area, including a single multi-storey block and a small group of three storey units. The residential pattern developed around community facilities, including two local schools, Middlefield Primary School and Smithfield School (now demolished) and a play park at Persley Crescent.

11.3.19 The Hilton area to the south-east of the Haudagain Roundabout has a similar urban make up to that of the southern part of Middlefield, although housing density is slightly lower with larger private gardens. The majority of dwellings are made up of 4-in-a-block units. The urban structure has been designed to generally align with the two main roads, Hilton Drive and Clifton Road. The residential streets branch off the main roads, with occasional crescents formed by the meeting of the side streets. Stewart Park is located in the centre of the area, and provides a number of community recreational facilities, including a football and cricket pitch, a bowls green and tennis courts.

11.3.20 To the east of the Haudagain Roundabout, many of the properties along the A96 Great Northern Road are higher density units of different styles and ages, including a pair of ten storey blocks of flats. While several of the smaller units are situated on the higher ground above the River Don, views to the north over the mature woodland and riparian habitats of the valley are limited. To the west of the roundabout there is a row of well-maintained semi-detached cottages lining the edge of the A96(T) Auchmill Road. Most units are one storey with attic conversions, with many of the properties built with large picture windows that afford them attractive views of the rolling hillside to the north. Many of the properties also have a front and back garden, although the setting of the dwellings is compromised by the high volumes of traffic on the A96.

Landscape/Townscape and Other Relevant Designations

11.3.21 The level of protection afforded to sites of landscape/townscape value and importance varies according to their designation as described below and shown on Figure 4.2 Environmental Constraints.

Nationally Protected Sites

National Scenic Areas (NSAs)

11.3.22 National Scenic Areas are recognised as the finest Scottish landscape due to their outstanding scenery. The study area is located east of Deeside and Lochnagar NSA but is not inter-visible with it.

Inventory Gardens and Designed Landscapes

11.3.23 There are no Gardens and Designed Landscapes within and around the study area.

Tree Preservation Orders

11.3.24 There are no Tree Preservation Orders identified within the study area.

Non-designated Landscape/Townscape Features

11.3.25 There is an area of mature mixed woodland located along the River Don with a woodland trail running parallel south of the River and the Danestone Country Park north of the River Don.

11.3.26 Neither of these features would be affected by the proposed scheme due to their distance from the road and screening provided by intervening vegetation and topography so they have not been given further consideration in this assessment.

Urban Character Areas

11.3.27 Five distinct Urban Character Areas (UCAs) have been identified within the study area and are described in summary, along with an evaluation of their susceptibility, value and sensitivity in Table 11.10 below. Detailed descriptions of the UCAs are contained in Appendix A11.1 (Urban Character Areas).

Table 11.10: Description of Urban Character Types

UCA	Description	Sensitivity
North Middlefield UCA)	Predominantly composed of pre-WWII (1935) three storey tenements designed around central semi-public communal courtyards. A number of tenements in poor condition, vacant and boarded, particularly at Logie Gardens. The natural topography of the area slopes down from south to north. Green open recreational areas are located at Logie Gardens and Manor Terrace. Small number of semi-detached red brick houses on Logie Place. Some of the smaller two storey tenement blocks have been converted into community facilities. Properties with designated off street parking, leaving the roads relatively clear, specifically on Logie Place. North Middlefield UCA is of medium susceptibility being a predominantly residential area with a structured simple layout focused on communal courtyards. The area is considered to be of low value with limited townscape or scenic quality. Much tenement housing is in poor condition and appears to be in decline with some housing and shops derelict.	Medium to Low
South Middlefield UCA	The area south of the proposed scheme consists of residential housing of a variety of different scales and styles of pre-war housing. A slightly more diverse residential character in comparison to North Middlefield due to lower density housing and narrow roads. The majority of dwellings have private front and back gardens with private off street parking which adds to the diverse residential appearance. The area has a range of community buildings; Middlefield Parish Church and a community hall. As Hilton Drive meets A90(T) North Anderson Drive there are a small set of three storey blocks of properties. There are a number of higher density units between Fairlie Street and Fowler Avenue to the south-east of the area comprising of one high rise block of flats in Smithfield Court. Views toward the rural landscape to the north can be gained mostly from the houses facing on to Manor Avenue. The condition of the houses and well maintained private gardens raise the townscape quality. This area is of high susceptibility due to its residential and particular urban character. The area is considered to be of low to medium value.	Medium
Auchmill Road UCA	Well maintained semi-detached villas facing directly on to the busy A96(T) Auchmill Road. Private front and back gardens and designated car parking. Properties look out on to the busy A96, mature vegetation with distant views of the rural landscape to the north. Distant views north to the rural landscape. Distinctive granite building styles. The area is of low susceptibility due to the location of road and mixture of dwellings from various ages. The area is considered to be of medium value.	Medium
Great Northern Road UCA	Predominantly high density housing blocks located along a busy roadside. The character is dominated by the busy A96, adjacent retail part and the Haudagain Roundabout. Limited communal open space around the housing block, car parking is the priority. No rarity value, conservation interest, recreation value and very limited scenic quality. The area is considered of low susceptibility due to the location of the busy road and particular urban character. The area is considered of low value.	Low
Haudagain Commercial and Industrial UCA	Area of commercial and retail units around Haudagain Roundabout and along the busy A96. Combination of modern retail units and commercial premises in more traditional stone and brick built premises, parts of which, are also used for accommodation.	Low

UCA	Description	Sensitivity
	Area is dominated by the busy A96 and the Haudagain Roundabout junction. No evident scenic quality, rarity or conservation interest. Perceived as the outskirts to the city well away from the retail city centre. The area is considered of low value and susceptibility as a result of the commercial and industrial nature of the area and proximity of surrounding roads.	

11.3.28 The UCAs are shown in relation to the scheme and assessed key viewpoints on Figures 11.1 with Figures 11.1a – 1f showing photographs of the UCA from the viewpoints locations.

Visual Baseline

Built and Outdoor Receptors

11.3.29 A total of 43 built receptor groups consisting of predominantly residential dwellings, and seven outdoor receptors (roads, parks and footpaths) were identified and assessed within the study area. No core paths are present within the study area.

11.3.30 Baseline visual conditions of the study area are summarised below. Sensitivity is described generally in the section to provide an overview of baseline visual sensitivity.

11.3.31 South Middlefield is a residential area made up of a mix of semi-detached houses, low and high rise flats with some areas of public open space. It is located on the higher ground in the south of the study area. The proposed scheme would be located directly to the north of this area. The layout of properties is relatively dense with views towards the proposed scheme varying in angle and extent due to 'filtering' by intervening properties and private garden vegetation. As the receptors in South Middlefield are predominantly residential they are considered to have high susceptibility to change, however views are of relatively low value, with no designations. These receptors are of medium sensitivity to change. Properties on Manor Avenue, gain open views of the proposed scheme in close proximity. Middlefield Parish Church and a community hall are located on Manor Avenue immediately south of the proposed scheme, but there are no views north from inside the buildings and the frontage overlooks the existing road. Their sensitivity to the proposed changes is generally low.

11.3.32 North Middlefield is predominantly residential and contains varying styles of properties though the majority are flats in three storey tenement buildings. The extents and angles of views towards the proposed scheme vary. The sensitivity of the receptors in this area is assessed to be medium as they are residents with a high susceptibility to change but existing views are generally of low value. Currently the majority of receptors experience restricted views of the residential townscape environment. Existing vegetation is limited to shrub planting found in the gardens of properties scattered through the southern extends of the UCA.

11.3.33 To the north, visual receptors primarily comprise retail and business units grouped close to Haudagain Roundabout and along the A96 Auchmill Road near the proposed junction and location of the proposed Sustainable Drainage Systems (SUDS) detention basin where demolition of residential properties would be required. Due to the relatively low susceptibility to change and value of views from these receptors, their sensitivity to change is generally low. Views from the receptors closest to the roundabout towards the scheme are limited due to intervening properties.

11.3.34 Further along the A96(T) Auchmill Road to the north west of its junction with Manor Drive, a group of residential properties is positioned close to the road. These properties, evaluated as being of medium sensitivity to change, gain their main views from their north facing windows which look directly across the A96 towards the rural landscape in the distance.

11.3.35 A small number of residential properties in Fullerton Court immediately to the north-east of Haudagain Roundabout currently have views west along the A96(T) Auchmill Road, in the vicinity of the proposed new link road junction and SUDS detention basin. However due to screening from

existing trees and intervening properties, visibility is limited. The upper floors of the two high rise residential blocks at the eastern end of Fullerton Court overlook the area of the proposed scheme. However intervening properties, many of which are over two storeys high, along with the distance and angle of available views limits visibility. The receptors in this location are of medium to low sensitivity.

View from the Road

11.3.36 Between the southern end of the proposed scheme at the junction with Manor Avenue and Haudagain Roundabout, existing views to the west from the A90 are predominantly restricted by tenement housing close to the road, with some longer vistas through residential areas gained along Manor Avenue and through amenity open space between buildings. Garden planting and amenity tree and shrub planting helps to soften views to some extent. Views to the east are slightly more open and varied in nature over a mix of housing and commercial development, with longer glimpses available to higher ground north of the Don Valley, filtered by mature tree planting. Distant views of the rural landscape to the north are also available on the approach to Haudagain Roundabout. Closer to the Haudagain Roundabout views out are restricted to the east and west by commercial premises, with roadside tree and shrub planting along A90(T) Mugiemoss Road limiting longer views to the north. Travelling south, the views are dominated by the A90(T) North Anderson Drive itself, rising up the hill slope, flanked by residential development

11.3.37 Views south from the stretch of the A96(T) Auchmill Road that would be bypassed by the proposed scheme (running west to east between Manor Drive and Haudagain Roundabout) are restricted by a mix of commercial properties close to the roundabout and housing, including detached properties set back from the road and tenement blocks. The only longer views available to the south is along Manor Drive which is flanked by residential properties with limited garden vegetation. Existing views from the A96(T) Auchmill Road to the north are more open. Exiting Haudagain Roundabout travelling west, views are initially partially restricted by roadside vegetation but then more open with views out to the distant suburban and rural wooded landscape across the Don Valley to the north. Further west towards Manor Drive commercial units positioned adjacent to the road restrict views north, though glimpses can be gained between the units through adjacent parking areas. Views east are dominated by the road itself flanked by mixed residential and commercial development, with amenity tree and shrub planting. High rise flats on the north side of the road form a prominent focal point. The view west is also dominated by the road itself, flanked by residential and commercial development, with some roadside planting and rural wooded hillside in the distance.

11.3.38 Existing views from Manor Avenue (running west from the A90(T) North Anderson Drive) are limited, restricted by the two and three storey housing located adjacent to the road and by the surrounding residential area. Glimpsed views out to the rural landscape to the north can be gained over the roofs of housing, looking down local roads and through adjacent open park space. The combination of rising landform and dense housing restricts views to the north. Views east and west are dominated by the road itself and flanking residential development softened to some extent by garden planting.

11.3.39 Views to the west and east from Manor Drive (running south from the A96(T) Auchmill Road) are of housing in the surrounding residential area. However views of the distant, more rural wooded and suburban landscape, are available to the north of the River Don.

11.3.40 Existing views from the remaining local roads within the vicinity of the proposed scheme are limited to views of housing, local roads and open space areas in close proximity. Views out are restricted due to the height and density of the housing and the area's sloping topography.

11.4 Potential Impacts

11.4.1 This section describes the potential impacts on the townscape and visual amenity of the study area during construction and operation of the proposed scheme. Landscape mitigation is predominantly achieved through alignment, earthworks, and landscaping which are incorporated into the design as assessed and reported in this ES. It is therefore not practicable to undertake an assessment of the potential landscape/visual impacts of the operational scheme in the absence of mitigation. This

section therefore provides a brief summary of the types of impacts that can occur during operation, and sets out potential temporary impacts during construction.

Construction Phase

11.4.2 The construction activities associated with road schemes cause generally temporary adverse townscape and visual impacts, typically resulting from:

- vehicles moving machinery and materials to and from the site;
- machinery, potentially including heavy excavators, earth moving plant, demolition machinery, cranes etc;
- exposed bare earth over the extent of the proposed works;
- structures, earthworks, road surfacing and ancillary works during construction;
- temporary site compound areas including site accommodation and parking;
- temporary soil storage heaps and stockpiles of construction materials;
- demolition operations including temporary demolition material heaps;
- lighting associated with night-time working and site accommodation;
- traffic congestion and queuing during the proposed route work; and
- traffic management measures.

11.4.3 The significance of impacts depends on the scale and duration of construction activities and their location in relation to sensitive receptors. The most significant adverse townscape impacts during the construction period would therefore be likely to occur in areas of demolition, and where major earthworks or structural works are being carried out. Visual intrusion from construction activities can impact on views and also reduce the enjoyment of the townscape. Residential properties directly adjacent to the properties proposed for demolition are likely to experience significant adverse visual impact from the construction activity. The locations where these impacts are likely to occur are as follows:

- Manor Drive and where it joins the A96(T) Auchmill Road;
- properties on either side of Logie Avenue and Logie Place and Logie Gardens; and
- the east end of Manor Avenue and where it joins A90(T) North Anderson Drive.

11.4.4 Temporary visual impacts can also occur due to the presence of temporary construction compounds. As explained in Chapter 4 (The Proposed Scheme), the location of construction compounds is not known at this stage, as this would be determined by the appointed Contractor depending on phasing and execution of the works. Mitigation is set out in Section 11.5 to guide the location of construction compounds, and this would also include mitigation for potential visual impacts.

Operational Phase

11.4.5 Potential impacts on townscape character and visual amenity during operation are described below for the proposed scheme.

11.4.6 Impacts would result from changes to connectivity within the urban area, and to the urban structure. Due to the large scale demolition resulting from the proposed new route running through Middlefield residential area, the urban character and structure of the local townscape would be significantly affected.

11.4.7 The introduction of a dual carriageway and associated junctions and linking roads would have an impact on the townscape. Utilising the existing surrounding roads and the existing local topography

would limit the potential for impacts on townscape features and the character of the surrounding landscape/townscape. The construction of the proposed scheme would result in large scale demolition and creation of major earthworks in cutting and embankment on new access routes. The extent of street lighting in the area would increase to support the additional road infrastructure, with the introduction of new LED light columns ranging from 6m to 10m in height, as well as the potential replacement of existing light columns on adjacent local roads.

Landscape

11.4.8 Potential landscape impacts would include the following:

- alteration of the local urban structure, character and network due to the loss of housing and changes to road infrastructure;
- alteration to the pedestrian access routes and connectivity of existing green spaces;
- loss or severance of existing tree and shrub vegetation in parks and private gardens;
- introduction of infrastructure elements associated with the proposed scheme, including lighting, signage and creation of a SUDS detention basin; and
- alteration of the landform through to the construction of alignment embankments and cuttings.

Visual

11.4.9 Potential visual impacts arising from the elements of the proposed scheme and the changes that may affect the visual amenity of receptors within the study area, from winter in the year of opening onwards, are identified as follows:

- alteration of views due to the demolition of a number of properties;
- the movement of vehicles along the proposed dual carriageway link road, Manor Drive and along linking local access routes;
- new roads, associated infrastructure and earthworks; and
- alteration to vegetation patterns through the loss of existing vegetation followed by mitigation planting and seeding.

11.4.10 The sloping topography and built up nature of the area strongly influence the availability of views and hence the visual impacts of the proposed scheme. Receptors to the south are located on higher ground overlooking the proposed scheme, however only those properties located on upper floors or with open views uninterrupted by intervening buildings would gain views of it. The existing views from the affected properties are urban in character and this would not fundamentally change as a result of the proposed scheme, though the demolition of buildings and the introduction of the new road, associated infrastructure and traffic, would have an impact.

11.4.11 In the northern part of the study area the majority of affected receptors are located on upper floors of three storey tenement blocks overlooking the proposed scheme at close range, with visibility for some receptors increased as a result of the demolition required to construct the proposed scheme.

11.4.12 Visual impacts taking mitigation into account are set out in Section 11.6

11.5 Mitigation

Introduction

11.5.1 The proposed scheme would result in large scale demolition, earthworks, cuttings and the disruption of communal green spaces and networks. Additional land would need to be acquired to mitigate the resultant impacts.

11.5.2 Measures to mitigate townscape and visual impacts and where possible provide enhancements to the existing townscape, have been developed through an iterative design process involving engineering, environmental and landscape specialists. Specific Urban Design Objectives, detailed in Appendix A11.3 (Urban Design Objectives), have been developed in consultation with Aberdeen City Council (ACC) to focus the preparation of the design proposals, help meet the overall scheme objectives and mitigate the environmental impacts of the scheme. These would form part of an Urban Design Strategy document developed in consultation with ACC, which would provide further details of the landscape and urban design proposals for the proposed scheme.

11.5.3 The landscape mitigation proposals have been designed in accordance with the policy documents, 'Fitting Landscapes: Securing More Sustainable Landscapes' (Transport Scotland, March 2014), 'DMRB Volume 10, Environmental Design and Management' (Highways Agency et al., 2001) and 'Planning Advice Note (PAN) 58: Environmental Impact Assessment (Scottish Executive, 1999). The principles in Fitting Landscapes Policy has four central themes to be applied throughout the planning, design and implementation of road proposals:

- ensure high quality of design and place;
- enhance and protect national heritage.
- use resources wisely; and
- build in adaptability to change.

11.5.4 Landscape mitigation is concerned primarily with mitigation of significant (moderate or greater) impacts which are considered to represent key townscape changes and impacts on visual amenity. Mitigation would generally be required to reduce these where practicable.

11.5.5 Mitigation of adverse impacts falls into three categories:

- Prevention: avoidance of the loss of significant townscape elements through the design of the proposed scheme to achieve sensitive horizontal and vertical alignment;
- Reduction: lessening of those adverse impacts that cannot be eliminated by prevention (e.g. roadside mounding and planting to enhance the townscape, provide screening and integrate the surrounding townscape with surrounding landform and landscape); and
- Offsetting: provision of alternative or compensatory measures where appropriate and feasible (e.g. replacing open space and amenity vegetation where appropriate).

11.5.6 Mitigation measures are taken into account in the assessment for winter year of scheme opening, when landscape earthworks and built screening elements, such as noise barriers, are in place, but before new planting has become established. The landscape mitigation has been designed to be fully established within 15 years, with species selected to continue to mature and provide mitigation, in line with the four key policy aims from Fitting Landscapes. The proposed scheme impacts are also assessed for the summer, 15 years after the proposed scheme opening when mitigation planting would be established.

Construction Phase

11.5.7 The following mitigation measures are proposed to avoid or reduce townscape and visual impacts during construction (**Mitigation Item LV1**). This is particularly important in close proximity to residential receptors:

- Programming of works to minimise disruption, including keeping the construction programme to the minimum practicable time and planning works to be undertaken in a way which minimises disruption to adjacent residents;
- avoidance of night-time working where possible. Where necessary, directed lighting would be used to minimise light pollution/glare. In addition to specific approval from the relevant road authority, the Contractor may be required to comply with the specific requirements of the Local Authority, which may include providing advice to potentially affected residents;

- sensitive locating of site compounds to minimise their townscape impact. Where possible existing features such as trees should be used to screen from sensitive visual receptors. Where this is not possible, screening can be achieved using bunds or embankments which become part of the permanent works. Alternatively, temporary screens can be erected, designed and painted to be as inconspicuous in their surroundings as possible;
- construction sites to be kept tidy (e.g. free of litter and debris);
- efficient traffic management and pedestrian diversions; and
- protection of vegetation and avoidance of damage to private ground.

11.5.8 The above measures would help reduce the townscape and visual impacts during construction. However, due to the extensive construction works necessary, these cannot be completely mitigated.

Application of Mitigation Principles

11.5.9 In line with the urban design objectives the road alignment and mitigation measures have been designed to avoid or reduce adverse impacts. Measures designed to mitigate townscape and visual impacts, are summarised below and illustrated on Figure 11.4.

Earthworks

11.5.10 Earthworks proposals aim to minimise the impact of cuttings and embankment slopes and to allow integration of the road with surrounding land (**Mitigation Item LV2**), through:

- modification or grading out of embankment and cutting slopes where practical to create smooth transitions with surrounding landform;
- rounding off top and bottom of cuttings and embankments;
- sensitive creation of mounding between the carriageway and the adjacent residential areas, located to assist visual screening, buffering and noise mitigation;, and
- manipulation of planting and screening elements on the earthworks where possible to ensure integration.

11.5.11 Where there is limited space for screen planting, mounding earthworks would comprise of amenity grassland planted with bulbs for seasonal interest. Earthworks, including sculpted mounding are proposed to screen views of the road, enhance neighbouring open spaces (**Mitigation Item LV3**).

SUDS Detention Basin

11.5.12 A SUDS detention basin, required as part of the road drainage system, would be sited south of the River Don in the North Middlefield UCA. The earthworks would be seeded with species rich grassland and groups of trees planted for visual interest and to soften associated fencing, outfall and inlet structures, and to promote biodiversity. Hedge planting is proposed along the boundary to the detention basin at a low height to allow visibility of the area from the neighbouring footways. Any boundary fencing required for safety purposes would be designed to be as unobtrusive as possible, consistent with serving the required safety function, with the fence type and alignment designed to minimise visual impact so far as possible. It would also be visually benefical for the vehicular access to the detention basin to be surfaced using grass with reinforcement e.g. a plastic or concrete cellular system (**Mitigation Item LV12**).

Noise Barriers

11.5.13 Where noise mitigation is proposed, as determined by the noise assessment, it would be provided in the form of noise barriers designed to absorb the noise. Careful consideration has been given to the integration of the noise barriers with the landscape design including their scale and positions. It is proposed to plant climbing species on both sides the barriers. As these establish they would assist in ‘softening’ the appearance of the barriers when viewed by road users and residents

overlooking them. The proposed grass verges on the southbound side of the link road have been widened to allow the avenue tree planting to continue adjacent to the noise barriers. This would further assist in softening the appearance of the barriers (**Mitigation Item LV13**). The indicative locations of the noise barriers are shown on Figure 11.4. Chapter 14 (Noise and Vibration) provides further details of noise mitigation proposals.

Planting

11.5.14 Where practicable existing trees and shrubs would be retained and integrated with new planting proposals (**Mitigation Item LV4**).

11.5.15 New planting (**Mitigation Item LV5**). is also proposed to:

- replace trees lost to the construction of the proposed scheme;
- mitigate the impacts of the proposed scheme on the townscape by introducing new 'green infrastructure' and provide new spatial definition;
- provide screening to reduce visual impacts of the roads and lighting;
- soften the visual impact of existing residential properties;
- create/enhance a strong sense of place; and
- enhance biodiversity through use of a mix of native and non-native species which are robust and can adapt to the anticipated local conditions

11.5.16 The proposed planting includes the following:

- Formal avenue tree planting in grassed verges alongside the new roads, backed by parallel formal hedges to create a clear sense of place and strong landscape structure. The new planting is intended to create attractive, interesting short range views within the road corridor with hedges providing lower level screening. This would form a clear boundary between the new link road and the adjacent residential and new open space areas. Together the trees and hedge planting are designed to provide a green buffer 'filtering' views between the new road and residential areas and open space areas, whilst giving visual interest for the road users, pedestrians and cyclists. Extra heavy standard trees are proposed for the avenue planting to provide effective mitigation at an early stage (**Mitigation Item LV6**).
- Groups of specimen trees in grass would be positioned for visual interest and to screen views from neighbouring residential and new open space areas. These would include a variety of species chosen for their robustness to the anticipated growing conditions, their seasonal interest, form and biodiversity value (**Mitigation Item LV7**). A combination of earth mounding and specimen tree planting is proposed to provide partial screening of views of the proposed Link Road to residents located along Manor Drive and Manor Avenue (**Mitigation Item LV16**).
- Specimen tree planting and hedge planting to replace boundary trees and hedges lost and severed in the community parks at Logie Terrace and Logie Place. The existing parks would be directly impacted by the scheme, therefore their layout would require to be redesigned. This would include the grubbing up and topsoiling of the remaining minor local road separating the parks. Existing boundary vegetation would be retained where possible to assist screening and integration with the park design. Hedgerow planting would be used to link any remaining severed hedges and delineate the boundary to the park whilst providing low level screening. Tree planting is proposed along the boundary to provide enclosure and visual interest within the reinstated park area and screening of views to the proposed scheme from surrounding residential properties. Mounding with grass seeding and bulb planting is proposed in the eastern part of the park area to create interest and provide additional buffering from the new road alignment. The path linking Logie Place to Manor Avenue would be retained but on a partially revised alignment. The local community would be consulted during the detailed design of the park/open space (**Mitigation Item LV14**).

Hedge Planting

11.5.17 Formal hedges are proposed as an element of the core landscape structure to provide low level screening, act as a buffer between the road corridor and the adjacent residential areas and create a soft landscape edge (**Mitigation Item LV8**). The hedge species mix would vary across the proposed scheme to provide diversity and seasonal interest. Typical species to be used for hedges would include:

- Holly – Ilex aquifolium;
- Hornbeam – Carpinus betulus; and
- Beech – Fagus sylvatica.

Tree Planting

11.5.18 Tree planting consisting of avenues and groups of trees is proposed. The majority of trees would be planted as heavy standards and extra heavy standards to provide an immediate impact and strong landscape structure. Typical species to be used may include:

- Double Gean – Prunus avium;
- Purple Beech – Fagus sylvatica purpurea;
- Weeping Silver Lime – Tilia tomentosa;
- Norway Maple – Acer platanoides;
- Red Oak – Quercus rubra;
- Himalayan Birch – Betula utilis var. jacquemontii; and
- Rowan – Sorbus aucuparia.

Grass Seeding

11.5.19 For all soft areas and road verges (**Mitigation Item LV9**), different seed mixes would be used, dependent on location and use:

- Roadside Verge Mix suited to the road-side location being low maintenance, fast establishing and tolerant of traffic and salt spray;
- Amenity Grass Seed Mix in areas of community open space and beneath avenue trees. Ornamental bulb planting is also proposed at key locations within these areas to provide visual interest for road users, pedestrians and cyclists and surrounding residential areas; and
- Semi Natural Grass Mix incorporating native wildflowers and suited for use in the SUDS detention basin and areas around culverts that are likely to experience intermittent wet conditions but would be predominantly dry.

Hard Landscape Treatment

11.5.20 It it proposed to surface the east facing embankment slope adjacent to Logie Avenue with setts or a similarly approved material. This is to assist enhancing and retaining its appearance when viewed in close proximity by the residents and by users of the adjacent footpath. (**Mitigation Item LV15**),

11.5.21 Details of site-specific landscape mitigation for each Urban Character Area are included below in in Section 11.6.

11.5.22 As townscape and visual impacts are closely related and inter-dependent, mitigation of visual impacts has been incorporated in the specific landscape mitigation measures described above.

11.5.23 The proposed landscape mitigation measures including earth mounding, grading out of embankment slopes, grass seeding, bulbs, climbing plants on noise barriers, formal tree and hedge planting would all assist in reducing visual impacts over time.

Lighting

11.5.24 The introduction of additional road lighting and other fixtures including signage and traffic lights can contribute to light pollution in the form of glare and/or light trespass/spill. It is beneficial to minimise these potential adverse impacts on the residential areas. Lighting is anticipated on the link road, on the local access road and at junctions. Consideration has been given to meeting light mitigation requirements by proposing to install LED's and a Central Management Systems (CMS) to allow for dimming and remote control to provide the right amount of light at the right time and in the right place to achieve further energy reduction and reduce environmental impacts. (**Mitigation Item LV10**).

11.5.25 If and where temporary lighting is essential during construction or operational maintenance, all reasonable precautions would be undertaken to reduce energy consumption and avoid/reduce the amount of light pollution in the form of glare and/or light trespass/spill where this can be achieved safely and effectively (**Mitigation Item LV11**).

11.6 Residual Impacts

Construction Phase

11.6.1 The townscape and visual impacts of the construction operations, as identified in Section 11.4 (Potential Impacts), are temporary in nature and are not considered to be significant in their own right, given their relatively short duration. However, it should be acknowledged that the significant impacts identified for the operational phase would commence during the construction phase.

Operational Phase

11.6.2 The residual impacts of the proposed scheme have been assessed taking into account the proposed landscape mitigation during winter year of opening and summer after 15 years. The impacts on each of the UCAs are detailed in Table 11.11. A Virtual Reality Model (VRM) was prepared for the project, showing the proposed scheme including detail such as cuttings, embankments and proposed planting. Stills from the VRM are included in Figures 11.5a–f together with photographs of the existing townscape for representative locations.

11.6.3 Visual receptors likely to be affected by the proposed scheme are identified on Figures 11.3. The visual impact assessment for building and outdoor receptors is presented together as tables with details of proposed mitigation measures in Appendix A11.2 (Built and Outdoor Receptor Assessment Tables). This information is summarised in Table 11.13 to show the total number of receptors affected to different degrees in the winter year of scheme opening and summer 15 years later.

Table 11.11: Residual Impacts on Urban Character Areas

UCA	Sensitivity	Description of Impacts (Direct or Indirect)	Winter, Year of Opening		Summary of Mitigation Proposals	Summer, 15 Years after Opening	
			Magnitude of Change	Significance		Magnitude of Change	Significance
North Middlefield UCA	Low to Medium	Direct Impacts from: • Disruption to townscape pattern/grain and residential character after demolition of tenement blocks and semi-detached properties. • Introduction of new dual carriageway and associated infrastructure (lighting, signage traffic signals etc.) and traffic. • Open and partial views of new link road and associated infrastructure. • Loss of central communal space and play park at Logie Gardens. • Loss of vegetation and public park space on Manor Terrace and Logie Terrace. • Significant earthworks including embankments and cuttings, particularly cuttings on access road connecting Manor Avenue. • SUDS detention basin with associated earthworks. • Introduction of noise barriers.	High	Substantial	• Avenue tree and hedge planting, amenity grass seeding including wide grass verges and bulb planting. • Tree groups, amenity grass seeding and bulb planting. • Park boundary trees and hedgerow planting. • Grading out of embankments and cuttings where practicable. • Earth mounding and false cuttings. • Climbing plants on noise barriers. • Species rich grass seed mix and tree and hedgerow planting in and around the SUDS basin. • Grass seeding of embankments and cuttings along the road corridor. • Hard landscape surfacing treatment on east facing slope on Logie Avenue. • Creation of new amenity open space areas to offset the loss of open space areas to the proposed scheme.	Medium to High	Moderate to Substantial
South Middlefield UCA	Medium	Direct Impacts from: • Introduction of a new wider road at Manor Avenue and the A90(T) North Anderson Drive. • Partial loss of private front gardens and boundary vegetation. Introduction of new access road from Manor Avenue. Indirect Impacts from: • Changes to views due to demolition in adjacent UCA. • Open and partial views of disruption to	Medium to High	Moderate to Substantial	• Avenue trees and hedgerow planting within adjacent North Middlefield UCA (open and partial visibility). • Individual tree groups within UCA and adjacent North Middlefield UCA (open and partial visibility). • Park boundary trees and hedgerow planting within adjacent North Middlefield UCA. • Earth mounding and false cuttings within adjacent North Middlefield UCA reduces visibility of new road and traffic. • Grading out of embankments and cuttings where possible both within UCA and within	Medium	Moderate

UCA	Sensitivity	Description of Impacts (Direct or Indirect)	Winter, Year of Opening		Summary of Mitigation Proposals	Summer, 15 Years after Opening	
			Magnitude of Change	Significance		Magnitude of Change	Significance
		townscape pattern and disruption to residential character. • Open and partial views along the new route and associated infrastructure. • Open and partial views of significant earthworks including embankments and cuttings particularly cuttings on the access road connecting Manor Avenue. • Open and partial views of noise barriers.			adjacent North Middlefield UCA. • Amenity grass and bulb planting amenity both within UCA and within adjacent North Middlefield UCA. • Climbing plants on noise barriers.		
Auchmill Road UCA	Medium	Direct Impacts from: • Partial temporary loss of adjacent footway. Indirect Impacts from: • Changes to views due to demolition in adjacent UCA. • Partial limited views of disruption to townscape pattern and disruption to residential character. • Partial and limited views of new route and associated infrastructure. • Partial and limited views of the SUDS detention basin.	Low to Medium	Slight to Moderate	• Avenue trees and hedgerow planting within adjacent North Middlefield UCA (open and partial visibility). • Individual tree groups within UCA and adjacent North Middlefield UCA (open and partial visibility). • Earth mounding and false cuttings within adjacent North Middlefield UCA reduces visibility of new road and traffic. • Grading out of embankments and cuttings where possible both within UCA and within adjacent North Middlefield UCA. • Species rich grass seed mix and tree and hedgerow planting in and around the SUDS basin within adjacent North Middlefield UCA. and • Amenity grass and bulb planting amenity both within UCA and within adjacent North Middlefield UCA.	Low	Slight
Great Northern Road UCA	Low	Indirect Impacts from: • Changes to views due to demolition in adjacent UCA. • Partial and limited views of new route and associated infrastructure. • Partial and limited views of the introduction of SUDS detention Basin.	Low	Slight	• Species rich grass seed mix and tree and hedgerow planting in and around the SUDS basin within nearby North Middlefield UCA.	Low	Negligible

UCA	Sensitivity	Description of Impacts (Direct or Indirect)	Winter, Year of Opening		Summary of Mitigation Proposals	Summer, 15 Years after Opening	
			Magnitude of Change	Significance		Magnitude of Change	Significance
		• Partial limited views of disruption to townscape pattern and disruption to residential character.					
Haudagain Commercial and Industrial UCA	Low	Indirect Impacts from: • Changes to views due to demolition in adjacent UCA. • Open and partial views of substantial demolition in adjacent UCA. • Open and partial views of disruption to townscape pattern and disruption to residential character. • Open and partial views of the introduction of SUDS detention basin. • Open and partial views of introduction of significant earthworks including embankments and cuttings. • Partial distant views of noise barriers.	Low to Medium	Slight	• Avenue trees and hedgerow planting within adjacent North Middlefield UCA (open and partial visibility). • Individual tree groups within UCA and adjacent North Middlefield UCA (open and partial visibility). • Earth mounding and false cuttings within adjacent North Middlefield UCA reduces visibility of new road and traffic. • Grading out of embankments and cuttings where possible both within UCA and within adjacent North Middlefield UCA. • Species rich grass seed mix and tree and hedgerow planting in and around the SUDS basin within adjacent North Middlefield UCA. • Amenity grass and bulb planting amenity both within UCA and within adjacent North Middlefield UCA. • Climbing plants on noise barriers.	Low	Negligible

Summary of Residual Townscape Impacts

11.6.4 Five UCAs were identified within the study area.

11.6.5 North Middlefield UCA would experience the greatest impact as the majority of the proposed scheme and all of the associated demolition would be located within this UCA. Although the sensitivity of this UCA is only assessed as being low to medium, the magnitude of change would be high and the impact Substantial in winter year of opening, reducing to Moderate to Substantial in summer 15 years after opening, when mitigation planting would have become established.

11.6.6 Although the physical impact of the proposed scheme on South Middlefield UCA would be limited, the setting of this area would be affected by changes to views and Moderate to Substantial impact would occur in winter year of opening, reducing to Moderate by summer 15 years after opening.

11.6.7 None of the remaining three UCAs would experience significant impact in either winter year of opening or summer after 15 years. Impacts would reduce over time in all three UCAs as planting becomes established.

Visual

11.6.8 Visual receptors likely to be affected by the proposed scheme are identified on Figure 11.3.

11.6.9 The visual impact assessment for each receptor group is presented together with details of proposed mitigation measures in Appendix A11.2 (Built and Outdoor Receptor Assessment Tables). This information is summarised in Table 11.12 to show the total number of receptors affected to different degrees in the winter year of scheme opening and residual impact by summer 15 years later. It was not considered practicable within an urban residential location to provide photographs from the identified visual receptors. Photographs have been taken from representative locations to indicate the nature of existing views as shown in Figures 11.1a-f.

Built Receptors

11.6.10 The most significantly affected built receptors would be within the Logie area of Middlefield residential area in close proximity to the proposed scheme.

11.6.11 Receptor group 32 is located in the Logie area of Middlefield and comprises of a group of three storey tenement blocks. This receptor group would overlook the proposed scheme in very close proximity. Views would be gained from all floor levels and would include the new dual carriageway link road, local access roads, noise barriers and the SUDS detention basin. Receptor group 18 lies at the junction between Manor Avenue and the A90(T) North Anderson Drive. Mitigation potential for this receptor is limited due to its elevated position and close proximity to the road. Whilst new avenue trees and hedge planting along the dual carriageway link road would reduce visual impact over time to some extent, Substantial impact occurring in winter year of opening would remain substantial in summer after 15 years for both receptor groups.

11.6.12 A number of receptors identified as experiencing Substantial visual impacts in winter year of opening would see a reduction in impacts in summer 15 after years due to screening and softening of views provided by the proposed tree and hedgerow planting and greening up of noise barriers, earthworks and mounding.

11.6.13 Receptor group 17 (properties on the south side of Manor Avenue) would experience open views of the new link road junction with the A90 and views north would be opened up through demolition of properties to the north and north-west. Views of the new dual carriageway link road and noise barriers to the north-west would also be gained due to the receptor group's elevated location. Avenue tree and hedgerow planting, climbing plants and the earth mounding would assist in partially screening and softening views. As a result the impact would reduce to Moderate to Substantial in summer 15 years after opening.

11.6.14 Receptor groups 34, 12 and 13 are located to the south-west of the proposed dual carriageway link road and would be affected by Substantial impact in winter year of opening. These receptor groups would benefit to some extent by buffering provided by the proposed earth mounding. For all three receptor groups the impacts would reduce to Moderate to Substantial by summer 15 years after opening when tree and hedge planting has become fully established. Receptor 13 is a three storey tenement with a view over the proposed junction of the link road and the diverted section of Manor Avenue. However, it would be set back slightly from the proposed scheme with a planted buffer to the north.

11.6.15 To the east, receptor groups 25, 27 and 30 which comprise two and three storey blocks, would be set back slightly from the new dual carriageway link road but close to the realigned local access roads. These receptors would be affected by Substantial impact in winter year of opening. The slight set back enables these properties to benefit from screening provided by the proposed tree and hedgerow planting, proposed noise barriers with climbing plants and the proposed earth mounding so the impact would reduce to Moderate to Substantial by summer after 15 years.

11.6.16 Receptor groups 3, 8, 16, 26 and 29 would also experience Moderate to Substantial visual impacts in winter year of opening. These receptors would gain views in relatively close proximity. Views in winter year of opening would be partial and filtered due to a combination of acute angles of view, screening provided by intervening properties or intervening existing vegetation. By summer 15 years the screening and softening impacts of the proposed tree and hedge planting would reduce impacts to Moderate.

11.6.17 Receptor groups 1, 4, 6 and 10 would all experience Moderate visual impact in winter year of opening reducing to Slight to Moderate in summer after 15 years. All of these receptors are located to the west of the proposed scheme and would gain partial or filtered views of it due to intervening buildings or structures. These receptor groups would benefit from the establishment of the proposed planting including avenue trees and hedges, park boundary planting and individual tree planting.

11.6.18 The remaining 25 visual built receptor groups would not be significantly affected by the proposed

scheme, with impacts ranging from Slight to Slight to Moderate in winter year of opening and reducing to between Negligible and Slight by summer after 15 years.

Outdoor Receptors

11.6.19 Six out of the seven identified outdoor visual receptors (O2 to O7) are existing roads with associated footways. The other (O1) is a park between Logie Terrace and Manor Terrace, the south-easterly corner of which would be physically affected by the proposed scheme.

11.6.20 The diverted section of Manor Avenue would require removal of mature trees and shrubs along the southern and south-eastern boundary of the park and the remaining area of park would be affected by Substantial adverse visual impact winter year of opening. Mitigation measures include restoration of the park including new boundary tree and hedge planting and by summer 15 years the visual impact would reduce to Moderate.

11.6.21 Two of the local roads with footpaths would experience Moderate to Substantial impacts in winter year of opening, Manor Avenue (east end) and Logie Place, receptors O2 (the eastern section of Manor Avenue) and O3 (the western section of Logie Place). Both of these roads are to be made into cul de sacs as part of the proposed works and both would experience open views of the proposed scheme. The introduction and establishment of tree and hedgerow planting would assist in visually integrating the proposed scheme and filtering views to the new sections of dual carriageway, access roads and associated earthworks. With these mitigation measures in place, impacts would reduce to Moderate summer after 15 years.

11.6.22 Receptor O4 (Manor Drive) would experience Moderate visual impact in winter year of opening. This route would remain intact apart from the northerly extents where its junction with the A96(T) Auchmill Road would be stopped up. Partial screening provided by the proposed tree groups and the avenue tree and hedge planting would assist in reducing the visual impact through the provision of partial screening, filtering and softening views and providing general landscape/townscape enhancement. By summer 15 years impacts would reduce to Slight.

11.6.23 The A90(T) North Anderson Drive south of Haudagain Roundabout (receptor O5), the A96(T) Auchmill Road west of Haudagain Roundabout (receptor O6), and the western section of Manor Avenue (receptor O7) would experience Slight visual impacts from the introduction of the proposed scheme. Views of the proposed scheme from all of these receptors are limited to junction locations apart from the A96 which would have views of the SUDS detention basin. The establishment of new planting along the proposed carriageways and at junctions and surrounding the SUDS detention basin, would assist in integrating the proposed scheme into the townscape. As a result of the proposed planting, the visual impact would be Negligible by summer after 15 years.

Table 11.12: Residual Visual Impacts

- Total Built Receptors (as receptor groups) = 43
- Total Outdoor Receptors = 7
- A single Built Receptor may comprise multiple properties.

Impact Significance/ Receptor Type		Winter Year of Opening	Summer 15 Years after Opening
Substantial	**Built**	9	2
	Outdoor	1	0
Moderate/Substantial	**Built**	5	7
	Outdoor	2	0
Moderate	**Built**	4	5
	Outdoor	1	3
Slight/Moderate	**Built**	11	4
	Outdoor	0	0
Slight	**Built**	12	11
	Outdoor	3	1

Negligible/Slight	**Built**	2	9
	Outdoor	0	0
Negligible	**Built**	0	5
	Outdoor	0	3

Summary of Residual Visual Impacts

11.6.24 The proposed scheme would have a visual impact on a total of 43 built receptor groups and seven outdoor receptors (a public park and six stretches of existing road with associated footways). Of the built receptor groups, in the winter year of opening 18 would experience significant (Moderate or greater) visual impacts. By summer 15 years after opening, 14 would be affected by significant impact (five Moderate, seven Moderate to Substantial and two Substantial). Of the outdoor receptors, in the winter year of opening four (the park between Logie Terrace and Manor Terrace and sections of Manor Avenue, Logie Place and Manor Drive) would be affected by significant (Moderate) impact, reducing to three in the summer 15 years after opening.

View from the Road

A90

11.6.25 Views from the A90 in the vicinity of the proposed scheme would remain largely unchanged, for the majority of the A90 to the south of Manor Avenue junction. The main change to views from the A90 would be in the vicinity of the new junction at Manor Avenue linking the A90 to the proposed dual carriageway link road. Due to the demolition of the properties at Manor Avenue and loss of roadside vegetation, more open views looking north towards the distant rural landscape would be available over the roof tops of the remaining intervening properties. With landscape mitigation in place, views of the remaining intervening properties would be partially screened by the proposed roadside planting as it matures. Views south would be restricted by cutting slopes, rising landform (including landscape earthworks) and existing buildings, with roadside tree and hedge planting becoming more prominent over time.

A96

11.6.26 Views north, east and west from the A96 in the vicinity of the proposed scheme would remain largely unchanged. However the view to the south from the stretch of road east of the existing junction with Manor Avenue would change due to the proposed scheme. Here the view would open up due to the demolition of the three storey tenement blocks adjacent to the A96, on Manor Drive and on the western end of Logie Avenue. The proposed dual carriageway link road and the SUDS detention basin with surrounding mitigation planting would be visible, however the remaining tenement blocks located off Logie Avenue would curtail potential longer distance of the proposed scheme views to the south. The proposed boundary hedgerow planting and tree planting around the SUDS basin would filter views over the SUDS basin and housing beyond to the south. Further east towards Haudagain Roundabout, views south from the A96 would remain largely unchanged.

Manor Avenue

11.6.27 The proposed scheme would alter the current alignment of Manor Avenue by stopping it up close to its junction with the A90 North Anderson Drive, and adding a new junction with a new section of local road joining to the proposed link road. As a result of the demolition of properties on the north side of Manor Avenue, the views east from the stopped up section of road would become more open in character, across the new section of dual carriageway close to its junction with the A90. New tree and hedge planting would ‘soften’ these views. There would also be longer, more open views to the north across the new link road to remaining tenement flats on Logie Avenue and to the rural landscape beyond, again ‘softened’ by mitigation planting. Views north and south from the section of road between the new turning head and the junction to the west would remain largely unchanged.

11.6.28 Views along the new section of road running north-east from Manor Avenue to the main dual carriageway junction would be partially contained by cuttings, noise barriers, new hedge and tree planting, with tenement flats on Logie Avenue in the middle distance and the wooded and agricultural landscape across the Dee valley to the north-east. Views south-west along this stretch of road would be uphill with the road itself and flanking planting prominent with residential development beyond.

Manor Drive

11.6.29 Views north and south from the southern part of Manor Drive would remain largely as existing and on approach to the A96 junction. Views to the east and north would open up with the demolition of tenements along Logie Avenue and the A96(T) Auchmill Road. Open views north and north-east would be gained over the proposed new link road, the new junction with the A96 and the SUDS detention basin. Planting proposed along the dual carriageway and around the SUDS basin would filter views, but more distant views to the north would be gained from the higher ground further south along Manor Drive.

Logie Place and Logie Terrace

11.6.30 Logie Place and Logie Terrace would both be stopped up and would gain open views of the proposed scheme and associated landscape mitigation from the new turning heads. Elsewhere their views would largely remain the same. Logie Avenue would be stopped up at its north-western and south-eastern ends with a new access road from the link road in-between. Views to the north and east would remain similar to those existing, with tenements close to the road. Views to the south and west would open up towards the new link road and the proposed junction but landscape mounding and planting would provide partial screening.

Proposed Link Road

11.6.31 Views out from the proposed link road would be defined by roadside avenue trees and hedge planting. Longer views would be restricted to the south and west by the existing nearby housing and rising landform. Proposed roadside planting and mounding to the south-west of the road would further limit views. Views to the north and north-east partially restricted by the proposed noise barriers with planting but generally would be more distant, beyond the nearby tenements to the rural landscape north of the Dee beyond.

11.6.32 Overall the views from the new road would be interesting and varied, particularly the link road, which, due to its curvature would provide travellers with an 'unfolding' vista, softened by roadside planting.

11.7 References

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12 Cultural Heritage

This chapter presents an assessment of the potential impacts of the proposed scheme on cultural heritage assets comprising archaeological remains, historic buildings and historic landscape types. It outlines measures for mitigating these impacts and describes any residual impacts that may occur with mitigation in place.

The study area was defined as the proposed scheme footprint plus a 200m buffer around it. The baseline conditions were established through consultation, desk-based assessment and site survey. These studies identified 22 archaeological remains, 11 historic buildings, and nine historic landscape types, mainly dating from the post-medieval period onwards.

To mitigate the impact on Asset 42 and 43 archaeological trial trenching is proposed, followed if required by mitigation in the form of archaeological recording. Where this is not practicable an alternative strategy (for example an archaeological watching brief) may be required.

With the implementation of proposed mitigation, no significant residual impacts are predicted. The significance of residual impact due to construction is predicted to be Slight for two assets and Neutral for two assets, with no residual impact on the remaining 32 assets. The significance of residual impact during operation is predicted to be Slight for one asset and Neutral for two assets, with no residual impact predicted on the remaining 33 assets.

12.1 Introduction

12.1.1 This chapter presents the assessment of the impact of the proposed scheme on cultural heritage. This includes archaeological remains, historic buildings and the historic landscape

12.1.2 This chapter is supported by Appendix A12.1 (Gazetteer), which is cross-referenced in the text where relevant.

12.1.3 The assessment was undertaken based on the guidance provided in DMRB Volume 11, Section 3, Part 2 Cultural Heritage (HA208/07) (Highways Agency et al., 2007). The chapter considers the impacts of the proposed scheme on cultural heritage under the three sub-topics of 'Archaeological Remains', 'Historic Buildings' and 'Historic Landscape Types'. Simple Assessments (as defined in Chapter 5 of HA208/07) were undertaken for all three sub-topics.

12.1.4 This chapter considers permanent operational and temporary construction impacts of the proposed scheme.

12.1.5 An assessment of compliance with relevant policies and plans is presented in Chapter 17 (Policies and Plans).

12.2 Approach and Methods

Study Area

12.2.1 DMRB (HA208/07, paragraph 5.4.1, Annex 5) specifies that once route options have been identified the study area for impacts on archaeological remains should be assessed for an area extending for at least 200m in all directions from the scheme. For the purposes of this assessment, a study area extending 200m from the scheme was adopted for archaeological remains and also for the other two cultural heritage sub-topics.

12.2.2 Where construction or operation of the proposed scheme could affect the setting of designated cultural heritage assets outside the study area, these assets should be included in the baseline. However, no additional assets were identified.

Data Gathering

12.2.3 Data gathering was undertaken by a combination of desk-based assessment, walkover survey, and consultation.

Desk-based Assessment

12.2.4 To obtain information for the cultural heritage baseline, the following sources of information were consulted:

- The DMRB Stage 2 Assessment for the proposed scheme (Jacobs, 2014).
- Information on heritage assets recorded on CANMORE by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS).
- Historic Landuse Assessment (HLA) undertaken by RCAHMS.
- The Aberdeen City Council Sites and Monuments Record for information on undesignated heritage assets. Data from the SMR was provided by Aberdeen City Council.
- Aerial photographs held in the National Collection of Aerial Photography maintained by RCAHMS.
- Published documentary and photographic sources held in the search room of the RCAHMS.
- Historic mapping including Ordnance Survey and pre-Ordnance Survey mapping held in the map library of the National Library of Scotland, available through the Map images website http://maps.nls.uk.
- Discovery and Excavation in Scotland available online http://archaeologydataservice.ac.uk/archives/view/des.

Walkover Survey

12.2.5 A walkover survey of the DMRB Stage 2 options, including the preferred option, was undertaken in February 2014.

Consultation

12.2.6 Details of the consultation process are provided in Chapter 6 (Consultation and Scoping) with a summary of key issues raised through consultation provided in Appendix A6.2 (Summary of Consultation Responses). Consultations of particular relevance to this assessment included Historic Scotland and Aberdeen City Council.

12.2.7 Historic Scotland was consulted by letter in July 2014. Historic Scotland confirmed that there were no cultural heritage assets of national importance within the study area and therefore the proposal fell outside Historic Scotland's remit for EIA consultation.

12.2.8 In an email of 1 April 2015 Aberdeenshire Council Archaeology Service, in their role as archaeological advisors to Aberdeen City Council, stated that they were content with the mitigation proposed.

Legislative and Policy Context

12.2.9 In addition to DMRB guidance, other policy documents and published guidelines that were taken into account in the preparation of this chapter included:

- Scottish Planning Policy (Scottish Government, 2014);
- PAN 2/2011: Planning and Archaeology (Scottish Government, 2011);
- Scottish Historic Environment Policy (SHEP) (Historic Scotland, 2011);
- Managing Change in the Historic Environment: Setting (Historic Scotland, 2010);
- Standard and Guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2014);
- Aberdeen City and Shire Strategic Development Plan (2014); and

- The Aberdeen Local Development Plan (2012).

Legislation

12.2.10 Scheduled Monuments are by definition of national importance and are protected by law under the Ancient Monuments and Archaeological Areas Act 1979 (as amended by the Historic Environment (Amendment) (Scotland) Act 2011). Consequently, it is a criminal offence to damage a Scheduled Monument, and Scheduled Monument Consent must be obtained from the Scottish Ministers before any works affecting a Scheduled Monument may take place.

12.2.11 Listed Buildings are protected under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended by the Historic Environment (Amendment) (Scotland) Act 2011), and are recognised to be of special architectural or historic interest. Under the Act, planning authorities are instructed to have special regard to the desirability of preserving a Listed Building, its setting, or any features of special architectural or historic interest which it possesses (Planning (Listed Buildings and Conservation Areas) Act, Section 66(1)). Designation as a Listed Building confers additional controls over demolition and alteration through the requirement for Listed Building Consent to be gained before undertaking alteration or demolition.

12.2.12 The Town and Country Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (as amended by the Historic Environment (Amendment) (Scotland) Act 2011) imposes a duty on local planning authorities to designate and protect *"areas of special architectural or historic interest the appearance or character of which it is desirable to preserve or enhance"* as Conservation Areas. Designation provides control over demolition of unlisted buildings through the requirement for Conservation Area Consent, limit permitted development rights, and provides the basis for planning policies to further preserve and enhance the area's special character.

12.2.13 The Historic Environment (Amendment) Scotland Act (2011) made it a statutory duty for Historic Scotland to compile and maintain an Inventory of Gardens and Designed Landscapes on behalf of Scottish Ministers. Under the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008, local authorities are required to consult Historic Scotland on development proposals considered to affect an Inventory Garden or Designed Landscape.

12.2.14 The Scottish Minister's policies for gardens and designed landscapes are set out in Scottish Historic Environment Policy (SHEP) (Historic Scotland, 2011).

Planning Policy

12.2.15 Paragraphs 135-151 of the Scottish Planning Policy (SPP), (Scottish Government, 2014) deal with the historic environment, which is defined to include ancient monuments; archaeological sites and landscape; historic buildings; townscapes; parks; gardens and designed landscapes; and other features. When significant elements of the historic environment are likely to be affected by development proposals, developers are required by the SPP to take the preservation of this significance into account in their proposals (SPP Paragraph 142).

12.2.16 Paragraph 141 of the SPP states that with regard to Listed Buildings there is a presumption against demolition or other works that would adversely affect a Listed Building or its setting. With regards to Scheduled Monuments, paragraph 145 states that development which would have an adverse impact on a Scheduled Monument or the integrity of its setting should not be permitted unless there are exceptional circumstances. Change to Gardens and Designed Landscapes is controlled under Paragraph 148, which states significant elements of these assets which justify the designation are protected or enhanced.

12.2.17 Paragraph 150 states that archaeological sites and monuments are a finite and non-renewable resource and that they should be protected and preserved in situ wherever feasible. If preservation in situ is not feasible then developers are required to undertake excavation, recording, analysis and publication. It further states that if archaeological discoveries are made during any development, a professional archaeologist should be given access to inspect and record them.

12.2.18 The SHEP document sets out Scottish Ministers' policies for the historic environment and provides a framework for management of the historic environment. The SHEP is relevant to the statutory planning, EIA and Strategic Environmental Assessment (SEA) process. It sets out the Scottish Ministers' policies on the designation of ancient monuments through scheduling, buildings and other structures through listing and the designation of Conservation Areas, Historic Marine Protected Areas, Gardens and Designed Landscapes and Historic Battlefields. It details the system of controls for works directly affecting designated assets through the requirement for consents from the Scottish Ministers, and the management of Historic Marine Protected Areas. It also provides guidance to planning authorities on planning applications affecting sites on the Inventory of Gardens and Designed Landscapes and the Inventory of Battlefields.

12.2.19 Planning Advice Note (PAN) 2/2011: Planning and Archaeology (Scottish Government, 2011), provides advice on archaeological remains within the planning process. The PAN sets out the requirement to protect archaeological remains in a manner which is proportionate to the relative value of the remains and of the developments under consideration.

Assessment of Sensitivity/Value

12.2.20 Based on the guidance provided by DMRB, cultural heritage was considered under the sub-topics of 'Archaeological Remains', 'Historic Buildings' and 'Historic Landscape Types'. For all three sub-topics, an assessment of the sensitivity ('value') of each heritage asset was undertaken on a six-point scale of Very High, High, Medium, Low, Negligible and Unknown, based on professional judgement, guided by the criteria provided in DMRB and presented in Tables 12.1 to 12.3.

Table 12.1: Criteria to Assess the Value of Archaeological Remains

Value	Criteria
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.
Unknown	The importance of the asset been ascertained.

Table 12.2: Criteria to Assess the Value of Historic Buildings

Value	Criteria
Very High	Structures inscribed as of universal importance as World Heritage Sites. Other buildings of recognised international importance.
High	Scheduled Monuments with standing remains. Category A Listed Buildings. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the category. Conservation Areas containing very important buildings. Undesignated structures of clear national importance.
Medium	Category B Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. Conservation Areas containing buildings which contribute significantly to their historic character. Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Low	Category C Listed Buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g.

Value	Criteria
	including street furniture and other structures).
Negligible	Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Table 12.3: Criteria to Assess the Value of Historic Landscape Types

Value	Criteria
Very High	World Heritage Sites inscribed for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factors.
High	Designated historic landscapes of outstanding interest. Undesignated landscapes of outstanding interest. Undesignated landscapes of high quality and importance, and of demonstrable national value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factors.
Medium	Designated special historic landscapes. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factors.
Low	Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes with value limited by poor preservation and/or poor survival of contextual associations.
Negligible	Landscapes with little or no significant historical interest.

Effects on Setting

12.2.21 In accordance with the guidance provided by Managing Change in the Historic Environment: Setting (Historic Scotland, 2010), a three-stage process was undertaken to assess the effect of the proposed scheme on the setting of historic assets:

- Stage 1: Designated and undesignated heritage assets that might be affected by the proposed scheme were identified. The potential for impacts on designated assets in the wider landscape due to potential intervisibility with the proposed scheme was also determined through desk-based review, a walkover survey and consultation, as noted in paragraphs 12.2.4, 12.2.5, 12.2.7 and 12.2.8 above.
- Stage 2: The setting of all baseline heritage assets was defined by establishing how the surroundings contribute to the ways in which the asset is understood, appreciated and experienced.
- Stage 3: The way in which the proposed development would impact upon setting was then assessed for all baseline assets.

Impact Magnitude

12.2.22 Magnitude of impact is the degree of change that would be experienced by an asset as a result of the proposed scheme, as compared with a 'do nothing' situation. Magnitude of impact is assessed without reference to the value of the receptor, and may include physical impacts upon the asset, or impacts upon its setting or amenity value.

12.2.23 Assessment of magnitude with and without mitigation was based on professional judgement informed by DMRB methodology and criteria for archaeological remains, historic buildings and historic landscape types, set out in Tables 12.4 to 12.6. Unless otherwise stated, all impacts are adverse.

Table 12.4: Defining Magnitude of Impact for Archaeological Remains

Magnitude	Criteria
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting.
Negligible	Very minor changes to archaeological materials, or setting.
No Change	No change.

Table 12.5: Defining Magnitude of Impact for Historic Buildings

Magnitude	Criteria
Major	Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting.
Moderate	Change to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified.
Minor	Change to key historic building elements, such that the asset is slightly different. Change to the setting of an historic building, such that it is noticeably changed.
Negligible	Slight changes to historic building elements or setting that hardly affect it.
No Change	No change to fabric or setting.

Table 12.6: Defining Magnitude of Impact for Historic Landscape Types

Magnitude	Criteria
Major	Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.
Minor	Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality, slight changes to use or access; resulting in limited changes to historic landscape character.
Negligible	Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality, very slight changes to use or access; resulting in a very small change to historic landscape character.
No Change	No change to elements, parcels or components, no visual or audible changes, no changes arising from amenity or community factors.

Impact Significance

12.2.24 For all three sub-topics, the significance of impact with and without mitigation was determined as a combination of the value of the asset and the magnitude of impact. This is achieved using professional judgement informed by the matrix illustrated below in Table 12.7. Five levels of significance of impact are defined which apply equally to adverse and beneficial impacts.

Table 12.7: Significance of Impacts Matrix

Magnitude / Value	No Change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Moderate or Slight	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Limitations to Assessment

12.2.25 This assessment has been prepared based on the results of desk-based research and walkover surveys only. No non-intrusive or intrusive archaeological investigations have been undertaken.

12.3 Baseline Conditions

12.3.1 This section describes the baseline conditions under the three sub-topics of Archaeological Remains, Historic Buildings and Historic Landscape Types. Additional information in support of this chapter is presented in Appendix A12.1 (Gazetteer). Please note the asset numbers have been retained from the DMRB Stage 2 assessment.

Archaeological Remains

12.3.2 A total of 22 archaeological remains have been identified within the study area. These are shown on Figure 12.1 and presented in Table 12.8.

Table 12.8: Known Archaeological Remains in the Study Area

Asset Number	Asset Name	Designation	Value
25	Woodside House Building (Site of)	None	Low
26	Mugiemoss Road Stone (1) (Site of)	None	Negligible
27	Persley Station (Site of)	None	Low
28	Mugiemoss Road Stone (2) (Site of)	None	Negligible
29	The Colwyn, 868 Great Northern Road (Site of)	None	Negligible
38	Aberdeenshire Canal (Site of)	None	Low
39	Heathryfold Farmhouse (2) (Site of)	None	Low
40	Heathryfold Farmstead (1) (Site of)	None	Low
41	Denhead Gas Works (Site of)	None	Low
42	Middlefield Buildings (1) (Site of)	None	Low
43	Middlefield Buildings (2) (Site of)	None	Low
45	Upper Middlefield Boundary Stone 10 (Site of)	None	Negligible
46	Upper Middlefield Boundary Stone 11 (Site of)	None	Negligible
47	Great Northern Road Inn (Site of)	None	Low
49	Woodside Spearhead Findspot	None	Negligible
55	Middlefield Boundary Stone 9 (Site of)	None	Negligible
56	Middlefield Boundary Stone 7 (Site of)	None	Negligible
57	Middlefield Boundary Stone 8 (Site of)	None	Negligible
59	Middlefield Boundary Stone 6 (Site of)	None	Negligible
60	Smithfield Farmstead (Site of)	None	Low
62	Upper Middlefield Private Lunatic Asylum (Site	None	Low

Asset Number	Asset Name	Designation	Value
	of)		
66	Gatelodge to Woodside House (Site of)	None	Low

12.3.3 A total of 12 assets have been assessed to be of low value.

- Woodside House Building (Site of), Middlefield Buildings (1) (Site of), Middlefield Buildings (2) (Site of), Great Northern Road Inn (Site of) and Gatelodge to Woodside House (Site of) (Assets 25, 42, 43, 47 and 66 respectively) are the sites of buildings of post-medieval date identified by historic mapping and removed by later development. While remains of these assets would contribute to our understanding of the history of the local area, it is unlikely that any remains survive and those that do are likely to be severely truncated. Assets of this date and type are also not rare. In consideration of this, these assets have been assessed to be of low value.
- Three assets are associated with farming. Heathryfold Farmstead (1 and 2) (Sites of) (Assets 39 and 40) and Smithfield Farmstead (Site of) (Asset 60) are the sites of farmsteads identified by historic mapping and removed by later development. While remains of these assets would contribute to our understanding of the history of the local area, it is unlikely that any remains survive and those that do are likely to be severely truncated. Assets of this date and type are also not rare. In consideration of this, these assets have been assessed to be of low value.
- Two assets are associated with the development of transportation within the study area and appear to have been removed by later development. Asset 38 is the route of the Aberdeenshire Canal; the Aberdeenshire Canal was operational between 1805 and 1854 and ran from Waterloo Quay to Port Elphinstone. In 1854 the canal was bought by the Great North of Scotland Railway and much of the route was redeveloped for the railway line. Asset 27 is the site of Persley Station that opened in 1903 on the Great North of Scotland Railway and closed in 1955. Remains associated with these assets may survive but those that do are likely to be severely truncated. Any additional contribution to our understanding of 19th century transportation is likely to be limited. Assets of this date and type are also not rare. Two archaeological evaluations targeted on the possible site of the canal (Clements 2006, Murray 2006) failed to identify any remains associated with the canal in consideration of this and the intense redevelopment of the sites of these assets, these assets have been assessed to be of low value.
- One asset is associated with industry. Denhead Gasworks (Site of) (Asset 41) is depicted on the 1st and 2nd editions of the OS 6-inch map. It was still visible on an aerial photograph taken in 1961, Library reference A0081, frame number 0186. The site of this asset has been redeveloped as a caravan park. Assets of this type are not particularly rare and while archaeological remains may survive, it is likely that redevelopment would have removed or truncated archaeological remains associated with it. As such, this asset has been assessed to be of low value.
- One asset is associated with health care and has been removed by later development. Upper Middlefield Private Lunatic Asylum (Site of) (Asset 62) is depicted on both the 1st and 2nd editions of the OS 6-inch map. However, it is not annotated as an asylum on the 2nd edition map. By the time of the Ordnance Survey 1937 1:25,000 map the Asylum is no longer depicted and the area has been developed for residential housing. However, it is possible that some remains survive under the back-greens of the flats on Newton Road. While this asset could contribute to our understanding of 19th century health care, it is likely that any remains associated with it that do survive are likely to be severely disturbed. The value of this asset has been assessed to be low.

12.3.4 Ten assets have been assessed to be of negligible value. Woodside Spearhead Findspot (Asset 49) is the generic national grid reference given for the location of the discovery of a bronze spearhead that was sold at auction in 1898 (present whereabouts unknown). While a tentative indication of prehistoric activity in the study area, in consideration of its limited potential to increase our knowledge of the prehistoric activity in the study area this asset has been assessed to be of negligible value. The remaining nine assets (Assets 26, 28, 29, 45, 46, 55, 56, 57 and 59) are also

of negligible value. They comprise boundary stones either washed away by the River Don or removed in subsequent building developments and The Colwyn, 868 Great Northern Road (Site of) (Asset 29) which was depicted on both the 1st and 2nd edition Ordnance Survey 6" to the mile map. While this was formerly designated as a Category B Listed Building following a building survey, it was demolished in 2006 under listed building consent (Application No. 080096).

Potential for Unknown Archaeological Remains

12.3.5 The urban nature of the study area and its widespread and continuing development has led to the likely truncation of archaeological remains as is evidenced by the two archaeological evaluations undertaken within the study area. Both of the evaluations were targeted on the possible route of the Aberdeenshire Canal (Asset 38) and while modern services were encountered, no remains of archaeological value were identified (Clements 2006, Murray 2006). The potential for unknown archaeological remains within the study area has therefore been assessed to be low.

Historic Buildings

12.3.6 Based on the results of the desk-based survey, primarily data gathered from the RCAHMS and Aberdeen City Council SMR and the site inspection, a total of 11 historic buildings have been identified within the study area. These are shown on Figure 12.1, listed below in Table 12.9 and further information is provided in Appendix A12.1 (Gazetteer). There are no Listed Buildings or Conservation Areas within the study area, Listed Buildings out with the study area are shown on Figure 12.1.

Table 12.9: Historic Buildings in the Study Area

Asset Number	Asset Name	Designation	Value
19	Boundary Marker 49	None	Negligible
20	Persley Bridge Pillbox	None	Low
23	Grove Cemetery Lodge	None	Negligible
24	Woodside House, Walled Garden	None	Low
30	Fullerton Court	None	Low
31	Great Northern Road 'A' Phase 2	None	Low
32	Murray Court	None	Low
44	Middlefield Cottage	None	Low
48	Denhead Gas Works Boundary Walls	None	Low
54	Middlefield Parish Church and Church Hall	None	Low
58	Smithfield Court	None	Low

12.3.7 Nine of these eleven assets have been assessed to be of low value.

- Woodside House, Walled Garden (Asset 24) comprises a walled garden, which was probably originally part of Woodside House Garden. In consideration of the evidence that it provides for 18th and 19th century horticultural practices this asset has been assessed to be of low value.
- Three assets Fullerton Court, Great Northern Road 'A' Phase 2 and Murray Court (Assets 30, 31 & 32) comprise social housing built during the mid to late 20th century. While buildings of this type contribute to our understanding of social housing during this period, they are not rare and unusual. As such, they have been assessed to be low value.
- Persley Bridge Pillbox (Asset 20) is associated with defensive works for Persley Bridge during World War II. Due to its historical association with the war this asset has been assessed to be of low value.
- Middlefield Cottage (Asset 44) is a cottage depicted on the 1st edition OS 6-inch map. In consideration of the evidence that it provides for 19th century vernacular architecture this asset have been assessed to be of low value.

- Denhead Gas Works Boundary Walls (Asset 48) comprises the surviving remains of walls associated with Denhead Gas Works. This asset is of historic and architectural interest as evidence of the development of 19th century industry. It has been assessed to be of low value.
- Middlefield Parish Church and Church Hall (Asset 54) were constructed in the mid to late 20th century. They provide a modest example of late 20th century religious architecture and as such both assets have been assessed to be of low value.
- Smithfield Court (Asset 58) is a ten-storey tower block built in the early 1970's as a public housing development in Middlefield for Aberdeen Borough Council. The block contains 58 dwellings. While buildings of this type contribute to our understanding of social housing during this period, they are not rare and unusual. As such, this asset has been assessed to be low value.

12.3.8 Two of the eleven assets have been assessed to be of negligible value.

- Grove Cemetery Lodge (Asset 23) is the gate lodge to Grove Cemetery which was established in 1989. This asset has been assessed to be of negligible value.
- Boundary Marker 49 (Asset 19) is a boundary marker that is a modern replacement for an original that stood at the confluence of the Scatterburn and River Don. This site has been assessed to be of negligible value.

Historic Landscape Types

12.3.9 A total of nine historic landscape types (HLT) have been identified within the study area. These are shown on Figure 12.2 and listed in Table 12.10, and discussed below.

Table 12.10: Historic Landscape Types in the Study Area

Historic Landscape	Historic Landscape Type Name	Designation	Value
HLT 1	Designed Landscape,17th-19th Century Policies and Parkland	None	Medium
HLT 2	18th Century-Present Cemetery	None	Low
HLT 3	Recreation Area, 20th Century-Present, Allotments and Sports Fields	None	Negligible
HLT 4	Built-up Area, Late 20th Century	None	Negligible
HLT 5	Built-up Area, Mid to Late 20th Century	None	Negligible
HLT 6	Late 20th Century-Present Woodland Plantation	None	Negligible
HLT 7	19th Century-Present Industrial and Commercial Area, Commercial Units	None	Negligible
HLT 8	19th Century-Present Railway	None	Negligible
HLT 9	20th Century to Present Industrial and Commercial Area, Industrial Estate	None	Negligible

12.3.10 The Designed Landscape, 17th-19th Century Policies and Parkland type (HLT 1) comprise elements of woodland and parkland associated with Woodside House, built in 1769 and extended from 1840 to 1850. This type is characterised by tree lined avenues and footpaths and includes the formal walled garden (Asset 24). Views to the north are restricted by the mature planting along the edge of the River Don. Views to the south are somewhat restricted by the tree lined avenues and the land as it rises towards the A96 Great Northern Road. In consideration of its historic interest as part of a designed landscape, this asset has been assessed to be of medium sensitivity.

12.3.11 HLT 2, 18th Century-Present Cemetery type, has been assessed to be of low value; this type of historic landscape is characterised by the formal and ordered regular layout of the burial plots. There are good views to the north of Persley Bridge with views to the south restricted by the land as it rises towards the A96 Great Northern Road. This HLT has some historic legibility and interest and has been assessed to be of low value.

12.3.12 A total of seven HLTs have been assessed to be of negligible value.

- HLT 6, Late 20th Century-Present Woodland Plantation is to be found to the north-west of the study area and comprises an area of shrub planting that borders a golf course and is crossed by paths both formally and informally created and used as a public amenity area. In consideration of its limited time depth and lack of rarity this type has been assessed to be of negligible value.
- To the south of the study area is Built-up Area, Mid to Late 20th Century (HLT 5) comprising pre and post war developments of housing units usually comprising blocks of four flats over two storeys. Developed in the middle of the 20th century as affordable public housing stock, the main characteristics of this type are the restricted views afforded from the properties and the uniformity of the design. The second type; Built-up Area Late 20th Century, comprises late 20th Century (HLT 4) housing units of both detached and semi-detached houses and blocks of flats of both public and private stock. The main characteristics of this type are the restricted views afforded from the properties and the uniformity of the design of the units. In consideration of their limited time depth and lack of rarity these types have been assessed to be of negligible value.
- One area of HLT 3, Recreation Area, 20th Century-Present, Allotments and Sports Fields is located within the west of the study area. Its main characteristics are a series of allotments, bounded to the east by the pitch and associated buildings of Sunnybank FC and to the south by playing fields and parkland. All round views are dominated by housing. In consideration of its limited time depth and lack of rarity this type has been assessed to be of negligible value.
- 19th Century-Present Industrial and Commercial Area (HLT 7): One area of this type has been identified in the north of the study area. Strung out along the A96 Great Northern Road and A90(T) Mugiemoss Road are a series of commercial units. The main characteristics of this type are the restricted views afforded from the units, the uniformity of construction material (predominately brick) and the frontage of the units onto A96 Great Northern and A90(T) Mugiemoss Road. In consideration of its limited time depth and lack of rarity this type has been assessed to be of negligible value.
- The 19th Century-Present Railway (HLT 8) was originally depicted on the 1st edition Ordnance Survey 6" to the mile map annotated as the Great North of Scotland Railway and is now known as the Aberdeen to Inverness railway line. This type is characterised by the linear nature of its form. In consideration of its limited time depth and lack of rarity, this type has been assessed to be of negligible value.
- The 20th Century to Present Industrial and Commercial Area, Industrial Estate (HLT 9): One area of this type has been identified in the northwest of the study area. West of HLT 2 and southwest of Persley Bridge and accessed via Mugiemoss Road are a series of commercial, factory and warehouse units. The main characteristics of this type are the restricted views afforded from the units, the uniformity of construction material (brick, galvanised sheets or a mixture of both). In consideration of its limited time depth and lack of rarity this type has been assessed to be of negligible value.

12.4 Potential Impacts

12.4.1 The tables at the end of each sub-topic assessment provide the overall number of assets potentially affected. Any potential impact (significant or non-significant) on an asset is discussed in full.

12.4.2 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to cultural heritage has been undertaken and is detailed in Appendix 17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Archaeological Remains

Construction

12.4.3 Potential significant construction impacts have been identified for two undesignated archaeological remains. These are described below in paragraphs 12.4.4 to 12.4.5.

Undesignated Archaeological Remains

12.4.4 Construction of the proposed scheme would have potential significant impacts on two undesignated archaeological remains, as listed in Table 12.11.

Table 12.11: Undesignated Archaeological Remains - Potential Significant Construction Impacts

Asset number	Asset name	Value	Potential Impacts	
			Magnitude	Significance
42	Middlefield Buildings (1) (Site of)	Low	Major	Moderate
43	Middlefield Buildings (2) (Site of)	Low	Major	Moderate

12.4.5 Construction of the proposed Sustainable Drainage System (SUDS) pond could remove any surviving remains associated with Assets 42 and 43. The value of Assets 42 and 43 has been assessed to be low, the impact has been assessed to be major magnitude and of Moderate significance.

12.4.6 The proposed works in the vicinity of Aberdeenshire Canal (Site of) (Asset 38) comprise the creation of a signalised junction and pedestrian and NMU crossing points on the existing A96(T) Auchmill Road. These works are not predicted to have an impact on any remains associated with the canal or railway that may survive under the A96 Great Northern Road.

Operation

12.4.7 No potential significant operational impacts have been identified for archaeological remains.

Summary of Potential Impacts – Archaeological Remains

12.4.8 Table 12.12 shows the significance of all potential impacts on Archaeological Remains.

Table 12.12: Summary of Potential Impacts on Archaeological Remains

Significance	Number of Assets	
	Construction	Operation
Large adverse	0	0
Moderate adverse	2	0
Slight adverse	0	0
Neutral	0	0
TOTAL	**2**	**0**

Historic Buildings

Construction

12.4.9 Construction noise and construction activity would result in a temporary intrusion into the setting of Middlefield Cottage (Asset 44). The impact on this asset has been assessed to be negligible magnitude and of Neutral significance.

Operation

12.4.10 Demolition of buildings for the construction of the proposed SUDS pond has the potential to open up views from Middlefield Cottage (Asset 44) to the new carriageway and A96 Great Northern Road. The magnitude of this potential impact has been assessed to be minor and the significance of impact has been assessed to be Slight.

12.4.11 The magnitude of the impact resulting from the presence of a new element of infrastructure in the setting of Middlefield Parish Church and Church Hall (Asset 54) during operation has been assessed to be negligible. The significance of impact has been assessed to be Neutral.

Summary of Potential Impacts - Historic Buildings

12.4.12 Table 12.13 shows the significance of all potential impacts on historic buildings.

Table 12.13: Summary of Potential Impacts on Historic Buildings

Significance	Number of Assets	
	Construction	Operation
Large adverse	0	0
Moderate adverse	0	0
Slight adverse	0	1
Neutral	1	1
TOTAL	**1**	**2**

Historic Landscape Types

Construction

12.4.13 Construction would result in changes to a small number of historic landscape elements as buildings are demolished. Construction would also result in slight visual changes to the Built-up Area Mid to Late 20th Century HLT (HLT 5). However, construction would not significantly impact on the historic legibility of this landscape type and as such the magnitude of this potential impact has been assessed to be negligible and the significance of impact has been assessed to be Neutral.

Operation

12.4.14 The potential impact on the Built-up Area Mid to Late 20th Century HLT (HLT 5) during construction would continue into operation. The magnitude of this potential impact has been assessed to be negligible and the significance of impact has been assessed to be Neutral.

Summary of Potential Impacts - Historic Landscape Types

12.4.15 Table 12.14 shows the significance of all potential impacts on Historic Landscape Types.

Table 12.14: Summary of Potential Impacts on Historic Landscape Types

Significance	Number of Assets	
	Construction	Operation
Large adverse	0	0
Moderate adverse	0	0
Slight adverse	0	0
Neutral	1	1
TOTAL	**1**	**1**

12.5 Mitigation

12.5.1 Proposed mitigation for potential significant impacts and impacts on undesignated assets is described below.

Archaeological Remains

12.5.2 The preferred mitigation option for direct physical impacts on archaeological remains is to preserve them in situ. Where this is not possible, the alternative is preservation by record. Preservation by record comprises archaeological recording in advance of or during construction and the dissemination of the results of the archaeological recording to provide a permanent record of the impacted cultural heritage asset, reducing the amount of information that would be lost.

12.5.3 To mitigate potential impacts on the site of Middlefield Buildings (1) site of (Asset 42) and Middlefield Buildings (2) site of (Asset 43) evaluation in the form of archaeological trial trenching of the green to the south of 873-883 and 885-895 Great Northern Road would be implemented in consultation with Aberdeen City Council (**Mitigation Item CH1**). The aims of evaluation works would be to:

- identify any unknown archaeological remains that may be affected by the proposed route option and identify appropriate mitigation.

12.5.4 If archaeological remains associated with Asset 42 or Asset 43 are identified, archaeological excavation is proposed to mitigate the impact on these remains (**Mitigation Item CH2**). If no archaeological remains are identified, and with the agreement of Aberdeen City Council, no further archaeological investigations are proposed.

12.5.5 Where practicable the archaeological trial trenching, and any resulting archaeological excavation, should be undertaken in advance of the main contract; if this is not feasible, a watching brief during construction may be a suitable alternative. If archaeological remains are identified during the watching brief appropriate archaeological investigation and recording of these remains would need to be undertaken (**Mitigation Item CH3**).

12.6 Residual Impacts

12.6.1 The section below presents the assessment of the significance of residual impact for those assets identified in Section 12.4 above. For full details of residual impacts on other cultural heritage assets, please refer to Appendix A12.1 (Gazetteer).

Archaeological Remains

Undesignated Archaeological Remains

12.6.2 After mitigation, no significant impacts on undesignated archaeological remains are predicted (please refer to Table 12.15 below).

Table 12.15: Undesignated Archaeological Remains - Residual Impacts (with mitigation)

Asset No.	Asset Name	Value	Proposed Mitigation	Residual Impact	
				Magnitude	Significance
Construction					
42	Middlefield Buildings (1)(Site of)	Low	Trial trenching and if required archaeological recording in advance of or during construction.	Minor	Slight
43	Middlefield Buildings (2)(Site of)	Low	Trial trenching and if required archaeological recording in advance of or during construction.	Minor	Slight

Asset No.	Asset Name	Value	Proposed Mitigation	Residual Impact	
				Magnitude	Significance
Operation					
N/A	No residual impacts during operation are predicted.				

12.6.3 Assets 42 and 43 are the sites of two post medieval buildings. Remains associated with these well-understood assets are unlikely to be complex and therefore the record made as part of the trial trenching and excavation (if required), dissemination and archiving of this record, is considered appropriate to reduce the potential magnitude and significance of impact. Where practicable the archaeological trial trenching, and any resulting archaeological excavation, should be undertaken in advance of the main contract

Historic Buildings

Undesignated Historic Buildings

12.6.4 Residual impacts on undesignated historic buildings are presented in Table 12.16.

Table 12.16: Residual Impacts on Undesignated Historic Buildings

Asset No.	Asset Name	Value	Proposed Mitigation	Residual Impact	
				Magnitude	Significance
Construction					
44	Middlefield Cottage	Low	None proposed	Negligible	Neutral
Operation					
44	Middlefield Cottage	Low	None proposed	Negligible	Slight
54	Middlefield Parish Church and Church Hall	Low	None proposed	Negligible	Neutral

Historic Landscape Types

Undesignated Historic Landscape Types

12.6.5 In relation to the Built-up Area Mid to Late 20th Century HLT (HLT 5) construction would not significantly impact on the historic legibility of this landscape type and as such the magnitude of this potential impact has been assessed to be negligible and the significance of impact has been assessed to be Neutral.

Table 12.20: Residual Impacts on Undesignated Historic Landscapes

Asset No.	Asset Name	Value	Proposed mitigation	Residual Impact	
				Magnitude	Significance
Construction and Operation					
HLT5	Built-up Area Mid to Late 20th Century	Negligible	None proposed	Negligible	Neutral

Assessing Significance of Effects on the Overall Cultural Heritage Resource

12.6.6 After mitigation, the impact on archaeological remains has been assessed as being Slight, and the impact on historic buildings and historic landscape types as being Neutral. The overall impact on the cultural heritage resource has been assessed to be Slight.

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13 Air Quality

This chapter presents an assessment of the potential impacts of the proposed scheme on Local and Regional Air Quality during both construction and operational phases. It outlines measures for mitigating these impacts and describes any residual impacts that may occur with mitigation in place.

The proposed scheme is located within an Air Quality Management Area (AQMA) declared for nitrogen dioxide (NO_2). Local authorities are required to designate AQMAs where measured pollutant concentrations are unlikely to meet or are in exceedence of prescribed objective limits.

The proposed scheme would reduce congestion at the Haudagain Roundabout, by diverting traffic onto the new link road and consequently improving traffic flow at the existing junction.

The construction phase would include demolition, earthworks and construction activities, which may give rise to temporary fugitive dust emissions.

The study area includes the proposed scheme and roads where traffic flows are affected by the proposed scheme, including the Anderson Drive/Haudagain Roundabout AQMA.

The assessment has predicted an exceedence of annual mean NO_2 concentrations in the opening year without the proposed scheme. The exceedence is removed with the proposed scheme in place resulting in an improvement in local air quality within the AQMA.

The regional assessment has predicted an imperceptible change in annual mass emissions in the opening and design years.

The proposed scheme is considered to be 'Low Risk' with respect to altering the UK's reported position on compliance with the EU Limit Values.

With the implementation of proposed mitigation during construction, no residual impacts are predicted. No significant residual impacts are predicted during operation of the proposed scheme, and no mitigation is required.

13.1 Introduction

13.1.1 This chapter details the assessment of air quality impacts associated with the proposed scheme and considers how the scheme may affect nearby AQMAs and sensitive receptors. It is supported by Appendix A13.1 (Air Quality Methodology).

13.1.2 Aberdeen City Council (ACC) has declared three AQMAs. Of these only the Anderson Drive/Haudagain Roundabout AQMA is close to the proposed scheme. The City Centre and A956 Wellington Road AQMAs are located between 3.7km and 5.1km from the proposed scheme and are not impacted.

13.1.3 A detailed assessment of the potential impacts on air quality has been undertaken using atmospheric dispersion modelling. Its key objectives are to assess:

- Construction Impacts: to evaluate the impacts from fugitive dust and exhaust emissions associated with construction activities, and where required, identify appropriate mitigation measures.
- Operational Impacts (Local Air Quality): to describe the significance of the potential air quality impacts resulting from changes in traffic flow characteristics on the local road network due to the operation of the proposed scheme, with due regard for any impacts on the human exposure and sensitive vegetation and ecosystems.

13.1.4 The main pollutants of concern in this assessment are those associated with vehicle exhaust emissions and nuisance dust from construction works activity and vehicle movements.

13.1.5 Air pollution can have both chronic (long term) and acute (short term) adverse effects on health. The main pollutants in vehicle emissions that are of concern in relation to human health are nitrogen dioxide (NO_2) and particulate matter smaller than 10 microns in diameter (PM_{10}; i.e. very small smoke or dust particles, which can penetrate deep into the lungs). NO_2 can cause respiratory

problems; PM_{10} can cause a wide range of health problems, particularly by making existing respiratory and cardiovascular conditions worse.

13.1.6 NO_x (nitrogen oxides) emissions and acid deposition on vegetation can have detrimental impacts on species and habitats, particularly on more nitrogen sensitive ecosystems.

13.1.7 Nuisance dust emissions are generally variable in nature, and their potential impact is primarily dependent on the type of construction traffic and activity, ground conditions and weather conditions at the time.

13.1.8 Dust is the generic term used to describe particulate matter in the size range 1-75µm in diameter (British Standard Institute, 1983). Particles greater than 75µm in diameter are termed grit rather than dust. The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles - up to 10µm in diameter, remain suspended in the air for long periods and are small enough to be inhaled and so can potentially impact on health.
- Nuisance dust - generally larger than 10µm, which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry).

13.1.9 The human health receptors considered in this assessment are those situated within the Anderson Drive/Haudagain Roundabout AQMA and along roads which could potentially experience significant local air quality impacts. Air quality receptors are defined in LAQM TG(09), (Defra, 2009) and include housing, schools, hospitals, care homes and Designated Sites.

13.1.10 There are no designated ecological sites within close proximity to the proposed scheme or defined study area. No further consideration of ecological impacts is made in this assessment.

Relevant Air Quality Policies and Legislation

13.1.11 The assessment considers the relevant air quality legislation and the process of Local Air Quality Management (LAQM) (Defra, 2009). Relevant planning policy is considered at the national and local level.

13.1.12 Table 13.1 summarises the key national air quality legislation pertinent to this assessment.

Table 13.1: Key Air Quality Legislation

Legislation	Description
Environment Protection Act 1990 Part III	Provides statutory nuisance provisions for nuisance dust.
Environment Act 1995, Part IV	Defines requirements for Local Air Quality Management
Air Quality (Scotland) Regulations 2000 and Air Quality (Scotland) (Amendment) Regulations 2002	Defines the national Air Quality Objectives.
The National Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland, 2007	Updates the 2000 Air Quality Strategy and sets out how local air quality is managed through the application of Air Quality Objectives (AQO), based on the Air Quality (Scotland) Regulations 2000 and 2002 Amendments.
The Climate Change Act, 2009	Part 1 provides statutory framework for greenhouse gas emissions reductions in Scotland for 2020 and 2050.
The Air Quality Standards (Scotland) Regulations 2010	Transposes formalised limit values set out in the EU ambient air quality directive 2008/50/EC to UK law.

European Legislation

13.1.13 EU Directive 2008/50/EC (European Community, 2008) was published to consolidate previous European Directives on ambient air quality. Although published in 2007 by the Department for Environment, Food and Rural Affairs (Defra), the AQS for England, Scotland, Wales and Northern Ireland is consistent with Directive 2008/50/EC.

13.1.14 The National AQS 2007 (Defra, 2007) establishes Air Quality Objectives (AQOs) for a number of specific pollutants, which are set at a level to provide protection to the whole population, including more vulnerable groups such as the very young, elderly or unwell.

13.1.15 There is no legal requirement to meet objectives set within the AQS except where equivalent Limit Values are set within the EU Directives.

13.1.16 The 2008 Directive introduced a new limit value for ultra fine particulate matter ($PM_{2.5}$) but does not change the air quality objectives set out in the AQS.

National Legislation

13.1.17 The AQOs applicable to local air quality management are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 297), and Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297).

13.1.18 The Air Quality Standards (Scotland) Regulations 2010 implement limit values prescribed by Directive 2008/50/EC. The limit values are legally binding and the Scottish Ministers are responsible for their implementation.

13.1.19 Local authorities have statutory duties for LAQM and are obliged to ensure that AQOs are met as soon as practicable. This process is facilitated by the periodic Review and Assessment (R&A) of local air quality.

13.1.20 The R&A process, requires local authorities to undertake a phased assessment to identify any areas likely to experience exceedences of the AQOs. The process involves regular Progress Reports and Updating and Screening Assessments (USAs) and, if required, Detailed Assessments and Further Assessments.

13.1.21 Any location likely to exceed the objectives must be designated an AQMA and an Air Quality Action Plan (AQAP) must be prepared and implemented, with the aim of achieving the objectives in the designated area. The given dates for compliance have all now passed.

13.1.22 The pollutants relevant to this assessment are NO_2 and $PM_{10,}$ and the objectives for each are presented in Table 13.2. Further details of the pollutants are provided in Section 3.1 of Appendix A13.1 (Air Quality Methodology). AQOs for other AQS pollutants typically associated with the use of fuels for road transport (petrol and diesel combustion) such as benzene and 1,3 butadiene, are very unlikely to be exceeded and therefore have not been considered further in the local air quality assessment based on Design Manual for Roads and Bridges (DMRB) HA207/07 guidance (Highways Agency, 2007).

13.1.23 The relevant objective values and limit values listed in Table 13.2.

Table 13.2: National Air Quality Strategy Objectives

Pollutant	Averaging Period	Objective/Limit Value	Objective Target Date
Nitrogen dioxide (NO_2)	1 hour mean	200µg/m^3, not to be exceeded more than 18 times/yr	31/12/2005
	Annual mean	40µg/m^3	31/12/2005
Particulate matter (PM_{10})	Daily mean	50µg/m^3, not to be exceeded more than 7 times/yr	31/12/2010
	Annual mean	18µg/m^3	31/12/2010
Particles ($PM_{2.5}$)	Annual mean	12µg/m^3	2010

13.1.24 Air quality modelling methodology cannot calculate short term averaging period results for comparison with the NO_2 1 hour mean or the PM_{10} daily mean AQO. Therefore, compliance with the short term AQOs is assessed by following the LAQM Technical Guidance (LAQM TG(09)) (Defra, 2009), which provides a relationship between the annual mean concentration and the

number of periods per year where the short term AQO is likely to be exceeded. These relationships have been derived from examination of monitoring data across the UK.

13.1.25 Receptors would not be expected to exceed the NO_2 1 hour mean AQO if predicted annual mean concentrations are less than 60µg/m^3 or to exceed the PM_{10} daily mean AQO, if predicted annual mean concentrations are less than 22.4µg/m^3.

13.1.26 The $PM_{2.5}$ objectives have not been incorporated into LAQM regulations and are managed at a national level. Local authorities have no statutory obligation to review and assess air quality against them. Additionally, DMRB states that $PM_{2.5}$ does not need to be assessed or reported (Highways Agency et al*,* 2013a). Therefore, assessment of $PM_{2.5}$ has not been included.

13.1.27 The Climate Change (Scotland) Act (Scottish Government, 2009) is a key commitment of the Scottish Government to reduce its greenhouse gas (GHG) emissions and transition to a Low Carbon (LC) economy. The statutory framework sets an interim GHG reduction target of 42% by 2020, with the power for this to be varied based on expert advice, and 80% by 2050. Annual targets for 2010 – 2022 are set out in the Climate Change (Annual Targets) (Scotland) Order 2010 (Scottish Government, 2010).

Planning Policy

13.1.28 The National Planning Framework 3 (NPF3) (Scottish Government, 2014a) launched in June 2014, provides a statutory framework for Scotland's spatial development and sets out a long-term vision with a focus on supporting sustainable economic growth and the transition to a low carbon economy. The strategy as a whole aims to reduce GHG emissions and facilitate adaptation to climate change. The Climate Change (Scotland) Act 2009 sets a target for reducing GHGs by 42% by 2020. Section 44 of this Act places a duty on every public body to act:

- In the way best calculated to contribute to the delivery of emissions target in the Act.
- In the way best calculated to deliver the Scottish Government's climate change adaptation programme.
- In a way that it considers is most sustainable.

13.1.29 The Scottish Planning Policy 2014 (Scottish Government, 2014) sits alongside NPF3 and sets out how the objectives should be delivered through a series of national planning policies. Paragraph 28 states: *'The planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term*.'

13.1.30 Paragraph 29 states: *'This means that policies and decisions should be guided by the following principles:*

- *avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality*.'

13.1.31 ACC approved a new AQAP in March 2011 to cover the citys three AQMAs. This replaced the original 2006 plan that covered only the city centre area. The Aberdeen AQAP (ACC, 2011) and AQAP Progress Report (ACC, 2013b) sets out a strategic approach to improving air quality in Aberdeen. The AQAP progress report has proposed measures aimed at reducing emissions in order to achieve the AQOs. These are prioritised into the following 6 categories:

- Modal shift and influencing travel choice;
- lower emissions and cleaner vehicles;
- road infrastructure;
- traffic management;
- planning and polies; and

- non-transport measures.

13.1.32 Further assessment of the compliance of the proposed scheme against national, regional and local policies of relevance to air quality has been undertaken and is detailed in Appendix A17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

13.1.33 Transport Scotland's approach to evaluating significant air quality impacts reflects current policy, national planning policy and the requirements of the EIA Directive.

13.2 Approach and Methods

Overall Approach

13.2.1 A detailed dispersion modelling assessment has been carried out following guidance detailed in DMRB and various associated updates provided as Interim Advice Notes (IANs) 170/12v1, 174/13, 175/13 (Highways Agency et al., 2012, 2013a and 2013b) and LAQM TG(09) where appropriate. The guidance note related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans (Highways Agency et al, 2013b is currently being revised. This assessment has used the version available at the time of writing.

13.2.2 A summary of the assessment methodology is presented in this section. More detail is presented in Appendix A13.1 (Air Quality Methodology). The key elements of the assessment are:

- Review of the most recent air quality documents published by the local authority:
  - i. Air Quality Progress Report (Aberdeen City Council, 2013a);
  - ii. Air Quality Action Plan (Aberdeen City Council, 2013b);
  - iii. Air Quality Updating and Screening Assessment (Aberdeen City Council, 2012a);
  - iv. Aberdeen Local Development Plan (Aberdeen City Council, 2012b); and
  - v. AECOM Environment. Air Quality Action Plan (Aberdeen City Council, 2011).
- Review of air quality monitoring data to assess the baseline air quality using local authority and mapped background pollution data from www.scottishairquality.co.uk (Ricardo-AEA, 2014).
- Qualitative assessment of potential construction phase impacts on local air quality.
- Local air quality assessment for NO_2 and PM_{10} at human receptors within 200m of affected roads.
- Regional assessment calculating mass emissions of NO_x, PM_{10}, carbon dioxide (CO_2) and Hydrocarbons (HC).

13.2.3 This assessment considers local air quality in the opening year only (2018); and regional air quality in the opening year (2018) and design year (2033).

13.2.4 The local air quality assessment covers:

- 2012 Baseline scenario (i.e. existing conditions at the start of the assessment).
- 2018 Opening Year: Do-Minimum (DM) (i.e. without the proposed scheme in place).
- 2018 Opening Year: Do-Something (DS) (i.e. with the proposed scheme in place).

13.2.5 The study area has been defined based on the air quality scoping criteria set out in DMRB for 'affected' roads. This is presented in the assessment methodology within Appendix A13.1. These criteria have been applied to the traffic data produced for the project. Modelled roads (Study Area) and are presented in Figure 13.1.

13.2.6 The assessment of air quality impacts from the proposed scheme has been undertaken using Atmospheric Dispersion Modelling System for Roads (ADMS-Roads).

13.2.7 The 2012 baseline model results are compared to local monitoring data and adjustments are made to match the monitoring data near the road using a process called verification. The calculated adjustment factors are then applied to modelled road concentrations at receptor locations. Refer to Section 2.2 of Appendix A13.1 (Air Quality Methodology) for more detailed information about the verification process.

13.2.8 Modelled concentrations have been calculated at worst-case representative sensitive receptors to determine opening year concentrations at receptors where the maximum concentrations or greatest change in concentration due to the proposed scheme are expected to occur.

13.2.9 In July 2011, Defra published a report examining the Long Term air quality Trends in NO_x and NO_2 concentrations (Defra, 2011). This identified that ambient air quality concentrations are not decreasing in the future as is predicted using the current established methods of assessment defined in the LAQM TG(09). To address this, a Gap Analysis methodology has been developed by the Highways Agency (HA) as set out in the IAN 170/12v1 (HA et al., 2012) to adjust model predictions to better reflect measured long term trends of NO_x and NO_2. Full details of the model prediction process are set out in Section 2 of Appendix A13.1 (Air Quality Methodology).

13.2.10 An updated version of the spreadsheet was published in 2013, which incorporates lower future year vehicle emissions associated with Euro 6/VI improvements and therefore predicts lower future year concentrations. The updated version has not been used in this assessment because the emerging evidence around Euro 6/VI real-world performance is not yet conclusive. This is a conservative approach which is also consistent with the approach followed at the options appraisal Stage.

13.2.11 The Regional assessment calculates the total emissions of NO_x, PM_{10}, CO_2 and HC for DM and DS in the opening and design year.

13.2.12 Emission rates for individual links (road sections) are based upon their corresponding traffic flow, % Heavy Duty Vehicles (HDVs) and average link speed (kph) and then multiplied by the total length of the respective link. The emissions of all the links are combined to determine the total emissions of NO_x, PM_{10}, CO_2 and HC.

Traffic Data and Study Area

13.2.13 Traffic data was provided for the following parameters for the base, opening and design years:

- Annual Average Daily Traffic (AADT 24).
- Hourly flows per period (AM/IP/PM/OP).
- Percentage HDVs.
- Peak period traffic speeds (AM/PM) kph.
- Annual Average Daily Traffic speed (kph).

13.2.14 The Aberdeen Western Peripheral Route (AWPR) and Third Don Crossing are assumed to be in place for the opening year (2018) of this assessment and the impacts are taken account of within the traffic modelling for the proposed scheme.

13.2.15 The study area is defined by 'affected' roads and road links in close proximity to the proposed scheme. The qualifying criteria for an 'affected' road is outlined within DMRB HA207/07 and presented in detail in Section 2 of Appendix A13.1 (Air Quality Methodology).

13.2.16 The air quality modelling has been undertaken based on the Stage 3 design. This design includes the demolition of some existing sensitive receptors.

Baseline Data Gathering

13.2.17 In order to assess the significance of the proposed scheme in terms of air quality, it is necessary to identify and understand the baseline conditions at and around the proposed scheme study area. This provides a reference level against which any potential changes in air quality can be assessed.

13.2.18 Under Part IV of the Environment Act 1995, all local authorities are required to undertake a regular review of air quality in their area of jurisdiction, and assess whether the AQOs are being achieved. This is known as Local Air Quality Management (LAQM). A review of the recent Air Quality publications by ACC has been undertaken.

13.2.19 A review of air quality measurements in the vicinity of the scheme, and national mapped background concentrations which are provided by Ricardo-AEA on behalf of the Scottish Government (Ricardo-AEA, 2014) and are publicly available online from the Scottish Air Quality website (www.scottishairquality.co.uk) has been undertaken. More detail is provided in Section 2 of Appendix A13.1 (Air Quality Methodology).

Impact Assessment

Construction Impacts

13.2.20 The assessment of potential air quality impacts from the construction phase relates to the construction activities onsite, the delivery of materials and equipment to and from the site, and construction workers travelling to and from the site.

13.2.21 Using the approach as set out in DMRB HA207/07 (Highway's Agency et al., 2007) and more recent guidance published by the Institute of Air Quality Management (IAQM, 2014) an assessment of the risk of dust impacts has been made based on the scale and nature of the proposed scheme, and the proximity of sensitive receptors. The methodology applied is detailed in full in Section 2.3 of Appendix A13.1 (Air Quality Methodology).

13.2.22 From an air quality perspective, construction activities have the potential to create a variety of pollutant emissions, but the only one likely to cause a significant impact is the generation of fugitive dust. It is normally possible, by proper control, to ensure that dust deposition does not give rise to nuisance impacts. Routine dust control measures would normally ensure that the risk of long-term impacts is insignificant, although short-term events may occur (for example, due to technical failure or exceptional weather conditions).

13.2.23 The level and distribution of construction dust emissions would vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression measures.

13.2.24 Respirable PM_{10} has the aerodynamic diameter of less than 10µm, and is of greatest concern in relation to potential impacts on human health.

13.2.25 The sensitivity of the surrounding area is assessed in relation to the respective impact type: dust soiling, human health and ecosystem impacts. The criteria are presented in Tables 3, 4 and 5 in Section 2.5 of Appendix A13.1 (Air Quality Methodology). Only the highest level of area sensitivity from the table needs to be considered.

Construction Traffic Impacts

13.2.26 Construction of the proposed scheme will have associated construction traffic, comprising Contractors' vehicles, HDVs, diggers, and other diesel-powered vehicles. This would result in emissions of NO_x, particles and other combustion related pollutants.

13.2.27 The effect of construction traffic on local air quality is determined following EPUK guidance screening criteria, outlined in Section 2.1 of Appendix A13.1 (Air Quality Methodology). A maximum

of 60 additional cars per day is predicted during the construction phase. This is not a significant increase in daily traffic.

13.2.28 Based on the current construction programme, likely size, duration and type of construction works it is very unlikely that the HDV numbers would exceed the screening criteria. A targeted maximum of 100 HDV movements per day was used in this assessment.

13.2.29 It should be noted that HDV movements throughout the majority of the works would be lower than the above targeted maximum, which complies with the DMRB HA 207/07 screening criteria (change of 200 HDV flows per day) to indicate whether there are likely to be significant impacts. Based on the above, and assuming standard levels of vehicle maintenance and best practice operation on site, emissions from construction related vehicles on the local road network and non-road mobile machinery (NRMM) are expected to be negligible in terms of the effect on local air quality. Therefore, only the impacts arising from construction activities (namely PM_{10} as nuisance dust) are considered in detail below.

Operation (Local Air Quality)

13.2.30 ADMS-Roads is a recognised tool for carrying out air quality impact assessments and has been comprehensively validated by both the manufacturers and independently. It is used both by regulatory authorities and commercially to assist in decisions related to air quality and traffic management, urban planning and public health in many countries around the world. Version 3.2 (released October 2013) was used for this assessment.

13.2.31 The software takes into account various inputs, including the finalised traffic model data (including average speed, percentage of HDVs, road links), emission factors, historical hourly sequential meteorological information (including wind speed, wind direction, temperature and cloud cover) to produce predictions of pollutant concentrations at 'user specified' sensitive receptor locations. The use of the available data and its application in the model was conducted in accordance with the methodology described in LAQM TG(09). More information about the methodology used for model verification can be found within Section 2.3 of Appendix A13.1 (Air Quality Methodology).

Operation (Regional Air Quality)

13.2.32 Predicted mass emissions of NO_x, PM_{10}, HC and CO_2 were calculated for the following scenarios using the latest versions of the Emission Factor Toolkit (version 6.0.2) issued by the Defra (Defra, 2014):

- 2012 Baseline scenario.
- 2018 Opening Year: DM.
- 2018 Opening Year: DS.
- 2033 Opening Year: DM.
- 2033 Opening Year: DS.

Impact Significance

Construction

13.2.33 The evaluation of the significance of construction impacts is based on IAQM 2014 guidance (outlined in detail in Section 2.6 of Appendix A13.1: Air Quality Methodology) and professional judgement. The assessment takes into account the overall pattern of potential dust risk by applying the magnitude criteria for each potential source (Table 1 of Appendix A13.1) together with further relevant information relating to Receptor sensitivity (Table 2 of Appendix A13.1) and the sensitivity of the area to dust soiling effects (Table 3 of Appendix A13.1). The potential risk of dust impact per site activity is then considered and summarised. See Table 13.8 in Section 13.4 (Potential Impacts).

13.2.34 Mitigation measures consistent with the level of risk for the site for Construction Effects are identified using the Institute of Air Quality Management's (IAQM, 2014) guidance and are presented in Section 2.6 of Appendix A13.1 (Air Quality Methodology).

Operation (Local Air Quality)

13.2.35 The model results were used to assess whether there are any significant impacts as a result of the proposed scheme. The approach to evaluating significant air quality impacts is set out in IAN 174/13 and 175/13 published in June 2013 (Highways Agency et al., 2013a; 2013b).

13.2.36 The approach to air quality assessment identifies and assesses sensitive receptors near roads where air quality might be affected. Consequently, areas where national AQOs might be expected to be exceeded are considered, which includes AQMAs.

13.2.37 The model results are used to identify those receptors which are in exceedence of AQOs in either the DM or DS scenario. These are the only receptors which are considered in the judgement of significance. The change in predicted concentration is then calculated as the difference between DS and DM model results at these receptors.

13.2.38 Where the differences in concentrations are less than 1% of the AQO (e.g. less than or equal to 0.4µg/m³ for annual average NO_2), then the change at these receptors is considered to be imperceptible and they can be scoped out of the judgement on significance. Table 10 in Appendix A13.1 (Air Quality Methodology) outlines the descriptors for changes in magnitude.

13.2.39 The descriptions of impacts obtained using the approach above, are designed to apply at individual receptors. The significance of those impacts for the proposed scheme as a whole requires a different approach.

13.2.40 The framework defined in IAN 174/13 provides guidance on the number of receptors for each of the magnitude of change categories that might result in a significant effect.

13.2.41 These are guideline values only, and are to be used to inform professional judgement on significant effects of a scheme. The guideline bands are intended to help provide consistency across trunk road schemes. The significance categories and guideline property numbers are summarised in Table 13.3.

Table 13.3: Significance Categories and Guideline Property Numbers

Magnitude of Change	Number of Receptors with:	
	Worsening of AQO already above objective or creation of a new exceedance	**Improvement of an AQO already above objective or the removal of an existing exceedance**
Large (>10% of AQO)	1 to 10	1 to 10
Medium (>5% to 10% of AQO)	10 to 30	10 to 30
Small (>1 to 5% of AQO)	30 to 60	30 to 60

13.2.42 The significance of the change is greater the higher above the air quality thresholds the changes are predicted to occur. Where it is predicted that the short-term NO_2 and/or PM_{10} thresholds are also exceeded, then more significance should be attributed to these impacts.

13.2.43 The EU Directive on Ambient Air Quality sets limit values for a range of pollutants. The purpose of the Directive is to protect human health, and the environment as a whole. Defra reports annually, on behalf of the UK government, on the status of air quality to the European Commission. The compliance risk assessment test as detailed in IAN 175/13 (Highways Agency et al, 2013b) has been developed to enable decision makers to judge a scheme's likelihood of non-compliance with the EU Directive. The compliance risk assessment test also informs the air quality significance test.

13.2.44 The proposed scheme study area contains a number of roads which form part of Defra's assessment for the European Commission on the status of air quality in the UK. The Compliance Risk Road Network (CRRN) relevant to this study area includes road sections along the A96(T) Auchmill Road, A96 Great Northern Road and A90(T) North Anderson Drive. The modelling used for the local air quality assessment is combined with Defra's Pollution Climate Mapping model dataset to determine whether the proposed scheme may affect compliance with the EU Directive on Ambient Air Quality.

Model Verification

13.2.45 The model results were found to generally under-predict measured 2012 annual mean concentrations at the selected NO_2 diffusion tube locations within the study area. The process of comparing modelled outputs with measured concentrations is termed model verification. Further details are provided in Section 3.2 of Appendix A13.1 (Air Quality Methodology).

13.2.46 In order to remove under-prediction of NO_2 at modelled receptors a road NO_x adjustment factor of 1.543 and road NO_2 adjustment factor of 0.995 were applied following guidance in LAQM TG(09).

13.2.47 In the absence of local PM_{10} monitoring data for model verification, the road NO_x adjustment factor has been applied to the modelled PM_{10} road component.

13.2.48 These model adjustment factors have been applied to the results presented in this report and the appropriate background concentrations were then applied.

Operation (Regional Air Quality)

13.2.49 No formal significance criteria are available for the assessment of regional air quality impacts. The assessment therefore presents the likely emissions, but does not assign significance to these.

Limitations to Assessment

13.2.50 The air quality impact assessment is based on a series of computer models containing forecasted future conditions. The process begins with the modelling of future traffic flows, which is subject to its own inherent degree of uncertainty. This traffic data is then used in the air quality model to compare future air quality conditions both with and without the proposed scheme. The air quality model draws on a number of other trends and parameters that must be projected into the future.

13.2.51 As with any computer model that seeks to predict future conditions, there is an amount of uncertainty in the predictions made. Whilst being the best predictions available, elements of impact prediction such as the specific concentration of a given pollutant at a given property, or whether an exceedence of AQOs would or would not occur at a specific location, are not precise and are always subject to a margin for error.

13.3 Baseline Conditions

13.3.1 The baseline conditions provide a reference level against which any potential change in air quality can be assessed and are used to make a judgement as to whether the proposed scheme area is appropriate for the proposed land use.

13.3.2 A review of air quality within ACC area was undertaken based ACC's LAQM reports (Aberdeen City Council 2011, 2012a, 2013a). ACC has declared three AQMAs:

- Anderson Drive AQMA.
- Wellington Road AQMA.
- Aberdeen City Centre AQMA.

13.3.3 Anderson Drive AQMA has the potential to be directly impacted by the proposed scheme. The AQMA is presented in Figure 13.1 and extends from the bridge of the Dee to the A96 and includes Haudagain Roundabout.

13.3.4 Wellington Road and Aberdeen City Centre AQMAs will not be impacted by the proposed scheme. The closest affected road is 1.2km away.

13.3.5 Local authorities are obliged to produce air quality action plans for areas that have been declared as AQMAs. ACC published the AQAPs in January 2013 (Aberdeen City Council, 2013b). The report included specific indicators and trend analysis to monitor progress in the implementation of the action plan measures.

13.3.6 The AWPR was approved in October 2012. This AWPR fulfils the AQAP and would pass through mainly rural/suburban areas and allow traffic to travel around the City. It would particularly benefit the Anderson Drive/Haudagain Roundabout/A96(T) Auchmill Road AQMA due to the consequential reduction in traffic flows. The AWPR is expected to be completed in 2017 and construction of the proposed scheme would commence following the AWPR opening.

13.3.7 The Third Don Crossing is a committed development with a proposed opening date of 2016 (Aberdeen City Council, 2012a, Section 3.5, p44). The scheme is predicted to benefit the wider transport network by improving the effectiveness of sustainable transport modes and encourage behavioural change (Aberdeen City Council, 2011, Section 4.3, p13). This scheme is included within the traffic data utilised in this air quality assessment.

13.3.8 ACC operates six automatic monitoring stations and maintains a network of diffusion tubes across the city. There are no continuous analysers within air quality study area, but diffusion tubes were identified for use in the model verification process. The process of model verification is described in detail in Appendix A13.1. Table 13.4 presents the results taken at relevant ACC monitoring network sites.

Table 13.4: Annual Mean Nitrogen Dioxide Measurements within the Assessment Study Area

Tube IDs	Tube Location	OS co-ordinates		2012 Annual mean NO_2 Concentration ($\mu g/m^3$)
		X	Y	
ACC_1	Bucksburn Primary School, Inverurie Road	389744	809575	34
ACC_2	885 Gt Northern Rd	391167	809161	**40**
ACC_3	549 N Anderson Dr	391394	808949	29
ACC_23	785 Gt Northern Rd	391458	809102	33
ACC_24	40 Auchmill Rd	389913	809603	**47**
ACC_39	819 Gt Northern Rd	391293	809136	**69**
ACC_40	852 Fullerton Ct (facade)	391353	809158	36
ACC_41	852 Fullerton Ct (roadside)	391352	809151	30

Bold text denotes an exceedence of AQO.

13.3.9 Most measurements are within AQOs, with the exception of monitoring locations ACC_2, ACC_24 and ACC_39. These are all roadside sites adjacent to the Anderson Drive AQMA. Data capture for ACC_39 was <90% and is therefore an unreliable measurement and is excluded from the verification dataset. Figure 13.1 shows the locations of monitoring sites used in the verification process.

13.3.10 The representative receptors modelled are likely to experience the greatest pollutant concentrations and largest changes in concentration. More detail on the receptor selection is provided in Section 2.2 of Appendix A13.1 (Air Quality Methodology). Table 13.5 presents a subset of the receptors, which are subject to the greatest potential increases or reductions in road traffic with the proposed scheme, and therefore best describe the spatial distribution of impacts. Two properties within this subset are expected to be demolished as a result of the proposed scheme.

Table 13.5: Reported Sensitive Receptors

Site IDs	To be Demolished (Y/N and Option)	OS Co-ordinates	
		X	Y
3	N	390986	808813
4	N	391364	809156
5	Y	391163	809153
6	N	391388	808909
8	N	391367	808971
9	N	391421	808904
10	N	391299	809135
11	Y	391138	808956
13	N	391689	809105
14	N	391722	809076
15	N	391048	809181
18	N	390884	809379
21	N	389741	809606
23	N	390599	809259
26	N	389904	809600
29	N	390191	809843
31	N	391513	807874
34	N	391627	808551
35	N	390781	808743
36	N	391181	807519
38	N	391727	808177
39	N	392360	807846
41	N	393095	807790
42	N	393103	808281
45	N	392808	808549
46	N	392419	808913

13.4 Potential Impacts

Construction Phase: Nuisance Dust

13.4.1 The magnitude of the dust impact for each activity is presented in Table 13.6 and is derived from the classifications outlined in Table 1 of Appendix A13.1 (Air Quality Methodology) using the most recent construction information available.

Table 13.6: Magnitude of Dust Impact

Activity	Dust Emission Magnitude
Demolition	Medium
Earthworks	Large
Construction	Small
Trackout	Large

13.4.2 Due to the nature of the works, concrete batching is likely to be undertaken off-site. It is likely that 25% of concrete from demolition will be crushed on-site and would be undertaken at the site compound furthest from receptors to reduce nuisance dust. The haul route will be outlined within the Construction Environmental Management Plan. Trackout has been assessed on a worst case approach.

13.4.3 The classification in Table 2 of Appendix A13.1 (Air Quality Methodology) has been used to determine receptor sensitivity. For all categories, receptor sensitivity is high due to the close proximity of residential properties to the construction boundary and identified haul routes.

13.4.4 The 'Area Sensitivity' is determined using the matrices presented in Tables 3 to 5 of Appendix A13.1 (Air Quality Methodology). Receptor numbers and distance from source are used to assign an 'Area Sensitivity'. This is completed for each construction activity and effect as presented in Table 13.7.

Table 13.7: Sensitivity of the Area

Effect	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Health Effects of PM_{10}	Low	Low	Low	Low

13.4.5 Dust soiling effects and health effects of PM_{10} are considered for the construction impact assessment. There are no sites of ecological importance within the vicinity of the construction site or proposed haul routes which require inclusion.

13.4.6 A high 'Area Sensitivity' to dust soiling effects is assigned to all construction activities because there are between 10-100 receptors of high sensitivity within 20m of the site. There are 38 receptors within 20m of the site boundary and a total of 79 receptors within 50m of the site boundary. The highest level of 'Area Sensitivity' is always considered. Background PM_{10} concentration in the vicinity of the site is <14µg/m³, which is well below the AQO for the averaging period of the pollutant. A low 'Area Sensitivity' to health effects of PM_{10} is assigned to all construction activities. It is noted that the construction works are temporary in nature and with appropriate mitigation measures in place it is unlikely that there will be exceedence of AQOs in the short term.

13.4.7 The risk of dust impacts for a construction site is informed by the assigned 'Area Sensitivity' presented in Table 13.7 and follows the criteria presented in Tables 6 to 9 of Appendix A13.1 (Air Quality Methodology). A summary of the construction dust risk is presented in Table 13.8. This is used to inform the level and type of mitigation required.

Table 13.8: Summary Dust Risk to define Site Specific Mitigation

Potential Impact	Risk of Site Giving Rise to Dust Impacts			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	High	Low	High
Health Effects of PM_{10}	Low	Low	Negligible	Low

13.4.8 The potential for soiling effects differs for each site activity. Earthworks and Trackout are considered to pose the highest risk of soiling effects and this is due to the volumes of material excavated and imported, the number of earth moving vehicles active on-site, the maximum HDV movements per day and the close proximity of properties to roads used by construction traffic.. It is assumed that any crushing during the demolition phase would take place in the designated compound furthest from Receptors, with dust suppression to be applied at demolition sites. The potential for health effects of PM_{10} are negligible to low. Where the risk is assigned as 'negligible', no mitigation measures beyond those required by legislation are required, although good practice is recommended.

Significance

13.4.9 Research by the Institute of Environmental Management and Assessment (IEMA) has found that many UK EIA practioners no longer evaluate significance of adverse effects prior to mitigation because the EIA influences the design process, and any significant adverse environmental effects

are either avoided or reduced through design before the proposal is finalised, and thus the pre-mitigation impacts are not relevant (IEMA, 2011).

13.4.10 The significance of dust impacts is presented in Table 13.9. IAQM recommends that significance is only assigned to the effect after considering the construction activity with mitigation. It is acknowledged that even with a rigorous Dust Management Plan (DMP) in place, it is not possible to guarantee that dust mitigation measures are effective all the time, and if, for example, dust emissions occur under adverse weather conditions, there is a risk of short-term dust annoyance. However, the likely scale of this would not normally be considered sufficient to change the conclusion that with mitigation the effects would be 'not significant'.

13.4.11 Earthwork and Trackout activities are considered to be at high risk of causing dust soiling effects on receptors surrounding the site. The dust control measures that should be applied and are recommended for inclusion in the DMP are suitable for a high risk activity and should not result in significant effects on receptors from dust soiling or health effects. The contruction phase mitigation measures are described in Appendix A13.1.

Table 13.9: Significance of Impacts for Each Activity with Mitigation

Potential Impact	Risk of Site Giving Rise to Dust Impacts			
	Demolition	Earthworks	Construction	Track out
Dust Soiling	Low Risk	Low Risk	Low Risk	Low Risk
Health Effects of PM_{10}	Low Risk	Low Risk	Negligible	Low Risk

Operation: Local Air Quality Assessment (Human Health) Impacts

13.4.12 This section presents the impacts of the proposed scheme during operation upon local air quality within the study area. Impacts of the proposed scheme would relate to changes to the existing road network (e.g. as a consequence of changes to traffic speeds; or road alignment that brings traffic closer to, or further from, receptors).

13.4.13 The results presented throughout this section are based on the values predicted using the Gap Analysis methodology (Highways Agency et al., 2012), which takes into account the Long-term Trends for NO_x and NO_2. This is considered to be more conservative and representative of opening year impacts than the LAQM TG(09) methodology.

13.4.14 The receptor results in Table 13.10 and 13.11 have been selected to demonstrate the greatest modelled concentrations or to illustrate changes in pollution concentrations due to the proposed scheme. A table of results detailing background concentrations, the LAQM TG(09) and the Gap Analysis results for all modelled receptors included within the assessment, is provided in Section 2.4 of Appendix A13.1 (Air Quality Methodology).

13.4.15 The selected results of the local air quality modelling are presented in Table 13.10 for NO_2 and Table 13.11 for PM_{10}. The predicted change in annual mean NO_2 at all receptors modelled is also presented in Figure 13.2.

Table 13.10: Predicted Annual Mean NO_2 concentrations at Selected Sensitive Receptors

Receptor	Modelled NO_2 Concentration ($\mu g/m^3$) – AQO = 40 $\mu g/m^3$			
	Base (2012)	DM (2018)	DS (2018)	Change in Concentration (DS-DM)
3	16.2	15.5	16.0	0.5
4	36.0	31.1	29.2	-1.9
5	33.7	28.0	n/a	n/a
6	26.2	23.4	25.3	1.9
8	33.4	28.4	27.7	-0.7
9	32.0	27.3	30.0	2.7

Receptor	Modelled NO_2 Concentration (µg/m^3) – AQO = 40 µg/m^3			
	Base (2012)	DM (2018)	DS (2018)	Change in Concentration (DS-DM)
10	**55.1**	**46.1**	38.3	-7.8
11	19.8	18.5	n/a	n/a
13	23.5	21.1	21.4	0.3
14	29.1	24.8	25.6	0.8
15	36.0	30.7	35.4	4.7
18	29.6	26.4	26.5	0.1
21	**40.3**	33.8	33.6	-0.1
23	34.9	30.8	31.1	0.3
26	36.9	32.9	32.6	-0.3
29	21.0	29.9	29.8	-0.1
31	27.0	24.9	24.9	0.0
34	25.1	23.0	22.8	-0.1
35	17.0	16.4	16.4	0.0
36	27.7	25.6	25.6	0.0
38	27.3	25.1	24.6	-0.5
39	26.3	24.6	24.2	-0.5
41	29.5	29.3	29.6	0.2
42	31.8	32.7	33.1	0.4
45	31.7	29.5	30.0	0.5
46	30.4	28.0	28.8	0.8

Bold text denotes an exceedence of annual mean AQO; n/a refers to exposure removed due to demolition

13.4.16 The results presented in Table 13.10 show that in the Base 2012 model, there are currently predicted to be exceedences of the annual mean AQO for NO_2 at two receptor locations, and that there would continue to be exceedences in the Do-Minimum 2018 (DM) scenario at one receptor, namely receptor 10. It is predicted that this exceedence would be removed with the proposed scheme in place (DS) 2018 due to the diversion of traffic onto the new link road.

13.4.17 The maximum reduction would occur at receptor 10 (-7.8µg/m^3) and is of large beneficial magnitude.

13.4.18 The largest predicted increase in annual mean NO_2 is of large adverse magnitude and would occur at receptor 15, increasing concentrations by 4.7µg/m^3. This receptor is adjacent to the A96(T) Auchmill Road west-bound and the proposed new link road junction. The predicted concentration is a direct result of the additional traffic onto the network. AQOs are not predicted to be exceeded at this receptor and the worsening of air quality is not considered to be significant.

13.4.19 There are no predicted exceedences of AQOs with the proposed scheme in place and as such the predicted worsening in NO_2 concentrations at some receptors is unlikely to cause a significant impact on local air quality, based on the guidance in IAN 174/13. The removal of the predicted exceedence at receptor 10 would be a considerable improvement to air quality within an AQMA and equates to a large magnitude benefit, as defined by the categories in Table 13.12.

13.4.20 Properties within the Haudagain Triangle (area of proposed development) in the vicinity of the new road and that are not under compulsory purchase order are unlikely to exceed AQO's, and they therefore will not be significantly impacted as a result of the scheme. The minimum distance to the new link road of a property within the Haudagain Triangle is 16m. Other receptors that are closer to more heavily trafficked roads, such as Receptor 8 and 15 are below AQOs.

Table 13.11: Predicted Annual mean PM_{10} concentrations at Selected Sensitive Receptors

Receptor	Modelled PM_{10} Concentration ($\mu g/m^3$) – AQO = 18 $\mu g/m^3$			
	Base (2012)	DM (2018)	DS (2018)	Change in Concentration (DS-DM)
3	12.0	11.5	11.5	0.0
4	15.4	13.9	13.7	-0.2
5	15.2	13.9	n/a	n/a
6	13.8	12.8	13.0	0.2
8	14.9	13.5	13.2	-0.3
9	14.7	13.4	13.4	0.0
10	**18.5**	16.0	14.8	-1.2
11	12.8	12.2	n/a	n/a
13	13.9	13.0	13.1	0.1
14	14.8	13.6	13.7	0.1
15	15.8	14.4	14.6	0.2
18	15.1	14.0	14.0	0.0
21	17.1	15.1	15.0	-0.1
23	16.4	15.0	14.9	-0.1
26	16.5	14.9	14.9	0.0
29	14.1	14.7	14.7	0.0
31	14.5	13.5	13.5	0.0
34	13.9	12.9	12.8	-0.1
35	12.2	11.6	11.6	0.0
36	14.5	13.5	13.5	0.0
38	13.9	13.0	12.9	-0.1
39	14.0	13.1	13.0	-0.1
41	14.6	13.9	13.9	0.0
42	14.7	14.0	14.1	0.1
45	14.6	13.6	13.6	0.0
46	14.4	13.3	13.5	0.2

Bold text denotes an exceedence of annual mean AQ Objective; n/a refers to exposure removed due to demolition

13.4.21 The results show that one receptor (receptor 10) is in exceedence of the annual mean PM_{10} AQO in the Base year; although there are no exceedences of the 24 hour mean PM_{10} AQO.

13.4.22 Concentrations of PM_{10} decrease between the Base year (2012) and the opening year (2018). There are no predicted exceedences in the DM and DS modelling scenarios, with a maximum predicted concentration at relevant exposure in DS of 15.0$\mu g/m^3$ at receptor 21. Further consideration of PM_{10} for impact significance is not required.

Significance

13.4.23 Significance is only considered at receptors where there are predicted to be exceedences of the AQOs with or without the proposed scheme in the opening year. Modelled receptor concentrations do not approach the PM_{10} AQOs, and as such, there are not considered to be any significant effects with respect to PM_{10}. The model results for NO_2 are summarised in Table 13.12 following the guidance in IAN174/13.

Table 13.12: Significance of Potential Impacts

Magnitude of Change in Annual Average NO_2 ($\mu g/m^3$)	Total number of Receptors with:	
	Worsening of air quality objective already above objective or creation of a new exceedence	Improvement of an air quality objective already above objective or the removal of an existing exceedence
Large (>4)	0	1
Medium (>2 to 4)	0	0
Small (>0.4 to 2)	0	0

13.4.24 It is concluded that there would be no significant impact to local air quality as a result of the proposed scheme in accordance with the approach set out in IAN 174/13, which states it is unlikely for a significant effect to occur if the AQO is not exceeded. Receptor 10 is the worst case receptor. All properties in the vicinity of this location are set back from the road or are first floor exposure only. As such, the predicted concentrations would be lower than at receptor 10. Conversely, Receptor 15 is predicted to experience a large increase in NO_2 concentration. However, there is no exceedence of an AQO and there is headroom (4.6 $\mu g/m^3$) below the AQO and therefore a significant impact is unlikely. .

13.4.25 It is predicted there are no annual mean NO_2 concentration exceedences in the Base 2012 model that are predicted to worsen with the proposed scheme in place. Predicted concentrations are well below the 1 hour AQO annual mean equivalent NO_2 exceedence threshold of 60$\mu g/m^3$, and thus, potential impacts on the 1 hour AQO are not significant.

13.4.26 It is predicted that the proposed scheme would result in the removal of an exceedence adjacent to the AQMA and a large magnitude improvement in local air quality is predicted to occur at this location. This is a considerable beneficial impact and in line with ACC's AQAP. The large magnitude increase in NO_2 concentration experienced at one receptor close to the new road junction does not lead to an AQO exceedence. Based on the guideline ranges in IAN 174/13, the proposed scheme would not cause a significant air quality effect.

13.4.27 Additionally, there are no Defra Compliance Road Links which are predicted to fail to comply with the EU Limit Value in the opening year. The Compliance Risk Assessment is presented in Table 11 of Appendix A13.1 (Air Quality Methodology). The proposed scheme is considered to be 'Low Risk' with respect to altering the UK's position on compliance with the EU Limit Values reported to the EC.

Operation: Regional Air Quality

13.4.28 All the roads within the study area have been included in the regional assessment and annual mass emissions using the traffic data provided, have been calculated for the opening (2018) and the design (2033) years using Defra's emission factor tool kit (v6.0.2) (Defra, 2014). The results are presented in Table 13.13.

Table 13.13: Annual Emissions of NO_x, PM_{10}, HC and CO_2

Pollutant	DM 2018	DS 2018	DS-DM	% Change between DM to DS	DM 2033	DS 2033	DS-DM	% Change between DM to DS
	tonnes/yr				tonnes/yr			
NOx	42.7	43.4	0.7	1.7	25.9	24.4	-1.5	-5.8
PM_{10}	4.3	4.2	-0.01	-0.1	4.7	4.7	0.0	-0.2
HC	2.6	2.6	0.04	1.7	2.7	2.6	-0.1	-4.8
CO_2	18,592	18,783	191	1.0	21,015	20,109	- 906	-4.3

13.4.29 It is predicted the proposed scheme would result in small increases in NO_x, HC and CO_2 in 2018 and a predicted overall reduction in annual emissions for all pollutants in 2033.

13.4.30 The proposed scheme is located at the junction of four arterial routes and immediately south of one of the three River Don crossings. Demand on the network is high and congestion is predicted to occur without the proposed scheme particularly in the design year (2033).

13.4.31 The predicted volume of traffic on the network in 2033 is higher than that in the opening year leading to longer journeys, more delays and more rat-running as a result, in the DM scenario. The proposed scheme will reduce congestion and rat-running and traffic will reroute accordingly.

13.4.32 Despite traffic growth of around 20% within the Regional Assessment study area between 2018 and 2033, NO_x emission factors are seen to reduce by 38% between 2018 and 2033 (2030 within the EFT). This brings a reduction in NO_x emissions in 2033. The offset of emission factor reduction over traffic growth is larger for NO_x due to the introduction of Euro VI/6 cars into the vehicle fleet. This is more prevalent in future years as the fleet mix alters. The influence of Euro VI/6 cars on other pollutants is less pronounced, as shown by the increases in emissions.

13.4.33 The potential impact of the proposed scheme is put into context by examining the change in pollutant concentrations as a proportion of the annual transport emissions for Aberdeen City. These have been obtained from the National Atmospheric Emissions Inventory, for the most recent published year 2010, with the exception of CO_2 (2008). Data for $PM_{2.5}$ and HC is unavailable. The results are presented in Table 13.14.

Table 13.14: Regional Emissions Contribution as a Percentage of ACC Annual Road Transport Emissions

Pollutant	ACC Annual Transport Emissions (tonnes/yr)	DS-DM (2018) (tonnes/yr)	DS-DM (2018) Change as % of ACC Annual Emissions	DS-DM (2033) (tonnes/yr)	DS-DM (2033) Change as % of ACC Annual Emissions
NO_X	877.5	0.7	0.1	-1.5	-0.2
PM_{10}	69.7	-0.01	0.0	-0.01	0.0
CO_2	325,020	191	0.1	-906	-0.3

13.4.34 The 2018 predicted annual mass emissions contributions with the proposed scheme in place, equates to 0.1% of ACC's annual road transport pollutant contribution. This is considered to be negligible. The predicted contribution to ACC's annual road transport emissions in 2033 is beneficial and indicates a reduction in contributions with the proposed scheme in place.

13.4.35 The Climate Change Act publishes budgets for the reduction of the emissions of greenhouse gases, with a view to achieving 42% reduction by 2020 and an 80% reduction by 2050. The change in greenhouse gas emissions are included in the Regional Assessment calculations. The proposed scheme is predicted to increase ACC's CO_2 emissions by 0.1% of the toal 2010 annual road emissions in the opening year (2018), and reduce emissions by -0.3% in 2033.

13.5 Mitigation

Construction Phase

13.5.1 Control measures for dust effects arising during construction can be very effective. In order to minimise any potential emissions of fugitive dust during the construction phase, and hence minimise potential impacts, the Construction Environmental Management Plan would adopt comprehensive measures to control fugitive dust. The DMP should include the following mitigation measures:

13.5.2 The following mitigation measures are 'highly recommended' measures for 'high risk' sites (i.e. the proposed scheme) as outlined by IAQM (2014). The highest level of risk is applied to a site, but

where specific construction activities have been identified to be of a lower risk level, the mitigation measures are tailored to reflect the risk level assigned, as presented in Table 13.8. In this case demolition and construction activities are described as medium and low risk respectively, for construction dust impacts. Where text is italicised, it is considered to be "desirable" for the equivalent risk level.

Communications (**Mitigation Item AQ1**):

- Develop and implement a stakeholder communications plan that includes community engagement before work commences.
- .Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the local authority. The level of detail would depend on the risk, and should include as a minimum the recommended measures as set out in this appendix. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM10 continuous monitoring and/ or visual inspections.

Site Management (**Mitigation Item AQ2**):

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.

Monitoring (**Mitigation Item AQ3**):

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning to be provided if necessary. When activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions increase the frequency of inspections.
- Carry out regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.
- Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the local authority. Where possible commence baseline monitoring at least three months before work commences on site, or if it is a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction (IAQM, 2012).

Preparing and maintaining the site (**Mitigation Item AQ4**):

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use intelligent screening where possible – e.g. locating site offices between potentially dusty activities and the receptors.
- Where appropriate, erect solid screens or barriers around the site boundary that are at least as high as stockpiles.
- Fully enclose site or specific operations so far as practicable where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean.

- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Depending on the duration that stockpiles would be present and their size - cover, seed, fence or water to prevent wind whipping.

Operating vehicle/machinery and sustainable travel (**Mitigation Item AQ5**):

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).

Operations (**Mitigation Item AQ6**):

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips.
- *Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.*
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management (**Mitigation Item AQ7**):

- Only use registered waste carriers to take waste off-site.
- Avoid bonfires and burning of waste materials.

Demolition (**Mitigation Item AQ8**):

- *Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).*
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- *Bag and remove any biological debris or damp down such material before demolition.*

Measures specific to earthworks (**Mitigation Item AQ9**):

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. Only remove the cover in a small area during work and not all at once.

Measures specific to construction (**Mitigation Item AQ10**):

- *Avoid scabbling (roughening of concrete surfaces) if possible.*
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Measures specific to track-out (**Mitigation Item AQ11**):

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use.
- *Avoid dry sweeping of large areas.*
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. This can be in the form of a static drive through facility or a manually operated power jet.
- *Access gates to be located at least 10m from receptors where possible.*

Operational Phase

13.5.3 No significant impacts are predicted during operation of the proposed scheme, and no mitigation is required.

13.6 Residual Impacts

Construction Impacts

13.6.1 With the implementation of appropriate dust control measures in place, the construction phase of the proposed scheme is predicted to cause no residual impacts through dust nuisance.

Operational Impacts

13.6.2 No significant residual operational phase impacts are predicted.

13.7 References

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14 Noise and Vibration

This chapter presents an assessment of the potential noise and vibration impacts of the proposed scheme. It outlines measures for mitigating these impacts and describes any residual impacts that may occur with mitigation in place. The assessment considers the potential impacts of the proposed scheme in terms of noise and vibration.

Consideration has been given to mitigation measures where the potential noise impact at sensitive receptors is assessed to be Moderate adverse or worse, while consideration has also been given to the absolute noise level at the receptor.

On scheme opening, with the proposed mitigation measures in place, there would be a total of 553 dwellings experiencing perceptible adverse noise impacts and 424 dwellings experiencing perceptible beneficial noise impacts. Two other sensitive receptors are expected to experience perceptible adverse noise impacts. 115 dwellings are predicted to experience Major adverse impacts, while 115 dwellings and 1 other sensitive receptor are predicted to experience Moderate adverse impacts. Major and Moderate beneficial impacts are predicted at 10 and 26 dwellings, respectively.

In the long-term (2033) daytime period, with the proposed scheme and mitigation measures in place, there would be a total of 927 dwellings experiencing perceptible adverse noise impacts and 15 dwellings experiencing perceptible beneficial noise impacts, which equates to a reduction of 312 and 6 dwellings, respectively, when compared to the situation without the scheme in place. 11 other sensitive receptors are predicted to experience perceptible adverse noise impacts, 2 fewer than predicted in the situation without the scheme in place.

In the long-term (2033) daytime period, with the proposed scheme and mitigation measures in place, there are predicted to be 158 and 40 dwellings experiencing Moderate and Major adverse impacts, respectively. This equates to a reduction in Moderate adverse impacts of 207, and an increase in Major adverse impacts of 40, when compared to the situation without the scheme in place. In terms of other sensitive receptors, one would be predicted to experience a Moderate adverse impact with the scheme and mitigation in place, four fewer than without the scheme in place. Long-term Moderate beneficial noise impacts, with the scheme and mitigation in place, are predicted at six dwellings, while none are predicted without the scheme in place.

The benefit of the acoustic barriers included within this assessment is evident in the long-term daytime noise impacts. Without mitigation in place, when compared to the Do-Minimum situation in 2033, the scheme would result in 66 additional dwellings experiencing long-term Major adverse noise impacts. With mitigation this would reduce to 40 dwellings, with a consequent increase of 18 dwellings affected by Moderate noise impacts.

For the long-term night-time period, with the proposed scheme and mitigation measures in place, most impacts at dwellings would fall into either the no change or Negligible impact categories. 16 dwellings are predicted to experience a perceptible adverse noise impact, of which four are predicted to experience a Major adverse noise impact. This equates to a reduction of 40 perceptible adverse impacts, of which none are predicted to be Major adverse impacts in the situation without the scheme in place.

In considering the overall effect of the scheme, this assessment shows that while there is an increase (40 dwellings) in Major adverse long-term daytime impacts, there is a large reduction (207 dwellings) in Moderate adverse long-term daytime impacts and as such it is considered that there would be an overall neutral long-term noise impact with the scheme in place when compared to the Do-Minimum situation. This is due to the transference of traffic from smaller local roads onto the A96 and A90 reducing local traffic congestion.

On scheme opening noise impacts within the Candidate Noise Management Areas (CNMAs) and Candidate Quiet Area (CQA) this assessment indicates a Moderate beneficial impact is predicted on Clifton Road (in Aberdeen Road CNMA 2), a Minor beneficial impact is predicted on North Anderson Drive (in Aberdeen Road CNMA 2) and a Minor adverse impact is predicted on Great Northern Road (in Aberdeen Road CNMA 3). In the long-term, with the proposed scheme in place, daytime and night time noise impacts within the CNMAs and CQA are predicted to be Negligible.

Significant noise and vibration effects are likely for the properties closest to the construction activities associated with the proposed road scheme.

14.1 Introduction

14.1.1 This chapter presents an assessment of the predicted construction and operational noise and vibration impacts of the proposed scheme. The chapter is supported by the following appendices, which are cross-referenced in the text where relevant:

- A14.1 (Noise and Vibration – Definitions).
- A14.2 (Results of Baseline Noise Monitoring).
- A14.3 (Assumed Construction Plant and Scenarios).
- A14.4 (Predicted Operational Noise Levels – with Mitigation).

14.1.2 Appendix A14.1 has been produced to aid the understanding of this chapter.

14.1.3 Noise in its widest sense can be defined as unwanted sound (as defined by BS4142:2014). In this assessment, any potential noise impacts would relate to changes in road traffic or would be associated with construction activities. Road traffic noise can be a source of complaint for people in their homes, their gardens and also outside in recreation areas. The impact upon other sensitive receptors and the enjoyment of these receptors is also important. While noise impacts derived from road traffic during operation of the scheme would continue in the long-term, any impacts associated with construction would cease at the end of the construction period.

14.1.4 Vibration comprises oscillatory waves that propagate from a source through either the ground or the air to adjacent buildings. Although there is no evidence that traffic induced airborne vibration could cause even minor damage to buildings, it could be a source of annoyance to local people, causing vibrations of doors, windows and, on occasions, floors of properties close to a route. Ground-borne vibration effects could potentially be produced during the construction phase if piling or compaction techniques are used in close proximity to receptors and could be the source of annoyance to local residents.

14.2 Approach and Methods

Policy and Guidance

14.2.1 The assessment of road traffic noise and vibration, and the selection of appropriate mitigation, was carried out according to established prediction and assessment methodologies that are governed or guided by the following key documents:

- DMRB Volume 11 Section 3 Part 7 (HD 213/11 – Revision 1), Noise and Vibration. This includes guidance on the assessment methods for noise and vibration from new highways. DMRB is adopted by Transport Scotland for new trunk road schemes, and has been considered the most appropriate guidance for the assessment of the proposed scheme. The latest revision, issued in November 2011 has been used in this assessment and is referred to as 'HD 213/11';
- DMRB Volume 11 Section 2 Part 5 (HA 205/08), Assessment and Management of Environmental Effects.
- Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988).
- 'Guidance for Possible Measures to Manage Noise from Road and Rail' (Scottish Government, undated).

14.2.2 The Environmental Noise Directive (END) 2002/49/EC provides the following objectives:

- to determine the noise exposure of the population by mapping;
- to make the information on environmental noise available to the public; and
- to establish action plans based on the mapping results to prevent and reduce environmental noise where necessary and to preserve environmental noise quality where it is good.

14.2.3 The Environmental Noise (Scotland) Regulations 2006 transpose the END in Scotland. The geographical scope for Transportation Noise Action Plans (NAP) is determined by the location of roads with more than six million vehicle passages a year. The A90/A96 Haudagain Improvement was included in the noise mapping exercise and subsequent NAP. Three Candidate Noise Management Areas (CNMA) and a single Candidate Quiet Area (CQA) have been identified within the noise model calculation area for this assessment, these being:

- Aberdeen Road CNMA 2, North Anderson Drive at Clifton Road, which is directly south of the existing Haudagain Roundabout;
- Aberdeen Road CNMA 3, Great Northern Road near Smithfield Lane, which is directly east of the existing Haudagain Roundabout;
- Aberdeen Road CNMA 7, North Anderson Drive at Laburnum Walk, which is approximately 1km south of the existing Haudagain Roundabout; and
- Aberdeen CQA 1, Playing Field at Laurel Drive, which is approximately 1.4km north-east of the existing Haudagain Roundabout.

14.2.4 Further details on how the obligations detailed in the END will be delivered by the Scottish Government and its partners are provided within the Aberdeen Agglomeration: Noise Action Plan. The NAP was developed to assist in the management of environmental noise within Aberdeen, from, amongst other sources, road traffic. The NAP also details the procedure adopted for the identification of CNMAs and CQAs, while also presenting the CNMAs and CQAs located within the Aberdeen Agglomeration. The NAP makes particular mention of the A90/A96 Haudagain Improvement scheme, stating that the scheme may have the potential to reduce noise levels in CNMAs.

14.2.5 The Noise Insulation (Scotland) Regulations 1975 set out criteria for the provision of secondary glazing to selected rooms in qualifying properties where noise increases above a threshold occur as a consequence of traffic levels associated with a road improvement scheme. Potential impacts, mitigation and residual impacts discussed within this chapter do not include the benefits of such secondary glazing, entitlement to which will be assessed as required by the legislation.

Consultation

14.2.6 The Principal Environmental Health Officer of Aberdeen City Council (ACC) was consulted at an early stage (August 2014) to agree suitable noise and vibration baseline monitoring locations and the assessment approach to be adopted. Following initial noise modelling and assessment, consultation was undertaken with ACC in December 2014 on the noise mitigation strategy to be adopted.

Study Area

Noise

14.2.7 The study area and calculation area for the noise assessment was determined in accordance with HD 213/11.

14.2.8 The study area is defined by the following process:

i) Identify the start and end points of the physical works associated with the road project.

ii) Identify the existing routes that are being bypassed or improved, and any proposed new routes, between the start and end points.

iii) Define a boundary one kilometre from the carriageway edge of the routes identified in (ii) above.

iv) Define a boundary 600m from the carriageway edge around each of the routes identified in (ii) above and also 600m from any other affected routes within the boundary defined in (iii) above. The total area within these 600m boundaries is termed the 'calculation area'. An affected route is where there is the possibility of a change of 1 dB $L_{A10,18hr}$ or more in the short-term or 3 dB $L_{A10,18hr}$ or more in the long-term.

v) Identify any affected routes beyond the boundary defined in (iii) above.

vi) Define a boundary 50m from the carriageway edge of the routes identified in (v) above.

14.2.9 Figure 14.1 presents the calculation area and study area as defined by the requirements of HD 213/11. HD 213/11 requires a qualitative assessment to be undertaken for sensitive receptors that are outside the calculation area but within 1km of the proposed scheme.

Vibration

14.2.10 The study area for the vibration assessment was defined as within 40m of all roads where noise level predictions were undertaken.

Traffic Data

14.2.11 Traffic data for the Annual Average Weekday Traffic (AAWT) between 06:00 – 00:00 (18hr) were provided for the following parameters for each road link for the baseline and future year scenarios:

(i) Total traffic flow (AAWT 18hr).

(ii) Percentage Heavy Duty Vehicles (HDV).

(iii) Vehicle speed (kmph).

14.2.12 Traffic data were extracted from the Aberdeen Access from the North (AAFN) Paramics models. These were used to provide traffic volumes for the 2012 base, the 2018 baseline year and the 2033 future assessment year. For the future years, traffic data were provided for the Do-Minimum and Do-Something scenarios. The base traffic model has been calibrated and validated against traffic count data, journey time surveys and queue length surveys.

14.2.13 Traffic growth in the models from 2012 to 2018 and 2033 has been determined using the regional Aberdeen Sub Area Model (ASAM4A) which is in turn informed by ACC's and Aberdeenshire Council's Local Development Plans. Included in the future year models are the Aberdeen Western Peripheral Route (AWPR) and the Third Don Crossing. It is anticipated that the Haudagain link road would provide a significant level of benefit to local arterial routes and the Third Don Crossing, as well as improving the operation of some local roads.

Identification of Noise and Vibration Sensitive Locations

14.2.14 HD 213/11 provides examples of sensitive receptors. These include dwellings, hospitals, schools, community facilities, designated areas (e.g. AONB National Park, SAC, SPA, SSSI, SAM) and public rights of way such as footpaths and cycle paths.

14.2.15 For the purposes of assessment, noise sensitive receptors were identified primarily using Ordnance Survey (OS) mapping.

14.2.16 While all sensitive receptors within the study area have been assessed in accordance with HD 213/11, a number of sample receptors (27 in total, as shown in Tables 14.1 and 14.2, and in Figure 14.1), including designated areas, have been selected for the purpose of discussion. These sample receptors are considered to have acoustic environments representative of those at other nearby receptors and they are located where people are particularly sensitive to noise and include dwellings close to the proposed scheme. Furthermore, locations have been selected where it has been anticipated that receptors have the potential to experience perceptible changes in noise level

following the introduction of the proposed scheme, including those on affected routes on the local road network.

Table 14.1: Sample Receptors

Receptor Number	Receptor Name	Location Description Relative to Scheme
1	18 MANOR DRIVE	Directly West of proposed scheme
2	8 MANOR DRIVE	Directly West of proposed scheme
3	1st FLOOR APARTMENT, 32 LOGIE AVENUE [represents 2 receptors]	Directly East of proposed scheme
4	GROUND FLOOR APARTMENT, 32 LOGIE AVENUE [represents 2 receptors]	Directly East of proposed scheme
5	1st FLOOR APARTMENT, 22 LOGIE AVENUE [represents 2 receptors]	Directly East of proposed scheme
6	2nd FLOOR APARTMENT, 22 LOGIE AVENUE [represents 2 receptors]	Directly East of proposed scheme
7	1st FLOOR APARTMENT, 26 MANOR AVENUE [represents 2 receptors]	Directly South-west of proposed scheme
8	2nd FLOOR APARTMENT 26 MANOR AVENUE [represents 2 receptors]	Directly South-west of Proposed scheme
9	1st FLOOR APARTMENT, 11 MANOR WALK [represents 2 receptors]	West of proposed scheme
10	19 MANOR WALK	West of proposed scheme
11	60 MANOR AVENUE	West of proposed scheme
12	454 CLIFTON ROAD	~700 m East of proposed scheme
13	108 WESTERN ROAD	~1.1km South-east of proposed scheme
14	27 HILTON ROAD	~1.3km South-east of proposed scheme
15	133 HILTON AVENUE	~1.2km South-east of proposed scheme
16	98 DON STREET	~1.4km East of proposed scheme
17	97 DON STREET	~1.4km East of proposed scheme
18	519 CLIFTON ROAD	~450m East of the proposed scheme

Table 14.2: Designated Areas

Receptor Number	Type	Receptor Name	Location Description Relative to Scheme
19	SM	Scheduled Monument (Aberdeenshire Canal remains of)	~1.0 km East of proposed scheme
20	Cycle Route	National Cycle Route (rec 1)	~1.0 km North-west of proposed scheme
21	CQA	CQA_Playing Field at Laurel Drive	~1.4 km North-east of proposed scheme
22	CNMA	619 CLIFTON ROAD, ABERDEEN [1st floor/ represents 4 receptors]	Directly East of proposed scheme
23	CNMA	563 NORTH ANDERSON DRIVE, ABERDEEN [1st floor/ represents 2 receptors]	Directly East of proposed scheme
24	CNMA	733 GREAT NORTHERN ROAD, ABERDEEN	East of proposed scheme
25	CNMA	756 GREAT NORTHERN ROAD, ABERDEEN	East of proposed scheme
26	CNMA	342 NORTH ANDERSON DRIVE, ABERDEEN	~1.0 km South of proposed scheme

Receptor Number	Type	Receptor Name	Location Description Relative to Scheme
27	CNMA	315, NORTH ANDERSON DRIVE, ABERDEEN	~1.0 km South of proposed scheme

SM Scheduled Monument
CQA Candidate Quiet Area
CNMA Candidate Noise Management Area

Assessment Methodology for Operational Noise and Vibration

Road Traffic Noise

14.2.17 Assessment of noise levels at various noise sensitive receptors has followed the Detailed Assessment methodology outlined in HD 213/11. Noise levels have been calculated at all dwellings and other sensitive receptors within the calculation area as defined in HD 213/11.

14.2.18 This assessment considers noise level changes at dwellings and other sensitive receptors according to their baseline noise levels. It should be noted that in this context, the baseline is considered to be the Do-Minimum (DM) scenario in the baseline year. The following comparisons are made:

- DM scenario in baseline year (2018) against DM in the future assessment year (2033);
- DM scenario in the baseline year (2018) against Do-Something (DS) scenario in the baseline year (2018); and
- DM scenario in baseline year (2018) against DS scenario in the future assessment year (2033).

14.2.19 The future assessment year is that defined as the year within the first 15 years of opening of the proposed scheme where traffic flows are greatest. The future assessment year is therefore usually the design year of the proposed scheme (15 years after opening), which in this assessment is 2033.

Night-time Assessment

14.2.20 Consideration has also been given to night-time noise levels in accordance with HD 213/11. The Transport Research Laboratory (TRL) Report *'Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping'* provides a method (Method 3), which has been adopted here, for converting predicted $L_{A10,18hr}$ road traffic noise levels into L_{night} road traffic noise levels. The method applies an appropriate conversion factor based upon the type of road under consideration, namely whether the road is either a motorway or a non-motorway.

14.2.21 For the night-time assessment, the following comparisons are made:

- DM scenario in baseline year (2018) against DM in the future assessment year (2033); and
- DM scenario in baseline year (2018) against DS in the future assessment year (2033).

Noise Model – Settings and Configuration

14.2.22 The CadnaA noise modelling package, which incorporates the methodology contained in the Calculation of Road Traffic Noise 1988 (CRTN), has been used. CRTN is a technical memorandum produced by the Department of Transport and Welsh Office, providing the definitive method of predicting road traffic noise in the United Kingdom.

14.2.23 Noise level predictions take account of typical weekday volumes of traffic during the eighteen hour period from 6am to midnight (18-hour AAWT flows), and the following variables:

- percentage of Heavy Duty Vehicles (HDVs) (defined as having an unladen weight of >3.5 tonnes);

- traffic speeds;
- road gradient;
- local topography;
- nature of the ground cover between the road and the receptor (namely whether it is acoustically absorptive or reflective);
- shielding effects of any intervening structures, including allowances for limited angles of view from the road and any reflection effects from relevant surfaces; and
- road surfacing type.

Road surfacing

14.2.24 The surfaces of all existing roads and the proposed scheme have been assumed to be bituminous, with a texture depth of 2mm, within the noise modelling scenarios.

Traffic speeds

14.2.25 In line with HD 213/11, a minimum traffic speed of 20km/h is used in the noise model where the traffic model predictions provide speeds less than this.

Traffic flows

14.2.26 Some roads in the vicinity of the scheme and on the wider road network have AAWT,18 hour flows of less than 1000 vehicles. CRTN advises that predictions made using flows of less than 1000 vehicles may lead to errors. Nevertheless, CRTN does state that calculations can be undertaken for such flows for the purpose of assessing changes in noise levels. An alternative approach would be to assume zero flow where modelled vehicle flows are below 1000 vehicles; however, this will tend to underestimate the contribution from the road link in the noise predictions. Conversely, assuming a 1000 vehicle flow where vehicle flows are below 1000 vehicles would tend to overestimate the contribution from the road link in the noise predictions. Therefore, on balance, it is considered that using the actual flows in the prediction process provides the most appropriate approach.

Sensitive Receptors

14.2.27 Identification of sensitive receptors is based on Ordnance Survey (OS) MasterMap data. The heights of buildings within the noise model have been estimated using available online mapping. Two storey high buildings are assumed to be 7m. In general, building height increases by 2.5m per storey. A total of 10,989 receptor points representing residential receptors have been included within the Calculation Area, representing a total of 11,215 individual dwellings, while 75 other sensitive receptors have been included in the Calculation Area.

14.2.28 The noise model receptor heights have been assumed to be 1.5m for bungalows, and where applicable churches, schools, parks, doctor's surgeries and other ground floor level receptors. A receptor height of 4m has been assumed for all two-storey or taller properties. Noise predictions at three, or more, storey properties, i.e. residential apartment blocks (namely those close to the proposed scheme) have generally been made at multiple heights.

14.2.29 Where applicable, noise levels at sensitive receptors have been predicted at a distance of 1m from the most exposed façade and include a 2.5 dB façade correction. Noise levels for sensitive receptors positioned in open spaces and for the night-time period are free-field.

Noise Assessment and Mitigation Approach

14.2.30 In accordance with HD 213/11, for open space sensitive receptors, such as parks and other recreational areas, a representative position in close proximity to the nearest main road where the public could potentially be exposed to traffic noise has been selected.

14.2.31 The general approach to EIA requires the identification of impact significance taking into account the value or sensitivity of receptors and the magnitude of impact. However, as discussed in paragraph 3.36 of HD 213/11, in terms of road traffic noise, a standard methodology has not yet been developed to assign a significance according to both value/sensitivity and magnitude. This chapter therefore presents the assessment findings for operational noise in terms of impact magnitude only.

14.2.32 Section 3 of HD 213/11 provides guidance on the magnitude of impacts for traffic noise. Magnitude of impact is considered for both the short-term and long-term. A change in road traffic noise of 1 dB(A) in the short-term (for example when a project is opened) is the smallest that is considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible. The classification of noise impact magnitude is as detailed in Tables 14.3 and 14.4.

Table 14.3: Classification of Magnitude of Short-term Noise Impacts

Noise Change (LA10,18hr)	Magnitude of Impact
0.0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 14.4: Classification of Magnitude of Noise Impacts in the Long-term

Noise Change (LA10,18hr)	Magnitude of Impact
0.0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

14.2.33 For the assessment of night-time noise impacts, HD 213/11 advises that until further research is available, only noise impacts in the long-term should be considered. Therefore, the classification in Table 14.4 is used in this assessment for determining night-time noise impacts. In addition, HD 213/11 advises only those sensitive receptors predicted to be subject to noise levels exceeding 55 dB $L_{night,outside}$ should be considered.

14.2.34 Consideration has been given to mitigation measures where the potential noise impact at sensitive receptors is Moderate or worse. Hence, if there is a 3 dB increase in the short term or 5 dB increase in the long-term, mitigation measures were considered. This is consistent with the Technical Advice Note Assessment of Noise (TAN) where mitigation measures have been considered where the noise impact is deemed to be Moderate/Large or worse.

Ground Borne Vibration

14.2.35 HD 213/11 advises that should the level of vibration at a receptor be predicted to rise to above a level of 0.3mm/s, or an existing level above 0.3mm/s is predicted to increase, then this should be classed as an adverse impact from vibration.

14.2.36 The closest residential properties to the proposed scheme, which would have the potential to be exposed to the highest level of ground borne vibration are as follows:

- The apartments at 32 Logie Avenue – 12m from the proposed scheme;
- 1 and 3 Manor Avenue – approx. 14m from the Proposed scheme;
- The apartments at 1 Logie Gardens – 15m from the proposed scheme; and
- 551 and 553 North Anderson Drive – approx. 20m from the proposed scheme.

14.2.37 HD 213/11, paragraph A5.26 states "significant ground borne vibrations may be generated by irregularities in the road surface. Such vibrations are unlikely to be important when considering disturbance from new roads and the assessment will only be necessary in exceptional circumstances."

14.2.38 Further to this, Figure 3 from "*TRRL Report No RR53 – Ground Vibration Caused by Civil Engineering Works*" provides a summary of measurements taken by the TRRL, which indicates the relative effects of various construction related sources. This figure indicates that, for a heavy lorry on a poor road surface at 4m, a PPV of 0.3mm/s would be expected.

14.2.39 Given the distances between the nearest sensitive receptors and the proposed scheme, ground borne vibration is not considered to be a significant issue for properties close to the new road. However, there is still the potential for adverse ground borne vibration impacts at properties close to existing roads. Where sensitive properties along existing roads are predicted to experience noise increases as a result of the proposed scheme, and where the properties are within 4m of an existing road, there is the potential for ground borne vibration impacts.

14.2.40 Very few sensitive properties are located within 4m of an existing road or the proposed scheme. However, examples of areas where a small number of sensitive properties are located within, or very close to, 4m of an existing road include:

- properties on Anderson Road – directly east of the proposed scheme;
- properties on Western Road and Grandholm Street – at the eastern edge of the noise modelling Calculation Area;
- properties on Auchmill Terrace – at the western edge of the noise modelling Calculation Area; and
- properties on Fairview Grange – at the northern edge of the noise modelling Calculation Area.

14.2.41 It should be noted that noise change attributable to the proposed scheme, in both the baseline and future assessment years, in each of the above areas are predicted to be negligible and imperceptible.

14.2.42 The largest increases in noise level that can be attributable to the proposed scheme can generally be found at sensitive receptors directly west of the scheme, on roads such as Manor Walk and Manor Avenue, as well as those properties close to the proposed scheme. No properties fronting onto roads in these areas have been identified as being within 4m of an existing road or the proposed Link Road. As such, the likelihood of adverse ground borne vibration impacts as a result of the proposed scheme is considered to be low.

Vibration Nuisance

14.2.43 Where properties are within 40m of the carriageway, HD 213/11 recommends that, for a given level of noise exposure, the percentage of those 'bothered' by airborne vibration is 10% lower than the corresponding figure for noise nuisance derived from tables contained within HD 213/11. Where noise levels are below 58 dB $L_{A10,18hr}$, it should be assumed that residents would not be 'bothered' by vibration. Consideration has been given to changes in airborne vibration nuisance at all dwellings within 40m of roads where noise level predictions have been undertaken.

Assessment Methodology for Construction Noise and Vibration

Noise

14.2.44 Disruption caused during the construction phase of the proposed scheme has the potential to affect residents and other sensitive receptors adjacent to the works. HD 213/11 advises on the use of BS 5228 to assess and control noise and vibration from construction activities.

14.2.45 BS 5228-1: 2009+A1:2014 contains details of construction noise prediction methods and noise levels from different types and sizes of construction equipment. It contains a database on the noise emission from individual items of equipment and activities and routines to predict noise from demolition and construction methods. The standard also suggests practical ways to mitigate excessive noise.

14.2.46 BS 5228-1: 2009+A1:2014 provides two methodologies for the prediction of noise significance during typical construction works, based upon noise change and existing measured ambient noise levels. As there are both residential properties and other sensitive receptors (such as the CQA) in the vicinity of the proposed scheme, consideration has been given to Method 2, as Method 1 only applies for residential properties.

14.2.47 The CadnaA noise prediction software programme has been used in calculating construction site noise using the methodology set out in BS 5228-1:2009+A1:2014. CadnaA has been used in this assessment to predict the noise levels associated with the construction activities associated with the worst-case construction activities.

14.2.48 At this time the a Contractor has not been appointed, and therefore the approach and phasing of construction is not certain. As such, based on professional experience, an assessment of what are typically considered worst-case construction activities have been undertaken, these being:

- earthworks and drainage;
- demolition works; and
- piling.

14.2.49 It has been assumed that all construction activities would take place between 0700 and 1900, Monday to Friday, and between 0700 and 1600 on Saturdays. No Sunday working is anticipated.

14.2.50 The variables considered in the construction noise modelling calculations comprise:

- plant type and location;
- operating times;
- local topography;
- nature of the ground cover between the site and the receptor; and
- shielding effects of any intervening structures, including allowances for limited angles of view.

14.2.51 Construction plant information, as set out in Appendix A14.3 (Assumed Construction Plant and Scenarios), together with an indicative construction works programme formed the basis of the assessment. Construction plant noise levels used in this assessment have been taken from the current sound level data presented in Annex C of BS 5228-1:2009+A1:2014.

14.2.52 Three construction noise models were created within the CadnaA noise modelling package, to represent the piling scenario, earthworks and drainage scenario and the demolition scenario. The plant noise sources (as shown in Appendix A14.3: Assumed Construction Plant and Scenarios), with the exception of the vehicles on haul routes, were all located in the same position, which was selected to represent the central point within a working area. A total of four working areas were demarcated in both the earthworks and drainage model and the demolition model, these being in the south-eastern, south-western, central and northern areas of the proposed scheme. Haul routes were created to service each of the four working areas. A piling noise model considered impacts at properties close to the southern side of the SUDS basin.

14.2.53 Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from construction noise alone, for the daytime, evening and night-time periods respectively. This applies for a duration of one month or more, unless works for a shorter duration are likely to result in a significant effect.

The evaluation criteria are generally applicable for residential housing, hotels and hostels, buildings in religious use, schools and health or community facilities.

Vibration

14.2.54 BS 5228-2:2009:A1:2014 contains guidance on vibration levels in structures from construction works. It provides a prediction methodology for mechanised construction works, such as compaction and tunnelling works, and piling activities. The standard also presents guidance for the control of vibration from construction works.

14.2.55 BS 5228-2:2009:A1:2014 provides guidance on the human response to vibration in buildings. For construction works, the guidance contained in Table 14.5 is provided:

Table 14.5: Guidance on the Human Response to Vibration levels from BS5228-2:2009:A1: 2014

Vibration Level	Effect
0.14 mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might just be perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments would cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10.0 mm/s	Vibration is likely to be intolerable for any more than very brief exposure to this level.

14.2.56 For building structure response, BS 5228-2:2009:+A1:2014 reproduces the advice given in BS 7385-2: 1993 - *Evaluation and measurement for vibration in buildings: guide to damage levels from ground borne vibration*. The response of a building to ground borne vibration is affected by the type of foundation, underlying ground conditions, the building construction and the state of repair of the building. Table 14.6 reproduces the guidance detailed on building classification and guide values for cosmetic building damage.

Table 14.6: Guidance on the Effects of vibration Levels on Building Structures from BS 5228-2:2009:A1: 2014

Type of Building	PPV in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50 mm/s	50 mm/s
Industrial and heavy commercial buildings		
Un-reinforced or light framed structures	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Residential or light commercial buildings		

Note 1 Values referred to are at the base of the building.

Note 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

14.2.57 Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 14.6, with major damage at values greater than four times the values in the table. BS 7385-2: 1993 also notes that the probability of cosmetic damage tends towards zero at 12.5mm/s peak component particle velocity.

Baseline Conditions

14.2.58 Baseline operational road traffic noise levels within the Calculation Area were predicted using the noise model for the DM baseline year (2018) traffic scenario, as required by HD 213/11, paragraph 3.8. It should be noted that baseline sound levels relevant to the construction noise assessment would be those for the year preceding the year of opening, however for the purpose of this assessment the DM baseline year road traffic model has been taken as providing a reasonable proxy for the actual year of construction. The CRTN prediction method provides noise forecasts under consistent scenarios, i.e. not subject to daily variations in traffic flow or meteorological variations that would affect propagation scenarios. The CRTN procedure assumes a moderately

adverse wind scenario; that is with the wind blowing from the source to the receiver (as described in CRTN paragraph 4).

14.2.59 A baseline sound level monitoring survey of the area surrounding the proposed scheme was undertaken, and is described in detail below. The baseline survey demonstrated that the acoustic environment is considered to be generally dominated by traffic noise, though in some locations there may be significant contributions from other noise sources, including aircraft noise.

Noise Measurement Survey

14.2.60 A baseline noise survey was conducted to establish existing noise levels at representative sensitive locations close to the proposed scheme. This included long-term surveys over two days at two locations and short-term attended surveys at five locations in accordance with the CRTN shortened measurement procedure.

14.2.61 The results from the noise surveys have been used to verify the results of the noise modelling exercise and have been used within the construction noise assessment, as appropriate.

14.2.62 The survey methodology and results are presented in Appendix A14.2 (Results of Baseline Noise Monitoring), while the survey locations are illustrated in Figure 14.1.

Limitations to Assessment

14.2.63 As discussed in 14.2.25, roads with low traffic flows (AAWT,18hr flows <1000) would have an effect on the reliability of the assessment. However, such roads have all been modelled with their actual flow. This is considered the most robust approach and allows for the performance of mitigation measures, in the form of noise barriers, to be more appropriately considered.

14.2.64 Traffic data are fundamental to predicting noise levels. Traffic flow, composition and speed data all contribute in calculating noise levels. Traffic data have been provided for the year of opening (2018) (baseline year) and future assessment year (2033) for the DM and DS scenarios.

14.2.65 It is considered that all data inputs for this assessment are of an adequate level to support a 'Detailed' level of assessment as defined in HD 213/11.

14.2.66 It should also be noted that the assessment of residual impacts does not take account the potential changes to the baseline conditions which may take place in the future, for example development to Middlefield Regeneration Area which is identified in the Aberdeen Local Development Plan 2012, and which may require demolition of a number of properties that are identified as receptors in the assessment.

14.3 Baseline Conditions

14.3.1 Short-term baseline sound level monitoring was undertaken at five locations close to the proposed scheme, whilst long-term baseline monitoring was undertaken at a further two locations. Short-term monitoring was undertaken following the 'Shortened Measurement Procedure' detailed within CRTN, and involved an attended survey, during which comments regarding dominant sources of sound were noted. Long-term monitoring was unattended and was undertaken over a three day period. The results of the noise survey are detailed in Appendix A14.2 (Results of Baseline Noise Monitoring) and summarised in Table 14.7.

Table 14.7: Measured Baseline Weekday Sound Levels

Monitoring Location	Time	Measured Baseline Sound Levels (dB)			
		$L_{Aeq,T}$	L_{Amax}	$L_{A10,T}$	$L_{A90,T}$
ST1 Green Space opposite 3 Logie Terrace [1)]	14:00-17:00	60	78	63 (62)	50
ST2 Grass verge opposite	13:30-16:30	59	75	62 (61)	52

Monitoring Location	Time	Measured Baseline Sound Levels (dB)			
		$L_{Aeq,T}$	L_{Amax}	$L_{A10,T}$	$L_{A90,T}$
548 Clifton Road [2]					
ST3 49/ 51 Manor Avenue	13:58-16:58	61	75	66 (65)	51
ST4 Grass Verge opposite Logie Place, between 10 and 16 Logie Avenue [3]	10:00-13:00	56	74	58 (57)	52
ST5 Centre of grass verge on Logie Gardens [4]	10:00-13:00	53	70	54 (53)	48
LT1 12 Manor Drive	07:00-19:00	55	77	54	44
	19:00-23:00	50	73	50	39
	23:00-07:00	46	66	43	33
	06:00 to 24:00	-	-	52	-
LT2 17 Logie Place	07:00-19:00	54	76	55	47
	19:00-23:00	50	72	50	42
	23:00-07:00	46	63	44	36
	06:00 to 24:00	-	-	53	-

Note 1 Sound level monitoring undertaken between Wednesday 24 and Friday 26 September 2014.

Note 2 Free-field sound pressure levels presented.

Note 3 L_{A10} sound levels in parentheses are derived 18-hour (06:00 to 24:00) weekday noise levels.

1) 15-minute period between 16:15 and 16:30 affected by member of public shouting into microphone. This period has been omitted from the averages presented within the table.

2) 15-minute period between 15:30 and 15:45 affected by children shouting close to microphone. This period has been omitted from the averages presented within the table.

3) Two 15-minute periods between 10:45 and 11:00, and between 11:15 and 11:30, were affected by the microphone blowing over due to a strong gust of wind and voices of nearby members of the public. These measurement periods have been omitted from the averages presented above.

4) 15-minute period between 12:15 and 12:30 affected by a car idling close to microphone. This period has been omitted from the averages presented within the table.

14.3.2 The short-term surveys were conducted between Wednesday 24 to Friday 26 September 2014, with ST1 (Green space opposite 3 Logie Terrace) undertaken between 14:00 and 17:00, ST2 (Grass verge opposite 548 Clifton Road) undertaken between 13:30 and 16:30, ST3 (49/51 Manor Avenue) undertaken between the hours of 13:58 and 16:58, while ST4 (grass verge on Logie Place) and ST5 (grass verge on Logie Gardens) surveys were undertaken between 10:00 and 13:00. The weather was dry and overcast with slight to moderate wind, while the ST4 monitoring location had occasional strong gusts of wind.

14.3.3 The long-term surveys were conducted between Wednesday 24 and Friday 26 September 2014. The LT1 (12 Manor Drive) survey started at 13:29 on 24 September and finished at 13:10 on 26 September. LT2 (17 Logie Place) started at 13:06 on 24 September and finished at 12:53 on 26 September. The weather conditions were dry and overcast, with slight to moderate wind present. For both long-term and short-term surveys, no drift in calibration was noted at any of the monitoring locations.

14.3.4 The dominant sources of sound differ between the survey locations; however aeroplane and helicopter movements, dogs barking, and passing traffic (cars, buses, vans, and HGVs), were common between the locations. The volume of road traffic noted at each of the survey locations differed markedly. The sources of sound noted at each monitoring location included:

- ST1 – Light and steady road traffic was observed at this location, while additional observed sources of noise included voices, idling traffic, a loud car horn, a distant power washer and the sound of a distant siren.
- ST2 – Audible sources of sound included road traffic noise, the noise of distant sirens, voices and the sound of children playing nearby.

- ST3 – Light traffic was observed along Manor Avenue during the survey but was not considered to dominate the acoustic environment; additional sources included a lawn mower in a neighbour's rear garden, the loud noise of an engine from a reversing vehicle and a car starting beside the SLM.
- ST4 – Steady traffic on the A90 (east of the monitoring location) was observed during the survey and was considered fairly dominant throughout the survey; additional sources included the noise of revving engines and 'bangs' from HGVs on the A90..
- ST5 – Traffic noise was audible but not a dominant noise source at this location. Audible sources of sound included a distant lawn mower, voices, a school bell, distant sirens, birdsong, and a bin lorry.
- LT1 – Local road traffic noise, and distant road traffic noise from the A90 and A96, dominated at this monitoring location.
- LT2 – Local road traffic noise, and distant road traffic noise from the A90 and A96, dominated at this monitoring location.

14.3.5 It is considered that the data collected during the baseline sound level monitoring survey is representative of the existing acoustic climate, though it should be used with caution due to the gusts noted on Friday 26 September.

Comparison of Reference Case Noise Model against Measured Baseline Sound Levels

14.3.6 Comparison of noise model prediction outputs (Do-Minimum 2018) against measured baseline sound levels has been made.

14.3.7 Table 14.8 provides a comparison between predicted (DM18) road traffic noise levels and measured baseline sound levels ($L_{A10,18hr}$).

Table 14.8: Comparison between Predicted DM18 Noise Levels and Measured Baseline Sound Levels

Monitoring Location	Predicted free-field DM18 Noise Level, $L_{A10,18hr}$	Measured Baseline Sound Level, $L_{A10,18hr}$	Difference (dB)
ST1 Green Space opposite 3 Logie Terrace	57	62	-5
ST2 Grass verge opposite 548 Clifton Road	55	61	-6
ST3 Manor Avenue	60	65	-5
ST4 Grass Verge opposite Logie Place, between 10 and 16 Logie Avenue	56	57	-1
ST5 Centre of grass verge in Logie Gardens	48	53	-5
LT1 12 Manor Drive	50	52	-2
LT2 17 Logie Place	48	53	-5

14.3.8 Table 14.8 demonstrates that measured baseline sound levels exceed the road traffic noise levels predicted within the DM 2018 noise model. This is not uncommon, and can often be attributed to additional sound sources (such as birdsong, children playing, and other non-road traffic related sounds) that are not accounted for within the road traffic noise model. Weather conditions during the survey could also be responsible for some variation between measured and predicted noise levels.

14.3.9 The differences between the measured and predicted baseline levels at ST4 and LT1 show a strong correlation, though the variations shown at ST1, ST2, ST3, ST5 and LT2 (where measured levels are all 5 to 6 dB higher than predicted) are more pronounced. For the reasons discussed

above, all of the predicted noise levels are between 1 and 6 dB below the corresponding measured noise levels, and within the range of variation that would not be uncommon for this type of exercise.

Measured Baseline Sound Levels for use in Construction Noise Impact Assessment

14.3.10 For the purposes of the construction noise assessment, potential impacts are predicted in relation to the DM scenario in 2018, which are the predicted noise levels immediately before the change produced by the proposed scheme. As previously discussed, the baseline sound levels relevant to the construction noise assessment would be those for the year preceding the year of opening, however for the purpose of this assessment the DM baseline year road traffic model has been taken as providing a reasonable proxy for the actual year of construction

14.3.11 The baseline road traffic noise predictions are supplemented by both the long and short-term sound level monitoring data. The results gathered during the baseline monitoring exercise have been used to provide baseline data for use in the construction noise assessment, where appropriate.

14.3.12 In summary, it is considered that the data collected during the baseline sound level monitoring survey demonstrates a level of consistency with the predicted road traffic noise levels that would be expected for this type of validation exercise. As such, the noise models that have been created for the assessment of operational noise and vibration impacts, along with the worst-case construction noise impacts, resulting from the proposed scheme are suitable and can be relied upon to provide an accurate assessment of impact.

14.4 Potential Impacts

Construction

14.4.1 There are a number of receptors in very close proximity to the proposed scheme and the associated construction works.

14.4.2 There are a number of activities associated with the construction works that may result in an impact on nearby receptors. This assessment has been undertaken with reference to available information on likely construction works and programming, as set out in Appendix A14.3 (Assumed Construction Plant and Scenarios). Given the level of information currently available, the construction noise and vibration assessment should be considered indicative at this stage.

14.4.3 For the purposes of this assessment it is assumed that the majority of construction works would normally take place between 07:00 - 19:00 Monday to Friday and 08:00 to 16:00 on Saturday.

14.4.4 Table 14.9 details the three worst-case construction scenarios considered.

Table 14.9: Construction Scenarios

Scenario	Construction Activity
Demolition	Demolition and excavation of building structures and roads.
Earthworks and Drainage	Creation of project designed earthworks and preparation and installation of drainage systems.
Piling	Vibratory sheet piling north of properties on Logie Avenue at the southern side of the SUDS basin.

Construction Noise Impacts

Demolition and Earthworks/ Drainage Activities

14.4.5 Using the indicative construction activities and plant contained in Appendix A14.3 (Assumed Construction Plant and Scenarios), construction noise levels have been predicted at the closest representative receptors to the site of the proposed construction activities.

14.4.6 The noise predictions take into account plant specification details, plant numbers, expected daily operating times of each plant, distance of plant to the receptors, and ground topography. The noise model assumes typical locations for activities working simultaneously.

14.4.7 Predicted construction noise levels are compared against baseline ambient noise levels ($L_{Aeq,T}$). Where feasible, baseline noise levels have been derived from measurements, and as such include contributions from other sources of sound within the acoustic environment, and are not restricted to road traffic noise. Where this has not been possible, baseline levels have been derived from the daytime predicted $L_{A10,18hr}$ road traffic noise levels using conversion Method 3 of the TRL report *'Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping'*.

14.4.8 Paragraph 14.2.52 details the construction noise assessment method guidance given within BS5228-1+A1:2014, as has been considered in this assessment. Table 14:10 presents alternative permissible construction noise thresholds used on another recent Transport Scotland highways scheme in the Aberdeen area. It should be noted that the highest pre-construction ambient noise level recorded in this assessment is 66 dB(A) at 839 Great Northern Road (see Table 14.11), which would equate to a weekday daytime noise limit of 75 dB(A), as per the criteria presented within Table 14.10.

Table 14.10: Example Permissible Construction Noise Limits for TS Highway Scheme in Aberdeen

Typical Pre-Construction Ambient Noise as appropriate	Weekday working Monday to Friday excluding Public Holidays							
	Day (07.00-19.00) *$L_{Aeq,12hr}$	L_{Amax} (Fast)	Evening (19.00-22.00) *$_{LAeq,3hr}$	L_{Amax} (Fast)	Night Hours (23.00-07.00) *$L_{Aeq,8hr}$	Saturday (08.00-13.00) *$L_{Aeq,\ 5hr}$	L_{Amax} (Fast)	Sunday and public holidays
35	65	86	55	65	Given on request	65	86	Given on request
40	65	86	55	65		65	86	
45	65	86	60	70		65	86	
50	70	92	60	70		70	92	
55	75	96	65	75		75	96	
60	75	96	65	75		75	96	
65	75	96	65	75		75	96	
70	80	101	80	90		80	101	
75	80	101	80	90		80	101	

14.4.9 Table 14.11 presents the predicted noise impacts at the nearest, and most significantly impacted, receptors to the proposed scheme as a result of the demolition and earthworks/ drainage related construction activities.

Table 14.11: Predicted Construction Noise Levels

Receptor	DM18 Predicted Noise Level, L_{day}	Location of construction activities [1)]	Predicted Noise Level, L_{Aeq} dB					
			Demolition			Earthworks and Drainage		
			A	B	Change	A	B	Change
Caravan on Manor Drive	57.6	N	81.6	81.6	24.0	74.3	74.4	16.8
1 Logie Gardens	56.0[2]	C	87.8	87.8	31.8	81.5	81.5	25.5
10 Logie Avenue	59.0[3]	SE	88.6	88.6	29.6	81.6	81.6	22.6
16 Manor Drive	58.0[4]	N	80.1	80.1	22.1	77.1	77.2	19.2
19 Manor Drive	59.1	N	83.4	83.4	24.3	77.8	77.9	18.8
24 Manor Avenue	51.3	SE	82.8	82.8	31.6	77.0	77.0	25.8
25 Logie Avenue	56.0[2]	N	78.1	78.1	22.1	74.5	74.6	18.6

Receptor	DM18 Predicted Noise Level, L_{day}	Location of construction activities [1)]	Predicted Noise Level, L_{Aeq} dB					
			Demolition			Earthworks and Drainage		
			A	B	Change	A	B	Change
28 Manor Avenue	50.4	SW	84.7	84.7	34.3	77.2	77.2	26.8
3 Logie Terrace	62.0	SW	81.1	81.2	19.2	75.9	76.1	14.1
30 Manor Avenue	55.1	SW	92.8	92.8	37.7	83.4	83.4	28.3
31 Manor Avenue	64.0[5]	SE	82.0	82.1	18.1	76.7	76.9	12.9
32 Logie Avenue	50.8	N	88.4	88.4	37.6	84.3	84.3	33.5
430 Auchmill Road	60.7	N	81.7	81.7	21.0	74.6	74.8	14.1
65 Manor Avenue	64.0[5]	SW	83.3	83.4	19.4	77.3	77.5	13.5
7 Manor Drive	58.7	SW	78.0	78.1	19.4	72.5	72.7	14.0
8 Manor Drive	58.0[4]	C	78.2	78.2	20.2	72.8	72.9	14.9
839 Great Northern Road	66.2	N	80.0	80.2	14.0	72.9	73.7	7.5

1) Construction activities were spread around the construction site, with scenarios created towards the south-east, south-west, centre and north of the site. The highest predicted construction noise levels, i.e. those predicted from the worst-case scenario of the four considered, have been presented.

2) Measured daytime baseline sound level at nearest baseline monitoring location, ST5.

3) Measured daytime baseline sound level at nearest baseline monitoring location, ST4.

4) Measured daytime baseline sound level at nearest baseline monitoring location, LT1.

5) Measured daytime baseline sound level at nearest baseline monitoring location, ST3.

A Denotes the predicted construction façade noise level, dB(A).

B Denotes combined DM18 predicted or derived facade noise levels and predicted construction façade noise level, dB(A).

14.4.10 The construction noise assessment clearly demonstrates the potential for significant impacts at nearby sensitive properties during earthworks and drainage activities and demolition. Of particular note is the predicted noise level of 93 dB (A) at the 30 Manor Avenue receptor. This noise level is well in excess of the 65 dB threshold for significant daytime effects at this receptor, while also exceeding the permissible construction day, evening and Saturday noise limits presented within Table 14.10. At this stage a construction contractor has not been appointed, and as such no assumptions have been made here as to the phasing of construction activities.

14.4.11 Baseline sound levels are likely to be even lower on Saturday, which is a more sensitive period. As such there is a strong likelihood for increased adverse noise impacts during Saturday construction activities than those shown above.

14.4.12 A detailed assessment of construction noise impacts would be undertaken by the appointed construction contractor once a construction strategy has been designed, thereby allowing more accurate construction noise predictions to be made. At which point impacts, effects and mitigation options would be considered in more detail.

Vibratory Sheet Steel Piling

14.4.1 Piling can be a significant source of noise and vibration impact during construction. At this stage it is anticipated that piling may be required for construction of the drainage connection to Scatter Burn and the southern side of the SUDS basin, but would generally be undertaken at distances of 20m or more from the nearest sensitive receptors. Piling is likely to come into its closest proximity to sensitive properties when undertaken along the southern side of the SUDS basin. During this period plant associated with the piling activity would be approximately 20m from No. 32 and 30 Logie Avenue. Existing baseline noise levels in this location have been derived from predicted noise levels, and are shown to in the order of 53 to 57 dB $L_{Aeq,16hr}$, as a result of road traffic noise alone.

14.4.2 An indicative assessment of potential noise and vibration impacts resulting from piling has been undertaken. For the purposes of this assessment it has been assumed that a vibratory piling rig would be used.

14.4.3 Noise levels at the nearest sensitive receptors, No. 32 and 30 Logie Avenue, are predicted to be in the order of 84 dB(A) at the façade of the properties. Such noise levels are likely to exceed existing ambient noise levels by in the order of 27 to 31 dB(A), and would exceed the construction noise limits given in BS 5228: 2009+A1:2014 and those presented in Table 14.10.

Construction Vibration Impacts

14.4.4 Construction activities proposed which have the potential to give rise to largest levels of vibration at receptors would be associated with vibratory earthwork compacting works and vibratory sheet steel piling works .

14.4.5 A number of dwellings are within 10m of either the earthworks associated with the proposed scheme or properties that have been identified for demolition, these include:

- Several properties on Logie Avenue.
- Several properties on Manor Avenue.
- 14 Logie Place.

14.4.6 Such properties have been identified as being particularly susceptible to vibration impacts associated with construction activities, with 24 Manor Avenue being particularly at risk during the demolition of the neighbouring property (22 Manor Avenue), for example.

Vibration Compaction

14.4.7 Predicted vibration levels from the operation of vibration compaction plant are presented in Table 14.12. In view of the large number of receptors likely to be impacted by the vibratory compaction activities, predictions have not been provided for specific sensitive receptors. Instead vibration levels at different distances from the compaction activities have been provided. This indicative assessment can be used to help inform the Contractor of where construction vibration impacts, during vibratory compaction, may become significant.

14.4.8 Annex E to BS 5228-2:2009+A1:2014, provides guidance on the prediction of ground-borne vibration for compaction activities. It is assumed that the vibratory rollers would have two vibrating drums, with a drum width of 1m and a maximum amplitude of drum vibration of 0.5mm. Scaling factors of 50%, 33.3% and 5% are detailed, and relate to the probability of the predicted value being exceeded. The predicted vibration levels detailed in Table 14.12 assume a 5% and 50% probability of being exceeded, thereby providing a range of likely vibration impacts.

Table 14.12: Predicted Ground-borne Vibration from Vibratory Soil Compaction Plant

Distance between receptor and site of vibratory soil compaction (m)	Predicted ground-borne vibration level mm/s (PPV)	
	Steady State (5%)	Steady State (50%)
2.5	21.1	5.7
3.5	14.5	3.9
4	12.3	3.4
5	9.4	2.6
10	3.8	1.0
20	1.4	0.4
40	0.5	0.1
80	0.2	0.1

14.4.9 Based upon the prediction methodology contained within BS 5228-2:2009+A1:2014, the ground-borne vibration levels, at distances of approximately 2.5m, would have a 5% probability of

exceeding 21.1mm/s PPV and a 50% probability of exceeding 5.7mm/s PPV. Predicted vibration levels would be between 9.4 and 2.6mm/s PPV (at 5% and 50% probability , respectively), and between 3.8 and 1.0mm/s PPV (at 5% and 50% probability, respectively), at distances of 5m and 10m respectively.

14.4.10 As vibration passes through the foundations of a building the level would alter as the vibration is transferred (referred to as the 'transfer function'). Such transfer functions differ between properties; however, a general reduction in vibration from free-field to foundations of 60% is often applied, consistent with the guidance provided in Measurement & Assessment of Ground borne Noise & Vibration (ANC, 2012). However, for the purpose of this assessment no reduction has been assumed and is therefore a worst case assessment approach.

14.4.11 Despite the uncertainty with the vibration predictions highlighted above, it is likely that those properties within 10m of earthworks activities would be subject to perceptible levels of vibration (see Table 14.5), while there is a 5% probability that cosmetic damage may occur to properties within approximately 3.5m of earthworks activities (see Table 14.6). However, the soil compaction works are transient in nature; therefore the worst-case vibration levels shown in Table 14.12 would be experienced for relatively short durations, typically two to three days, when the compaction works occur at the nearest position to the residents. After this time, vibration levels would significantly reduce due to predicted levels of vibration being heavily influenced by the distance of works to receptor.

Vibratory Sheet Steel Piling

14.4.12 As discussed, it is anticipated that piling may be required for construction of the drainage connection to Scatter Burn and the southern side of the SUDS basin, and would generally be undertaken at distances of 20m or more from the nearest sensitive receptors. Piling is likely to come into its closest proximity to sensitive properties when undertaken along the southern side of the SUDS basin. During this period plant associated with the piling activity would be approximately 20m from No. 32 and 30 Logie Avenue.

14.4.13 Vibration impacts at the nearest sensitive receptors, during steady state operation, have been calculated at PPV levels of 0.9 and 4.0 mm/s, with a 50% and 5% probabilities respectively. As such, the assessment of vibration impact demonstrates that perceptible PPV vibration levels may be experienced within nearby properties and may cause complaint, but are unlikely to be sufficient to cause cosmetic building damage.

Operation

14.4.14 Predicted noise levels at each of the sensitive receptors included within the operational noise assessment are presented within Appendix A14.4 (Predicted Operational Noise Levels – with Mitigation).

Noise Levels at Sample Receptors

14.4.15 Table 14.13 compares daytime noise levels at each sample receptor location for the Do-Minimum 2018 scenario against the Do-Something scenario in 2018 (short-term impact). Tables 14.14 and 14.15 compares noise levels at each sample receptor location for the Do-Minimum situation in 2018 against the Do-Something scenario in 2033 (long-term impact) for the day and night-time periods, respectively.

14.4.16 Tables 14.13, 14.14 and 14.15 show the magnitude of noise change in accordance with the criteria presented in Tables 14.3 and 14.4.

Table 14.13: Comparison of Predicted Daytime Noise Levels for Do-Minimum and Do-Something Scenarios (2018) at the Sample Receptors

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)			
		Do Minumum	Do Something		
		2018	DS 2018	Noise Change (dB)	Magnitude of Change
Sample Receptors – Residential Properties					
1	18 MANOR DRIVE	50.6	65.9	15.3	Major Adverse
2	8 MANOR DRIVE	52.2	62.2	10.0	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	53.5	68.5	15.0	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	51.8	67.6	15.8	Major Adverse
5	22 LOGIE AVENUE (First Floor)	49.3	56.5	7.2	Major Adverse
6	22 LOGIE AVENUE (Second Floor)	52.2	58.2	6.0	Major Adverse
7	26 MANOR AVENUE, (First Floor)	53.5	62.3	8.8	Major Adverse
8	26 MANOR AVENUE (Second Floor)	54.8	63.1	8.3	Major Adverse
9	11 MANOR WALK	53.4	57.8	4.4	Moderate Adverse
10	19 MANOR WALK	56.3	59.6	3.3	Moderate Adverse
11	60 MANOR AVENUE	56.2	60.0	3.8	Moderate Adverse
12	454 CLIFTON ROAD	58.4	58.6	0.2	Negligible Adverse
13	108 WESTERN ROAD	57.5	57.7	0.2	Negligible Adverse
14	27 HILTON ROAD	54.0	54.0	0.0	No Change
15	133 HILTON AVENUE	55.0	55.1	0.1	Negligible Adverse
16	98 DON STREET	56.3	55.9	-0.4	Negligible Beneficial
17	97 DON STREET	56.9	56.4	-0.5	Negligible Beneficial
18	519 CLIFTON ROAD	59.3	59.3	0.0	No Change
Sample Receptors – Designated Areas					
19 [1)]	SM (Aberdeenshire Canal remains of)	65.6	65.8	0.2	Negligible Adverse
20 [1)]	National Cycle Route (rec 1)	71.5	71.4	-0.1	Negligible Beneficial
21 [1)]	CQA_Playing Field at Laurel Drive	58.8	58.7	-0.1	Negligible Beneficial
22	CNMA_619, CLIFTON ROAD, ABERDEE	72.0	68.5	-3.5	Moderate Beneficial

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)			
		Do Minumum	Do Something		
		2018	DS 2018	Noise Change (dB)	Magnitude of Change
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	74.1	71.6	-2.5	Minor Beneficial
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	72.4	73.4	1.0	Minor Adverse
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	69.7	70.3	0.6	Negligible Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	70.0	70.1	0.1	Negligible Beneficial
27	CNMA_315, NORTH ANDERSON DRIVE, ABERDEEN	70.6	70.8	0.2	Negligible Adverse

1) Free-field noise level.
SM Scheduled Monument.
CQA Candidate Quiet Area.
CNMA Candidate Noise Management Area.

14.4.17 As indicated in Table 14.13, in the daytime 2018 scenario, Major adverse noise impacts are predicted for properties in Manor Drive, Logie Avenue and parts of Manor Avenue, with Moderate adverse noise impacts predicted for properties in Manor Walk and parts of Manor Avenue.

14.4.18 For properties in Clifton Road, Western Road, Hilton Road, Hilton Avenue and Don Street the noise impact is either Negligible or no change.

14.4.19 For the designated areas, most are predicted to experience a Negligible beneficial or Negligible adverse impact. CNMA_619, Clifton Road, is predicted to experience a Moderate beneficial impact, whilst CNMA_563, North Anderson Drive, is predicted to experience a Minor beneficial impact. A Minor adverse noise impact is predicted for CNMA_733, Great Northern Road.

Table 14.14: Comparison of Predicted Daytime Noise Levels for Do-Minimum (2018) and Do-Something Scenario (2033) at the Sample Receptors

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum				Do Something		
		DM 2018	DM 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
Sample Receptors – Residential Properties								
1	18 MANOR DRIVE	50.6	51.2	0.6	Neg. Adverse	67.6	17.0	Major Adverse
2	8 MANOR DRIVE	52.2	52.6	0.4	Neg. Adverse	67.6	17.0	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	53.5	53.1	-0.4	Neg. Benefit	63.7	11.5	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	51.8	51.4	-0.4	Neg. Benefit	70.4	16.9	Major Adverse
5	22 LOGIE AVENUE (First Floor)	49.3	49.9	0.6	Neg. Adverse	69.4	17.6	Major Adverse

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum				Do Something		
		DM 2018	DM 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
6	22 LOGIE AVENUE (Second Floor)	52.2	52.8	0.6	Neg. Adverse	57.6	8.3	Mod. Adverse
7	26 MANOR AVENUE, (First Floor)	53.5	53.8	0.3	Neg. Adverse	59.3	7.1	Mod. Adverse
8	26 MANOR AVENUE (Second Floor)	54.8	55.1	0.3	Neg. Adverse	63.6	10.1	Major Adverse
9	11 MANOR WALK	53.4	53.0	-0.4	Neg. Benefit	64.4	9.6	Mod. Adverse
10	19 MANOR WALK	56.3	55.3	-1.0	Neg. Benefit	57.9	4.5	Minor Adverse
11	60 MANOR AVENUE	56.2	56.6	0.4	Neg. Adverse	59.7	3.4	Minor Adverse
12	454 CLIFTON ROAD	58.4	64.2	5.8	Mod. Adverse	60.3	4.1	Minor Adverse
13	108 WESTERN ROAD	57.5	63.1	5.6	Mod. Adverse	61.7	3.3	Minor Adverse
14	27 HILTON ROAD	54.0	60.2	6.2	Mod. Adverse	62.6	5.1	Mod. Adverse
15	133 HILTON AVENUE	55.0	59.1	4.1	Minor Adverse	58.8	4.8	Minor Adverse
16	98 DON STREET	56.3	60.7	4.4	Minor Adverse	58.0	3.0	Minor Adverse
17	97 DON STREET	56.9	63.3	6.4	Mod. Adverse	58.0	1.7	Neg. Adverse
18	519 CLIFTON ROAD	59.3	64.3	5.0	Mod. Adverse	59.5	2.6	Neg. Adverse
Sample Receptors – Designated Areas								
19 [1)]	SM (Aberdeenshire Canal remains of)	65.6	66.5	0.9	Neg. Adverse	66.6	1.0	Neg. Adverse
20 [1)]	National Cycle Route (rec 1)	71.5	72.1	0.6	Neg. Adverse	72.8	1.3	Neg. Adverse
21 [1)]	CQA_Playing Field at Laurel Drive	58.8	58.8	0.0	No Change	59.4	0.6	Neg. Adverse
22	CNMA_619, CLIFTON ROAD, ABERDEE	72.0	73.2	1.2	Neg. Adverse	70.2	-1.8	Neg. Benefit
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	74.1	74.7	0.6	Neg. Adverse	72.3	-1.8	Neg. Benefit
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	72.4	72.1	-0.3	Neg. Benefit	73.3	0.9	Neg. Adverse
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	69.7	69.9	0.2	Neg. Adverse	70.4	0.7	Neg. Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	70.0	70.9	0.9	Neg. Adverse	70.9	0.9	Neg. Adverse
27	CNMA_315, NORTH	70.6	70.6	0.0	No	70.8	0.2	Neg. Adverse

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum				Do Something		
		DM 2018	DM 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
	ANDERSON DRIVE, ABERDEEN				Change			

1) Free-field noise level.

SM Scheduled Monument.

CQA Candidate Quiet Area.

CNMA Candidate Noise Management Area.

14.4.20 As indicated in Table 14.14, in the daytime 2033 scenario, Major and Moderate adverse noise impacts are predicted with the proposed scheme in place for properties in Manor Drive, Logie Avenue, parts of Manor Avenue and Western Road. Minor adverse noise impacts are predicted for properties in Manor Walk, parts of Clifton Road, Hilton Road, Hilton Avenue and parts of Manor Avenue. Negligible adverse impacts are predicted for properties in Don Street and parts of Clifton Road.

14.4.21 It is noted from Table 14.14 that long-term Moderate adverse noise impacts are predicted for properties in parts of Clifton Road, Western Road, parts of Don Street and Hilton Road in the DM situation. Hence, the adverse noise impacts for the receptors in those streets are not scheme related and the net impact of the scheme should be separated from the overall impact determined.

14.4.22 Designated areas are predicted to experience Negligible impacts.

Table 14.15: Comparison of Predicted Night-time Noise Levels for Do-Minimum (2018) and Do-Something Scenario (2033) at the Sample Receptors

Receptor Number	Receptor Name	Predicted Noise Level $L_{night,outside}$ (dB)						
		Do Minumum				Do Something		
		DM 2018	DM 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
Sample Receptors – Residential Properties								
1	18 MANOR DRIVE	39.3	39.8	0.5	Neg. Adverse	54.6	15.3	Major Adverse
2	8 MANOR DRIVE	40.7	41.1	0.4	Neg. Adverse	51.1	10.4	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	41.9	41.5	-0.4	Neg. Benefit	57.1	15.2	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	40.4	40.0	-0.4	Neg. Benefit	56.2	15.8	Major Adverse
5	22 LOGIE AVENUE (First Floor)	38.1	38.6	0.5	Neg. Adverse	45.6	7.5	Mod. Adverse
6	22 LOGIE AVENUE (Second Floor)	40.7	41.3	0.6	Neg. Adverse	47.1	6.4	Mod. Adverse
7	26 MANOR AVENUE, (First Floor)	41.9	42.2	0.3	Neg. Adverse	51.0	9.1	Mod. Adverse
8	26 MANOR AVENUE (Second Floor)	43.1	43.3	0.2	Neg. Adverse	51.7	8.6	Mod. Adverse
9	11 MANOR WALK	41.8	41.4	-0.4	Neg. Benefit	45.8	4.0	Minor Adverse
10	19 MANOR WALK	44.4	43.5	-0.9	Neg. Benefit	47.5	3.1	Minor Adverse

Receptor Number	Receptor Name	Predicted Noise Level $L_{night,outside}$ (dB)						
		Do Minumum				Do Something		
		DM 2018	DM 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
11	60 MANOR AVENUE	44.3	44.7	0.4	Neg. Adverse	48.0	3.7	Minor Adverse
12	454 CLIFTON ROAD	46.3	51.5	5.2	Mod. Adverse	49.3	3.0	Minor Adverse
13	108 WESTERN ROAD	45.5	50.5	5.0	Mod. Adverse	50.1	4.6	Minor Adverse
14	27 HILTON ROAD	42.3	47.9	5.6	Mod. Adverse	46.7	4.4	Minor Adverse
15	133 HILTON AVENUE	43.2	46.9	3.7	Minor Adverse	45.9	2.7	Neg. Adverse
16	98 DON STREET	44.4	48.4	4.0	Minor Adverse	45.9	1.5	Neg. Adverse
17	97 DON STREET	44.9	50.7	5.8	Mod. Adverse	47.3	2.4	Neg. Adverse
18	519 CLIFTON ROAD	47.1	51.6	4.5	Minor Adverse	49.4	2.3	Neg. Adverse
Sample Receptors – Designated Areas								
22	CNMA_619, CLIFTON ROAD, ABERDEE	58.5	59.6	1.1	Neg. Adverse	56.9	-1.6	Neg. Benefit
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	60.4	61.0	0.6	Neg. Adverse	58.8	-1.6	Neg. Benefit
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	58.9	58.6	-0.3	Neg. Benefit	59.7	0.8	Neg. Adverse
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	56.5	56.6	0.1	Neg. Adverse	57.1	0.6	Neg. Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	56.7	57.5	0.8	Neg. Adverse	57.5	0.8	Neg. Adverse
27	CNMA_315, NORTH ANDERSON DRIVE, ABERDEEN	57.3	57.3	0.0	No Change	57.5	0.2	Neg Adverse

14.4.23 As indicated in Table 14.15, in the night-time 2033 scenario Major and Moderate adverse noise impacts without mitigation are predicted for properties in Manor Drive, Logie Avenue and parts of Manor Avenue. Minor adverse noise impacts are predicted for properties in Manor Walk, parts of Manor Avenue, Clifton Road, Western Road and Hilton Road. Negligible adverse impacts are predicted for properties in Hilton Avenue, Don Street and parts of Clifton Road.

14.4.24 It should be noted that long-term night-time Moderate adverse noise impacts are also predicted for properties in Clifton Road, Western Road, Hilton Road and parts of Don Street in the DM situation.

14.4.25 Designated areas are predicted to experience Negligible impacts.

Summary Tables

14.4.26 Tables 14.16, 14.17 and 14.18 provide the potential noise level change comparisons in accordance with the reporting requirements for a Detailed Assessment within HD 213/11. For these summary

tables, changes in daytime noise levels are in terms of $L_{A10,18hr}$, whereas changes in night-time noise levels are in terms of a $L_{night,outside}$.

14.4.27 The figures in parentheses within the text below are the number of non-residential sensitive receptors experiencing the noise impacts being reported, while the total number of sensitive receptors include both residential and non-residential receptors.

Table 14.16: Detailed Assessment Summary Table: Short-term Traffic Noise Reporting Table – Do-Minimum (2018) against Do-Something (2018)

Scenario/Comparison: DM 2018 against DS 2018			
Change in Noise Level (dB)		**Daytime**	
		No of dwellings	**No of other sensitive receptors**
Increase in noise level	0.1-0.9	3466	31
	1.0-2.9	314	1
	3.0-4.9	105	0
	5 +	127	1
No Change	0	1795	12
Decrease in noise level	0.1-0.9	4981	30
	1.0-2.9	389	0
	3.0-4.9	28	0
	5 +	10	0

14.4.28 It can be seen from Table 14.16 that in the short-term the majority of receptors would experience no change or a Negligible noise impact, while a total of 130(1) receptors would experience short-term Major noise increases, with 105(0) experiencing Moderate noise increases.

14.4.29 Table 14.16 shows that 10(0) receptors would experience Major beneficial noise decreases, while 30(0) would experience Moderate beneficial noise decreases.

14.4.30 In terms of perceptible changes, i.e. noise level change of 1 dB $L_{A10,18hr}$ or more, 550(2) receptors are predicted to experience perceptible increases with 431(0) experiencing perceptible decreases with mitigation measures in place.

Table 14.17: Detailed Assessment Summary Table: Long-term Traffic Noise Reporting Table – Do-Minimum (2018) against Do-Minimum (2033)

Scenario/Comparison: DM 2018 against DM 2033				
Change in Noise Level (dB)		**Daytime**		**Night-time**
		No of dwellings	**No of other sensitive receptors**	**No of dwellings**
Increase in noise level	0.1-2.9	8484	58	1404
	3.0-4.9	874	8	56
	5.0-9.9	365	5	0
	10 +	0	0	0
No Change	0	158	2	25
Decrease in noise level	0.1-2.9	1313	2	282
	3.0-4.9	21	0	0
	5.0-9.9	0	0	0
	10 +	0	0	0

14.4.31 Table 14.17 shows that without the scheme in place, the vast majority of receptors would experience no change or a Negligible noise impact, either adverse or beneficial in the long-term, for the daytime period.

14.4.32 For the daytime period, without the proposed scheme in place, there are predicted to be 1252(13) receptors experiencing perceptible noise increases, comprising 370(5) Moderate adverse and 882(8) Minor adverse impacts. A total of 21(0) receptors experience perceptible noise decreases with an associated Minor noise benefit.

14.4.33 During the night-time period without the proposed scheme in place, there are predicted to be 56 dwellings experiencing perceptible noise increases with an associated Minor noise impact and no dwellings that would experience perceptible beneficial noise impacts.

Table 14.18: Detailed Assessment Summary Table: Long-term Traffic Noise Reporting Table – Do-Minimum (2018) against Do-Something (2033)

Scenario/Comparison: DM 2018 against DS 2033				
Change in Noise Level (dB)		**Daytime**		**Night-time**
		No of dwellings	**No of other sensitive receptors**	**No of dwellings**
Increase in noise level	0.1-2.9	9977	64	1637
	3.0-4.9	714	10	12
	5.0-9.9	140	1	0
	10 +	64	0	6
No Change	0	64	0	18
Decrease in noise level	0.1-2.9	240	0	91
	3.0-4.9	11	0	0
	5.0-9.9	5	0	0
	10 +	0	0	0

14.4.34 Table 14.18 shows that with the proposed scheme in place the vast majority of receptors would experience no change or a Negligible noise impact for the daytime period. With the scheme in place there are predicted to be 929(11) receptors experiencing perceptible adverse noise impacts, comprising 64(0) Major adverse, 141(1) Moderate adverse and 724(10) Minor adverse impacts. A total of 16(0) receptors experience perceptible noise decreases with 11 experiencing a Minor noise benefit and five a Moderate noise benefit.

14.4.35 With the proposed scheme in place there would be 918 dwellings experiencing perceptible adverse noise impacts, 321 fewer than in the daytime DM situation in 2033. In terms of other sensitive receptors there would be two fewer perceptible adverse noise impacts with the proposed scheme compared to the daytime DM situation in 2033. With the proposed scheme in place there would be 64 dwellings experiencing Major adverse noise impacts, compared to none in the DM situation in 2033 for the daytime, and 225 fewer dwellings experiencing Moderate adverse noise impacts compared to the DM situation in 2033 for the daytime. In terms of other sensitive receptors there would be four fewer Moderate adverse noise impacts with the proposed scheme compared to the DM situation in 2033.

14.4.36 During the night-time period with the proposed scheme in place, there are predicted to be 18 dwellings experiencing perceptible noise increases, six with a Major noise impact and 12 with a Minor noise impact. Conversely, there are predicted to be no dwellings that would experience perceptible beneficial noise impacts in the night-time period, with the proposed scheme in place.

14.4.37 Without the proposed scheme in place there would be 56 dwellings experiencing perceptible night-time increases with an associated Minor adverse noise impact. Hence, there would be far more dwellings experiencing perceptible noise increases without the proposed scheme in place, though no Major adverse impacts are predicted.

Noise Nuisance

14.4.38 Calculations of the change in noise nuisance have been undertaken for all dwellings within the HD 213/11 Calculation Area for the assessment of permanent traffic noise impacts. Table 14.19 provides the results of the noise nuisance assessment undertaken.

Table 14.19: Noise Nuisance Assessment

Scenario/Comparison: Noise Nuisance Assessment			
Change in Nuisance Level		**Do-Minimum (dwellings)**	**Do-Something (dwellings)**
Increase in nuisance level	< 10%	9592	6893
	10 < 20%	131	3363
	20 < 30%	0	415
	30 < 40%	0	136
	> 40%	0	98
No Change	0%	158	69
Decrease in nuisance level	< 10%	1334	241
	10 < 20%	0	0
	20 < 30%	0	0
	30 < 40%	0	0
	> 40%	0	0

14.4.39 Table 14.19 shows that in the Do-Minimum situation the vast majority of dwellings would experience a <10% change in nuisance level, with most properties experiencing an increase in nuisance level.

14.4.40 With the proposed scheme in place, without mitigation, there are 98 properties experiencing an increase in nuisance level of >40% compared to none in the DM situation. With the proposed scheme in place 649 dwellings would experience an increase in nuisance level between 20 and >40% compared to none in the DM situation. With the proposed scheme in place 241 dwellings would experience a decrease in nuisance level of <10%, which compares to 1334 dwellings in the Do-Minimum scenario.

14.4.41 Although a number of dwellings are predicted to experience increases in nuisance levels greater than 10% under the Do-Something scenario, it should be noted that the changes predicted in the short-term represent a larger percentage increase in nuisance levels, e.g. a 0.9 dB increase in noise level is equivalent to 20% increase in the noise nuisance level in the short-term. In other words, as noted in Annex 6 of HD 213/11, people are more sensitive to abrupt changes in traffic noise than gradual changes. Therefore, the sensitivity to new schemes is an effect that can last for a number of years, when in fact gradual changes in noise levels can represent higher overall noise increases.

Vibration Nuisance

14.4.42 Changes in vibration nuisance have been calculated for all dwellings within 40m of roads that are within the HD 213/11 Calculation Area. Table 14.20 provides the results of the vibration nuisance assessment undertaken.

Table 14.20: Vibration Nuisance Assessment

Scenario/Comparison: Vibration Nuisance Assessment			
Change in Nuisance Level		**Do-Minimum (dwellings)**	**Do-Something (dwellings)**
Increase in nuisance level	< 10%	4065	4256
	10 < 20%	116	91

Scenario/Comparison: Vibration Nuisance Assessment			
Change in Nuisance Level		**Do-Minimum (dwellings)**	**Do-Something (dwellings)**
	20 < 30%	0	6
	30 < 40%	0	0
	> 40%	0	0
No Change	0%	1788	1744
Decrease in nuisance level	< 10%	341	213
	10 < 20%	0	0
	20 < 30%	0	0
	30 < 40%	0	0
	> 40%	0	0

14.4.43 Table 14.20 shows that in the DoMinimum situation the majority of dwellings would experience a <10% change in nuisance level. A total of 4181 dwellings would experience an increase in nuisance level with 341 dwellings experiencing a decrease in nuisance level.

14.4.44 With the proposed scheme in place, without mitigation, the majority of dwellings would experience a <10% change in vibration nuisance level.

14.4.45 With the proposed scheme in place 4256 dwellings would experience an increase in nuisance level of <10%, with 91 dwellings experiencing a 10 to <20% increase, and six dwellings experiencing a 20 to <30% increase in nuisance level. Whereas 213 dwellings would experience a <10% decrease in nuisance level.

Qualitative Operational Assessment

14.4.46 The Calculation Area covers most of the Study Area, as defined within HD213/11, meaning most impacts at dwellings and other sensitive receptors within 1km of the proposed scheme have been assessed as part of the 'detailed' assessment. However, a quantitative assessment of noise and vibration impacts at sensitive properties within 1km of the proposed scheme that are outside of the Calculation Area is provided here. These properties are largely located to the south-west of the proposed scheme in Northfield, close to Provost Fraser Drive and Provost Rust Drive. There are also a number of properties located close to the A96, directly west of the proposed scheme, close to the junctions with Newton Terrace and Goodhope Road.

14.4.47 For the majority of sensitive receptors within these areas there is likely to be a Negligible decrease in noise level in the baseline year with the proposed scheme in place compared to the Do-Minimum situation.

14.4.48 In the future assessment year the majority of such sensitive receptors are likely to see a Negligible increase in noise level with the proposed scheme in place compared to the baseline year Do-Minimum situation.

Basic Noise Level (BNL) Changes

14.4.49 Consideration has also been given to likely noise impacts in the wider network, outside the HD 213/11 Calculation Area. Table 14.21 provides predicted basic noise levels (BNL) for Affected Routes outside the Calculation Area.

Table 14.21: Basic Noise Levels for affected routes outside the Calculation Area

Road		Sensitive Receptors within 50m	Basic Noise Level $dBL_{A10,18hr}$						
Link IDs	**Road Name**		**Do-Minimum 2018**	**Do-Minimum 2033**		**Do-Something 2018**		**Do-Something 2033**	
1089:1747	Meston Walk (off	1	57.0	58.7	(1.7)	58.2	(1.2)	58.6	(1.6)

Road		Sensitive Receptors within 50m	Basic Noise Level $dBL_{A10,18hr}$						
Link IDs	Road Name		Do-Minimum 2018	Do-Minimum 2033		Do-Something 2018		Do-Something 2033	
1090:1089	Bedford Road, B991)		55.8	58.0	(2.2)	57.6	(1.8)	58.0	(2.2)
1091:1090			57.2	59.5	(2.3)	59.0	(1.8)	59.5	(2.3)
1092:1091			57.6	59.7	(2.1)	59.4	(1.8)	59.8	(2.2)
1093:1092			56.7	59.0	(2.3)	58.5	(1.8)	59.0	(2.3)
882:1955	Mugiemoss Road (east of A947)	60	56.7	57.5	(0.8)	54.7	(-2.0)	57.6	(0.9)
1954:1955			56.7	57.3	(0.6)	54.9	(-1.8)	57.8	(1.1)
883:1954			59.7	58.9	(-0.8)	57.8	(-1.9)	60.6	(0.9)
883:902			57.4	57.4	(0.0)	55.2	(-2.2)	57.7	(0.3)
1169:1170	A96, Great Northern Road	42	69.8	59.9	(-9.9)	69.9	(0.1)	58.8	(-11.0)
1537:1569	Hayton Road	89	57.2	60.2	(3.0)	55.3	(-1.9)	59.0	(1.8)
1568:1569			57.2	60.0	(2.8)	55.1	(-2.1)	58.9	(1.7)
1568:1572			57.2	60.1	(2.9)	55.3	(-1.9)	59.1	(1.9)
1565:1572			57.4	60.4	(3.0)	55.7	(-1.7)	59.2	(1.8)
1564:1565			57.2	60.1	(2.9)	55.4	(-1.8)	59.1	(1.9)
1563:1564			57.3	60.3	(3.0)	55.6	(-1.7)	59.2	(1.9)
1562:1563			57.6	60.3	(2.7)	55.7	(-1.9)	59.2	(1.6)
1522:1562			57.2	60.1	(2.9)	55.3	(-1.9)	59.0	(1.8)

Note: The numbers presented in parentheses are noise change (dB) between the baseline year Do-Minimum scenario and the respective future assessment year or Do-Something scenario.

14.4.50 Table 14.21 shows that a total of 192 sensitive receptors outside of the Calculation Area fall within 50m of an Affected Route. With and without the proposed scheme in place, long-term noise increases are likely for Meston Walk, Mugiemoss Road and Hayton Road with predicted noise decreases for the A96 (Great Northern Road).

14.4.51 Short term benefits are likely for Mugiemoss Road and Hayton Road. Major beneficial impacts are predicted in the long-term for the A96 (Great Northern Road), both with and without the proposed scheme, which appears to be attributable to a junction redesign at the Back Hilton Road, Great Northern Road and Ashgrove Road junction, and are not attributable to the proposed scheme. Short-term minor adverse impacts are predicted at the property close to Meston Walk, which would fall to Negligible in the long-term.

14.4.52 With the exception of the benefits shown on the A96 (Great Northern Road), no long-term perceptible noise changes are predicted for those properties adjacent to Affected Routes with the proposed scheme in place.

14.5 Mitigation

Construction

14.5.1 All work would be undertaken to the guidance detailed in BS 5228: 2009+A1:2014. It is anticipated that the following mitigation measures would be employed on site to ensure that noise and vibration levels are attenuated as far as possible (**Mitigation Item NV1**):

- All construction plant shall be the quietest of its type practical for carrying out the work required and shall be maintained in good condition with regard to minimising noise output.
- All construction plant shall be operated and maintained in accordance with the manufacturer's written recommendations, including the use and maintenance of any specific noise reduction measures.
- The use of 'best practicable means' during all construction activities.
- Switching off plant and equipment when it is not in use for extended periods of time.
- Establish agreement with the ACC on appropriate controls for undertaking significantly noisy works or vibration-causing operations close to receptors.
- Programming works so that the requirement for working outside normal working hours is minimised (taking into account the highway authority's statutory duties under the Traffic Management Act 2004).
- Use of low noise emission plant where possible.
- Use of low amplitude running options on vibratory compactors when operating close to sensitive properties.
- The use of temporary noise screens around particularly noisy activities, which could take the form of either hoardings in close proximity to receptors or construction activities or acoustic enclosures which can house specific noisy plant items (e.g. generators).
- Regular plant maintenance.

14.5.2 It is anticipated that a scheme of noise and vibration monitoring would be agreed with the environmental department of ACC and noise and vibration limits be contained within any Construction Environmental Management Plan (CEMP) agreed (**Mitigation Item NV2**).

14.5.3 Construction works are likely to result in significant noise levels at properties in close proximity to the proposed scheme, particularly when considering that several adjacent properties have been identified for demolition. Therefore, these receptors have the potential to be exposed to significant noise levels for prolonged periods. An updated assessment of potential construction noise and vibration levels should be undertaken once the construction contractor has been appointed and the exact plant, methodology and phasing is known. This assessment should include consideration of the benefits of mitigation measures as noted above (**Mitigation Item NV3**).

14.5.4 If the updated assessment referred to above indicates that sensitive properties may be exposed to significant construction noise impacts over a prolonged period of time, consideration should be given to the provision of noise insulation (NI), typically in the form of secondary window glazing, or temporary or permanent re-housing (TRH), as per paragraph E.5 of BS5228-1+A1:2014. In this regard a prolonged period of time is defined within BS5228-1+A1:2014 as: '*a period of 10 or more days of working in any consecutive days or for a total number of days exceeding 40 in any 6 consecutive months'* (**Mitigation Item NV4**).

Operation

14.5.5 A number of different options for the mitigation of noise impacts through the installation of noise barriers were considered, and the merits of each option were reviewed. In particular, each option was reviewed in relation to the following:

- The practicality of providing mitigation. For example, the ability to site noise barriers in locations where they would not restrict access to properties from the street.
- The absolute noise level predicted at the sensitive receptors, in particular whether the noise level exceeded 59.5 $dBL_{A10,18hr}$. The 59.5 $dBL_{A10,18hr}$ noise limit is applicable at dwellings and is based on guidance given in the WHO document entitled 'Guidelines for Community Noise' (WHO, 1999). The noise limit has been used on previous Transport Scotland highway improvement schemes, including the AWPR. This document states that '*to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dBL_{Aeq} for a steady, continuous noise*'. The WHO document refers to a daytime time base of 16 hours ($L_{Aeq,16hr}$), while CRTN predictions are expressed as $L_{A10,18hr}$. To translate the WHO $L_{Aeq,16hr}$ to $L_{A10,18hr}$ a correction of +2 dB is required (BS8233:2014), with a further +2.5 dB (CRTN:1988) necessary to translate into façade levels. This translation applied to 55 $dBL_{Aeq,16hr}$ gives an equivalent threshold façade level of 59.5 $dBL_{A10,18hr}$.
- The noise level reduction predicted at sensitive receptors as a result of the noise barrier. Consideration was given to whether or not the predicted noise reduction would be perceptible (i.e. whether a 1 dB reduction would be achieved in the short term) and whether it would reduce the magnitude of noise impact at sensitive receptors.
- The scale and location of noise barriers within the urban context. The noise reduction benefits of different barrier combinations were considered against the potential for landscape/townscape and visual impact, and impacts on amenity associated with the introduction of barriers within the urban context.

14.5.6 The review of the noise barrier mitigation options resulted in the following barriers being included in the design of the proposed scheme, as illustrated in Figures 14.2a to 14.2c (**Mitigation Item NV5**):

- 2.0m high and 35m long absorptive barrier between OS 391112, 809113 and OS 391124, 809081, on the inside of the curve between the proposed Link Road and Logie Avenue;
- 2.0m high and 120m long absorptive barrier between OS 391126, 809075 and OS 391126, 809075, on the inside of the curve between the proposed link road and Logie Avenue; and
- 2.0m high and 112m long absorptive barrier between OS 391229, 808991 and OS 391323, 808951, on the inside of the curve between the proposed Link Road and Logie Avenue.

14.5.7 In order to demonstrate the effectiveness of the proposed screening, predicted noise levels at sample receptors with and without this mitigation measure are detailed in this chapter.

14.5.8 It should be noted that, while absorptive barriers are proposed, the CRTN calculation method, as used in this assessment, assumes hard, reflecting surfaces. Barriers lined with absorbing material would reduce reflection effects, and where these are present the CRTN calculation method would tend to over-predict noise levels.

14.6 Residual Impacts

Construction

14.6.1 Construction work would be restricted to daytime hours of work where feasible and would follow current good practice (including BS 5228: 2009 + A1 2014 - Parts 1 and 2) to minimise noise and vibration emissions.

14.6.2 Some construction works would take place in the vicinity of sensitive receptors, particularly Logie Avenue, Logie Place and Manor Avenue. There is the potential for significant noise and vibration effects at these locations, even with mitigation measures incorporated.

14.6.3 Appropriate controls and mitigation measures would be implemented to reduce construction noise and vibration impacts, where practicable, as detailed earlier. It should be noted that construction noise and vibration impacts would be temporary in nature.

Operation

14.6.4 Absorptive acoustic fencing in three sections, 267m long and 2m high, have been included in the design of the proposed scheme, see section 14.5. It should be noted though that, while absorptive barriers are proposed, the CRTN calculation method assumes hard, reflecting surfaces, and as such the benefit afforded by absorptive barrier surfaces have not been included within the noise predictions made within this assessment

14.6.5 For ease of reference, noise predictions with the proposed scheme in place are reported below both with and without the proposed acoustic fencing.

Noise Levels at Sample Receptors

14.6.6 Table 14.22 compares daytime noise levels at each sample receptor location for the Do-Minimum 2018 scenario against the Do-Something scenario in 2018 (short-term impact). Tables 14.23 and 14.24 compares noise levels at each sample receptor location for the Do-Minimum situation in 2018 against the Do-Something scenario in 2033 (long-term impact) for the day and night-time periods, respectively. In addition, predicted noise levels for the Do-Minimum situation in 2033 are also detailed in Tables 14.26 and 14.28 to give an indication of non-scheme effects on future noise levels.

14.6.7 Tables 14.22, 14.23 and 14.24 show the magnitude of noise change in accordance with the criteria presented in Tables 14.4 and 14.5. The increase in predicted noise levels with mitigation in place, when compared to without mitigation in place, at Manor Drive and Manor Avenue are a result of reflection effects within the noise model (as discussed in paragraph 14.5.8). The use of absorptive barriers, as is proposed, would remove these apparent increases. The noise benefits afforded by the proposed barriers to the properties north of the proposed link road are shown for each scenario at 32 Logie Avenue (though only at ground floor height) and 22 Logie Avenue.

Table 14.22: Comparison of Predicted Daytime Noise Levels for Do-Minimum and Do-Something Scenarios (2018) at the Sample Receptors

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum	Do Something					
			Without Mitigation			With Mitigation		
		2018	DS 2018	Noise Change (dB)	Magn'de of Change	DS 2018	Noise Change (dB)	Magn'de of Change
Sample Receptors – Residential Properties								
1	18 MANOR DRIVE	50.6	65.9	15.3	Major Adverse	66.2	15.6	Major Adverse
2	8 MANOR DRIVE	52.2	62.2	10.0	Major Adverse	62.5	10.3	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	53.5	68.5	15.0	Major Adverse	68.5	15.0	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	51.8	67.6	15.8	Major Adverse	61.2	9.4	Major Adverse

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum	Do Something					
			Without Mitigation			With Mitigation		
		2018	DS 2018	Noise Change (dB)	Magn'de of Change	DS 2018	Noise Change (dB)	Magn'de of Change
5	22 LOGIE AVENUE (First Floor)	49.3	56.5	7.2	Major Adverse	54.5	5.2	Major Adverse
6	22 LOGIE AVENUE (Second Floor)	52.2	58.2	6.0	Major Adverse	56.4	4.2	Moderate Adverse
7	26 MANOR AVENUE, (First Floor)	53.5	62.3	8.8	Major Adverse	62.6	9.1	Major Adverse
8	26 MANOR AVENUE (Second Floor)	54.8	63.1	8.3	Major Adverse	63.4	8.6	Major Adverse
9	11 MANOR WALK	53.4	57.8	4.4	Moderate Adverse	57.8	4.4	Moderate Adverse
10	19 MANOR WALK	56.3	59.6	3.3	Moderate Adverse	59.6	3.3	Moderate Adverse
11	60 MANOR AVENUE	56.2	60.0	3.8	Moderate Adverse	60.0	3.8	Moderate Adverse
12	454 CLIFTON ROAD	58.4	58.6	0.2	Negligible Adverse	58.6	0.2	Negligible Adverse
13	108 WESTERN ROAD	57.5	57.7	0.2	Negligible Adverse	57.7	0.2	Negligible Adverse
14	27 HILTON ROAD	54.0	54.0	0.0	No Change	54.0	0.0	No Change
15	133 HILTON AVENUE	55.0	55.1	0.1	Negligible Adverse	55.1	0.1	Negligible Adverse
16	98 DON STREET	56.3	55.9	-0.4	Negligible Beneficial	55.9	-0.4	Negligible Beneficial
17	97 DON STREET	56.9	56.4	-0.5	Negligible Beneficial	56.4	-0.5	Negligible Beneficial
18	519 CLIFTON ROAD	59.3	59.3	0.0	No Change	59.3	0.0	No Change
Sample Receptors – Designated Areas								
19 [1)]	SM (Aberdeenshire Canal remains of)	65.6	65.8	0.2	Negligible Adverse	65.8	0.2	Negligible Adverse
20 [1)]	National Cycle Route (rec 1)	71.5	71.4	-0.1	Negligible Beneficial	71.4	-0.1	Negligible Beneficial
21 [1)]	CQA_Playing Field at Laurel Drive	58.8	58.7	-0.1	Negligible Beneficial	58.7	-0.1	Negligible Beneficial
22	CNMA_619, CLIFTON ROAD, ABERDEE	72.0	68.5	-3.5	Moderate Beneficial	68.5	-3.5	Moderate Beneficial
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	74.1	71.6	-2.5	Minor Beneficial	71.6	-2.5	Minor Beneficial
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	72.4	73.4	1.0	Minor Adverse	73.4	1.0	Minor Adverse

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)						
		Do Minumum	Do Something					
			Without Mitigation			With Mitigation		
		2018	DS 2018	Noise Change (dB)	Magn'de of Change	DS 2018	Noise Change (dB)	Magn'de of Change
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	69.7	70.3	0.6	Negligible Adverse	70.3	0.6	Negligible Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	70.0	70.1	0.1	Negligible Beneficial	70.1	0.1	Negligible Beneficial
27	CNMA_315, NORTH ANDERSON DRIVE, ABERDEEN	70.6	70.8	0.2	Negligible Adverse	70.8	0.2	Negligible Adverse

1) Free-field noise level.
SM Scheduled Monument.
CQA Candidate Quiet Area.
CNMA Candidate Noise Management Area.

14.6.8 The largest benefit afforded by the noise barriers, as shown in Table 14.22, is evident at ground floor level at 32 Logie Avenue, where a 6.4 dB reduction in noise level is predicted. No noise reduction is predicted at first floor height at 32 Logie Avenue, while a 2.0 and 1.8 dB reduction is predicted at first and second floor height, respectively, at 22 Logie Avenue.

14.6.9 As indicated in Table 14.22, in the daytime 2018 scenario, Major adverse noise impacts with or without mitigation are predicted for properties in Manor Drive, Logie Avenue and parts of Manor Avenue, with Moderate adverse noise impacts predicted for properties in Manor Walk and parts of Manor Avenue. 22 Logie Avenue, on the second floor, has a predicted Moderate noise impact with mitigation and a Major noise impact without mitigation.

14.6.10 For properties in Clifton Road, Western Road, Hilton Road Hilton Avenue and Don Street the noise impact is either Negligible or no change with or without mitigation.

14.6.11 The sensitive receptors on Logie Avenue, as represented by sample receptors 3 to 6, benefit from the inclusion of a noise barrier. The benefit, in terms of noise reduction, afforded by the barrier is related to, amongst other things, the height of the receptor point. As such, the sample receptor locations have been selected to demonstrate how noise reductions are likely to vary with height at the facades of nearby sensitive properties. For example, the ground floor sample receptor at 32 Logie Avenue sees a greater reduction in noise level than that seen at first floor height at the same property, while the first floor sample receptor at 22 Logie Avenue sees a greater reduction in noise level than that seen at second floor height at 22 Logie Avenue.

14.6.12 For the designated areas, most are predicted to experience a Negligible beneficial or Negligible adverse impact. CNMA_619, Clifton Road, is predicted to experience a Moderate beneficial impact, whilst CNMA_563, North Anderson Drive, is predicted to experience a Minor beneficial impact. A Minor adverse noise impact is predicted for CNMA_733, Great Northern Road. The proposed mitigation does not have an effect on predicted noise levels for the sample designated areas.

Table 14.23: Comparison of Predicted Daytime Noise Levels for Do-Minimum (2018) and Do-Something Scenario (2033) at the Sample Receptors

Receptor Number	Receptor Name	Predicted Noise Level $L_{A10,18hr}$ (dB)							
		Do Minumum		Do Something					
				Without Mitigation			With Mitigation		
		2018	2033	DS 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
Sample Receptors – Residential Properties									
1	18 MANOR DRIVE	50.6	51.2	67.6	17.0	Major Adverse	67.9	17.3	Major Adverse
2	8 MANOR DRIVE	52.2	52.6	63.7	11.5	Major Adverse	64.0	11.8	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	53.5	53.1	70.4	16.9	Major Adverse	70.3	16.8	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	51.8	51.4	69.4	17.6	Major Adverse	62.4	10.6	Major Adverse
5	22 LOGIE AVENUE (First Floor)	49.3	49.9	57.6	8.3	Moderate Adverse	55.5	6.2	Moderate Adverse
6	22 LOGIE AVENUE (Second Floor)	52.2	52.8	59.3	7.1	Moderate Adverse	57.5	5.3	Moderate Adverse
7	26 MANOR AVENUE, (First Floor)	53.5	53.8	63.6	10.1	Major Adverse	63.9	10.4	Major Adverse
8	26 MANOR AVENUE (Second Floor)	54.8	55.1	64.4	9.6	Moderate Adverse	64.6	9.8	Moderate Adverse
9	11 MANOR WALK	53.4	53.0	57.9	4.5	Minor Adverse	57.9	4.5	Minor Adverse
10	19 MANOR WALK	56.3	55.3	59.7	3.4	Minor Adverse	59.7	3.4	Minor Adverse
11	60 MANOR AVENUE	56.2	56.6	60.3	4.1	Minor Adverse	60.3	4.1	Minor Adverse
12	454 CLIFTON ROAD	58.4	64.2	61.7	3.3	Minor Adverse	61.7	3.3	Minor Adverse
13	108 WESTERN ROAD	57.5	63.1	62.6	5.1	Moderate Adverse	62.6	5.1	Moderate Adverse
14	27 HILTON ROAD	54.0	60.2	58.8	4.8	Minor Adverse	58.8	4.8	Minor Adverse
15	133 HILTON AVENUE	55.0	59.1	58.0	3.0	Minor Adverse	58.0	3.0	Minor Adverse
16	98 DON STREET	56.3	60.7	58.0	1.7	Negligible Adverse	58.0	1.7	Negligible Adverse
17	97 DON STREET	56.9	63.3	59.5	2.6	Negligible Adverse	59.5	2.6	Negligible Adverse
18	519 CLIFTON ROAD	59.3	64.3	61.9	2.6	Negligible Adverse	61.9	2.6	Negligible Adverse
Sample Receptors – Designated Areas									
19 [1)]	SM (Aberdeenshire Canal remains of)	65.6	66.5	66.6	1.0	Negligible Adverse	66.6	1.0	Negligible Adverse

Receptor Number	Receptor Name	Do Minumum		Predicted Noise Level $L_{A10,18hr}$ (dB)					
				Do Something					
				Without Mitigation			With Mitigation		
		2018	2033	DS 2033	Noise Change (dB)	Magn'de of Change	DS 2033	Noise Change (dB)	Magn'de of Change
20 [1)]	National Cycle Route (rec 1)	71.5	72.1	72.8	1.3	Negligible Adverse	72.8	1.3	Negligible Adverse
21 [1)]	CQA_Playing Field at Laurel Drive	58.8	58.8	59.4	0.6	Negligible Adverse	59.4	0.6	Negligible Adverse
22	CNMA_619, CLIFTON ROAD, ABERDEE	72.0	73.2	70.2	-1.8	Negligible Beneficial	70.2	-1.8	Negligible Beneficial
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	74.1	74.7	72.3	-1.8	Negligible Beneficial	72.3	-1.8	Negligible Beneficial
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	72.4	72.1	73.3	0.9	Negligible Adverse	73.3	0.9	Negligible Adverse
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	69.7	69.9	70.4	0.7	Negligible Adverse	70.4	0.7	Negligible Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	70.0	70.9	70.9	0.9	Negligible Adverse	70.9	0.9	Negligible Adverse
27	CNMA_315, NORTH ANDERSON DRIVE, ABERDEEN	70.6	70.6	70.8	0.2	Negligible Adverse	70.8	0.2	Negligible Adverse

1) Free-field noise level.
SM Scheduled Monument.
CQA Candidate Quiet Area.
CNMA Candidate Noise Management Area.

14.6.13 The largest benefit afforded by the noise barriers, as shown in Table 14.23, is evident at ground floor level at 32 Logie Avenue, where a 7.0 dB reduction in noise level is predicted, though this does not result in a change in impact classification at this receptor. No noise reduction is predicted at first floor height at 32 Logie Avenue, while a 2.1 and 1.8 dB reduction is predicted at first and second floor height, respectively, at 22 Logie Avenue.

14.6.14 As indicated in Table 14.23, in the daytime 2033 scenario, Major and Moderate adverse noise impacts with or without mitigation are predicted with the proposed scheme in place for properties in Manor Drive, Logie Avenue, parts of Manor Avenue and Western Road. Minor adverse noise impacts are predicted for properties in Manor Walk, parts of Clifton Road, Hilton Road, Hilton Avenue and parts of Manor Avenue. Negligible adverse impacts are predicted for properties in Don Street and parts of Clifton Road.

14.6.15 It is noted from Table 14.23 that long-term Moderate adverse noise impacts are predicted for properties in Clifton Road, Western Road and Hilton Road in the DM situation. Hence, the adverse noise impacts for the receptors in those streets are not scheme related and the net impact of the scheme should be separated from the overall impact determined.

14.6.16 Designated areas are predicted to experience Negligible impacts. The proposed mitigation does not have an effect on predicted noise levels for the sample designated areas.

Table 14.24: Comparison of Predicted Night-time Noise Levels for Do-Minimum (2018) and Do-Something Scenario (2033) at the Sample Receptors

Receptor Number	Receptor Name			Predicted Noise Level $L_{night,outside}$ (dB)					
		Do Minumum		Do Something					
				Without Mitigation			With Mitigation		
		2018	2033	DS 2033	Noise Change (dB)	Magn'de of Change	DS 2033 $L_{night,}$	Noise Change (dB)	Magn'de of Change
Sample Receptors – Residential Properties									
1	18 MANOR DRIVE	39.3	39.8	54.6	15.3	Major Adverse	54.8	15.5	Major Adverse
2	8 MANOR DRIVE	40.7	41.1	51.1	10.4	Major Adverse	51.3	10.6	Major Adverse
3	32 LOGIE AVENUE, (First Floor)	41.9	41.5	57.1	15.2	Major Adverse	57.0	15.1	Major Adverse
4	32 LOGIE AVENUE, (Ground Floor)	40.4	40.0	56.2	15.8	Major Adverse	49.9	9.5	Moderate Adverse
5	22 LOGIE AVENUE (First Floor)	38.1	38.6	45.6	7.5	Moderate Adverse	43.7	5.6	Moderate Adverse
6	22 LOGIE AVENUE (Second Floor)	40.7	41.3	47.1	6.4	Moderate Adverse	45.5	4.8	Minor Adverse
7	26 MANOR AVENUE, (First Floor)	41.9	42.2	51.0	9.1	Moderate Adverse	51.2	9.3	Moderate Adverse
8	26 MANOR AVENUE (Second Floor)	43.1	43.3	51.7	8.6	Moderate Adverse	51.9	8.8	Moderate Adverse
9	11 MANOR WALK	41.8	41.4	45.8	4.0	Minor Adverse	45.8	4.0	Minor Adverse
10	19 MANOR WALK	44.4	43.5	47.5	3.1	Minor Adverse	47.5	3.1	Minor Adverse
11	60 MANOR AVENUE	44.3	44.7	48.0	3.7	Minor Adverse	48.0	3.7	Minor Adverse
12	454 CLIFTON ROAD	46.3	51.5	49.3	3.0	Minor Adverse	49.3	3.0	Minor Adverse
13	108 WESTERN ROAD	45.5	50.5	50.1	4.6	Minor Adverse	50.1	4.6	Minor Adverse
14	27 HILTON ROAD	42.3	47.9	46.7	4.4	Minor Adverse	46.7	4.4	Minor Adverse
15	133 HILTON AVENUE	43.2	46.9	45.9	2.7	Negligible Adverse	45.9	2.7	Negligible Adverse
16	98 DON STREET	44.4	48.4	45.9	1.5	Negligible Adverse	45.9	1.5	Negligible Adverse
17	97 DON STREET	44.9	50.7	47.3	2.4	Negligible Adverse	47.3	2.4	Negligible Adverse
18	519 CLIFTON ROAD	47.1	51.6	49.4	2.3	Negligible Adverse	49.4	2.3	Negligible Adverse

Receptor Number	Receptor Name	Do Minumum		Predicted Noise Level $L_{night,outside}$ (dB)					
				Do Something					
				Without Mitigation			With Mitigation		
		2018	2033	DS 2033	Noise Change (dB)	Magn'de of Change	DS 2033 $L_{night,}$	Noise Change (dB)	Magn'de of Change
Residential Sample Receptors – Designated Areas									
22	CNMA_619, CLIFTON ROAD, ABERDEE	58.5	59.6	56.9	-1.6	Negligible Beneficial	56.9	-1.6	Negligible Beneficial
23	CNMA_563, NORTH ANDERSON DRIVE, ABERDEEN	60.4	61.0	58.8	-1.6	Negligible Beneficial	58.8	-1.6	Negligible Beneficial
24	CNMA_733, GREAT NORTHERN ROAD, ABERDEEN	58.9	58.6	59.7	0.8	Negligible Adverse	59.7	0.8	Negligible Adverse
25	CNMA_756, GREAT NORTHERN ROAD, ABERDEEN	56.5	56.6	57.1	0.6	Negligible Adverse	57.1	0.6	Negligible Adverse
26	CNMA_342, NORTH ANDERSON DRIVE, ABERDEEN	56.7	57.5	57.5	0.8	Negligible Adverse	57.5	0.8	Negligible Adverse
27	CNMA_315, NORTH ANDERSON DRIVE, ABERDEEN	57.3	57.3	57.5	0.2	Negligible Adverse	57.5	0.2	Negligible Adverse

14.6.17 The largest benefit afforded by the noise barriers, as shown in Table 14.24, is evident at ground floor level at 32 Logie Avenue, where a 6.3 dB reduction in noise level is predicted. No noise reduction is predicted at first floor height at 32 Logie Avenue, while a 1.9 and 1.6 dB reduction is predicted at first and second floor height, respectively, at 22 Logie Avenue.

14.6.18 As indicated in Table 14.24, in the night-time 2033 scenario Major and Moderate adverse noise impacts with or without mitigation are predicted for properties in Manor Drive, Logie Avenue and parts of Manor Avenue. Minor adverse noise impacts are predicted for properties in Manor Walk, parts of Manor Avenue, Clifton Road, Western Road and Hilton Road. It should be noted that long-term night-time Moderate noise impacts are also predicted for properties in Clifton Road, Western Road, Hilton Road and Don Street in the DM situation.

14.6.19 Designated areas are predicted to experience Negligible impacts. The proposed mitigation does not have an effect on predicted noise levels for the sample designated areas.

Summary Tables

14.6.20 Tables 14.25 and 14.26 provide the potential noise level change comparisons in accordance with the reporting requirements for a Detailed Assessment within HD 213/11. For these summary tables, changes in daytime noise levels are in terms of $L_{A10,18hr}$, whereas changes in night-time noise levels are in terms of a $L_{night,outside}$.

14.6.21 The figures in parentheses within the text below are the number of non-residential sensitive receptors experiencing the noise impacts being reported, while the total number of sensitive receptors include both residential and non-residential receptors.

Table 14.25: Detailed Assessment Summary Table: Short-term Traffic Noise Reporting Table – Do-Minimum (2018) against Do-Something (2018)

Scenario/Comparison: DM 2018 against DS 2018					
Change in Noise Level (dB)		Daytime			
		Without Mitigation		With Mitigation	
		No of dwellings	No of other sensitive receptors	No of dwellings	No of other sensitive receptors
Increase in noise level	0.1-0.9	3466	31	3474	31
	1.0-2.9	314	1	323	1
	3.0-4.9	105	0	115	0
	5 +	127	1	113	1
No Change	0	1795	12	1780	13
Decrease in noise level	0.1-0.9	4981	30	4986	29
	1.0-2.9	389	0	389	0
	3.0-4.9	28	0	25	0
	5 +	10	0	10	0

14.6.22 It can be seen from Table 14.25 that in the short-term the majority of receptors would experience no change or a Negligible noise impact both with and without mitigation in place.

14.6.23 Without mitigation, a total of 128(1) receptors would experience short-term Major noise increases, with 105(0) experiencing Moderate noise increases. However, with mitigation in place, a total of 114(1) receptors would experience adverse short-term Major noise increases, with 115(0) experiencing Moderate noise increases. There are 14 fewer dwellings experiencing Major adverse noise impacts with mitigation compared to the situation with no mitigation in place.

14.6.24 Both with and without mitigation, a total of 10(0) receptors would experience Major beneficial noise decreases, without mitigation in place 28(0) receptors would experience Moderate beneficial noise decreases, three more than are predicted with mitigation in place. This change in number of properties predicted to experience Moderate noise decreases is the result of the reflective barriers included within the noise model, and as such are unlikely to occur in practice with the installation of an absorptive barrier (as discussed in paragraph 14.5.8). The influence of an absorptive, rather than reflective, barrier is discussed in paragraphs 14.6.32 to 14.6.35.

14.6.25 In terms of perceptible changes, i.e. noise level change of 1 dB $L_{A10,18hr}$ or more, 553(2) receptors are predicted to experience perceptible increases with 424(0) experiencing perceptible decreases with mitigation measures in place.

14.6.26 The negative impact of changes resulting from the reflection effects of proposed noise barriers, are evident in Table 14.25, and can be seen in the greater number of dwellings experiencing perceptible noise increases with both mitigation and the proposed scheme. Absorptive barriers have been proposed, and as such this effect would not be seen in practice.

Table 14.26: Detailed Assessment Summary Table: Long-term Traffic Noise Reporting Table – Do-Minimum (2018) against Do-Something (2033)

Scenario/Comparison: DM 2018 against DS 2033							
Change in Noise Level (dB)		Without Mitigation			With Mitigation		
		Daytime		Night-time	Daytime		Night-time
		No of dwellings	No of other sensitive receptors	No of dwellings	No of dwellings	No of other sensitive receptors	No of dwellings
Increase in noise level	0.1-2.9	9977	64	1637	9978	64	1637
	3.0-4.9	714	10	12	730	10	12
	5.0-9.9	140	1	0	158	1	0
	10 +	64	0	6	38	0	4
No Change	0	64	0	18	57	0	18
Decrease in noise level	0.1-2.9	240	0	91	240	0	91
	3.0-4.9	11	0	0	10	0	0
	5.0-9.9	5	0	0	4	0	0
	10 +	0	0	0	0	0	0

14.6.27 Table 14.26 shows that for the proposed scheme with or without mitigation in place, the vast majority of receptors would experience no change or a Negligible noise impact for the daytime period. With mitigation in place, there are predicted to be 937(11) receptors experiencing perceptible adverse noise impacts, comprising 38(0) Major adverse, 159(1) Moderate adverse and 740(10) Minor adverse impacts. There are 26 fewer dwellings experiencing Major adverse noise impacts with mitigation compared to the situation with no mitigation in place. In addition, there are a total of 14(0) receptors experience perceptible noise decreases with ten experiencing a Minor noise benefit and four a Moderate noise benefit.

14.6.28 With mitigation and the proposed scheme in place there would be 38 dwellings experiencing Major adverse noise impacts, compared to none in the DM situation in 2033 for the daytime, and 207 fewer dwellings experiencing Moderate adverse noise impacts compared to the DM situation in 2033 for the daytime. In terms of other sensitive receptors there would be four fewer Moderate adverse noise impacts with the proposed scheme compared to the DM situation in 2033. With mitigation and the proposed scheme in place there would also be four dwellings experiencing Moderate beneficial noise impacts, while none occur in the DM situation in 2033. Hence, compared to the DM scenario, with the proposed scheme and mitigation in place, there would be an increase (38) in the number of dwellings experiencing Major adverse noise impact, while there would be a large reduction (207) in the number experiencing a Moderate adverse impact. In addition, there is a slight increase (4) in those experiencing a Moderate beneficial impact. As such, despite the increase in Major adverse impacts as a result of the proposed scheme (with mitigation in place), it is considered that the overall long-term daytime scheme impact is largely neutral.

14.6.29 During the night-time period with mitigation and the proposed scheme, there are predicted to be 16 dwellings experiencing perceptible noise increases, four with a Major noise impact and 12 with a Minor noise impact. Conversely, there are predicted to be no dwellings that would experience perceptible beneficial noise impacts in the night-time period, with the proposed scheme in place. Two fewer dwellings experience Major adverse noise impacts with mitigation compared to the situation with no mitigation in place.

14.6.30 Without the proposed scheme in place there would be 56 dwellings experiencing perceptible night time increases with an associated Minor adverse noise impact. Hence, there would be far more dwellings experiencing perceptible noise increases without the proposed scheme in place.

14.6.31 The impact on the predicted noise levels of the proposed barrier reflection effects (as per paragraph 14.5.8) seen within the noise model, are evident in Table 14.26, and can be seen in the greater number of dwellings experiencing perceptible noise decreases without mitigation in place. Absorptive barriers have been proposed, and as such this effect would not be seen in practice.

Reflective vs. Absorptive Barrier Review

14.6.32 As has been noted throughout this chapter, the likely noise reductions at noise sensitive properties resulting from the use of absorptive, rather than reflective, noise barriers are not evident within the predicted noise levels presented in Section 14.6 (Residual Impacts). In order to demonstrate the likely noise benefits of using an absorptive noise barrier, additional noise modelling predictions have been undertaken with the inclusion of an absorptive noise barrier. This approach is a departure from the prediction method detailed within CRTN and HD 213/11, and removes the potential correction for 'reflections from opposite façade' for the noise barrier at every receptor that may be affected, namely those on the Manor Drive, Manor Walk, Manor Avenue and Logie Terrace. Table 14.27 presents the HD 213/11 summary table results, for dwellings, for the DM18 vs. DS18 and DM18 vs. DS33 (daytime and night-time) comparisons.

14.6.33 It is clear that the introduction of a fully absorptive noise barrier has reduced the number of adverse impacts from those that are predicted when a reflective noise barrier is considered. For example, with no mitigation included within the noise model, a total of 427 dwellings are predicted to experience perceptible noise benefits in the baseline year. With reflective barriers introduced, this number reduces by 3 to 424, while 431 dwellings are predicted to experience such noise changes with absorptive barriers included. A similar effect is seen in the future assessment year, where 16 perceptible noise reductions are predicted when no mitigation is included, with the same number being predicted with absorptive barriers included. However this number reduces to 14 when reflective barriers are included.

14.6.34 In terms of perceptible adverse noise impacts, 546 are predicted with no noise mitigation in place, while 551 are predicted with reflective barriers and 546 with absorptive barriers, in the baseline year. These figures change to 918, for the situation where no mitigation is included and where absorptive barriers are included, and increase to 926 where reflective barriers are included, in the future assessment year.

14.6.35 It should be noted that the comparison between impacts experienced with reflective and absorptive barriers included are intended to be indicative only, as these scenarios assume either total reflection (as per CRTN) or absorption of all incident sound. In practice, it is likely that noise impacts are likely to be somewhere between those seen for reflective and absorptive noise barriers, and will be dependent upon the acoustic performance of the absorptive barriers.

Table 14.27: Reflective and Absorptive Noise Barrier Options Comparison

Scenario/Comparison: DM 2018 against DS 2018						
Change in Noise Level (dB)		**Daytime**				
		Without Mitigation	**With Reflective Barriers**	**Change vs. Without Mitigation**	**With Absorptive Barriers**	**Change vs. Without Mitigation**
Increase in noise level	0.1-0.9	3466	3474	8	3465	-1
	1.0-2.9	314	323	9	320	6
	3.0-4.9	105	115	10	113	8
	5 +	127	113	-14	113	-14
No Change	0	1795	1780	-15	1789	-6
Decrease in noise level	0.1-0.9	4981	4986	5	4984	3
	1.0-2.9	389	389	0	393	4
	3.0-4.9	28	25	-3	27	-1
	5 +	10	10	0	11	1
Scenario/Comparison: DM 2018 against DS 2033						
Increase in noise level	0.1-2.9	9977	9978	1	9977	0
	3.0-4.9	714	730	16	724	10
	5.0-9.9	140	158	18	156	16
	10 +	64	38	-26	38	-26
No Change	0	64	57	-7	64	0
Decrease in noise level	0.1-2.9	240	240	0	240	0
	3.0-4.9	11	10	-1	11	0
	5.0-9.9	5	4	-1	5	0
	10 +	0	0	0	0	0

Noise Nuisance

14.6.36 Calculations of the change in noise nuisance have been undertaken for all dwellings within the HD 213/11 Calculation Area for the assessment of permanent traffic noise impacts. Table 14.28 below provides the results of the noise nuisance assessment undertaken.

Table 14.28: Noise Nuisance Assessment

Scenario/Comparison: Noise Nuisance Assessment				
Change in Nuisance Level		**Do-Minimum (dwellings)**	**Without Mitigation**	**With Mitigation**
			Do-Something (dwellings)	**Do-Something (dwellings)**
Increase in nuisance level	< 10%	9592	6893	6889
	10 < 20%	131	3363	3375
	20 < 30%	0	415	420
	30 < 40%	0	136	162
	> 40%	0	98	68
No Change	0%	158	69	62
Decrease in nuisance level	< 10%	1334	241	239
	10 < 20%	0	0	0
	20 < 30%	0	0	0
	30 < 40%	0	0	0
	> 40%	0	0	0

14.6.37 Table 14.28 shows that in the Do-Minimum situation the vast majority of dwellings would experience a <10% change in nuisance level, with most properties experiencing an increase in nuisance level.

14.6.38 With the proposed scheme and mitigation in place there are 30 fewer properties experiencing an increase in nuisance level of >40% compared to the situation without mitigation. With the proposed scheme and mitigation in place 650 dwellings would experience an increase in nuisance level between 20 and >40%, one more than would be seen without mitigation in place. With the scheme and mitigation in place 239 dwellings would experience a decrease in nuisance level of <10%, which compares to 1334 dwellings in the Do-Minimum scenario.

14.6.39 Although a number of dwellings are predicted to experience increases in nuisance levels greater than 10% under the Do-Something scenarios, it should be noted that the changes predicted in the short-term represent a larger percentage increase in nuisance levels, e.g. a 0.9 dB increase in noise level is equivalent to 20% increase in the noise nuisance level in the short-term. In other words, as noted in Annex 6 of HD 213/11, people are more sensitive to abrupt changes in traffic noise than gradual changes. Therefore, the sensitivity to new schemes is an effect that can last for a number of years, when in fact gradual changes in noise levels can represent higher overall noise increases.

Vibration Nuisance

14.6.40 Changes in vibration nuisance have been calculated for all dwellings within 40m of roads that are within the HD 213/11 Calculation Area. Table 14.29 provides the results of the vibration nuisance assessment undertaken.

Table 14.29: Vibration Nuisance Assessment

Scenario/Comparison: Vibration Nuisance Assessment				
Change in Nuisance Level		**Do-Minimum (dwellings)**	**Do-Something (dwellings)**	
			Without Mitigation	**With Mitigation**
Increase in nuisance level	< 10%	4065	4256	4255
	10 < 20%	116	91	82
	20 < 30%	0	6	4
	30 < 40%	0	0	0
	> 40%	0	0	0
No Change	0%	1788	1744	1758
Decrease in nuisance level	< 10%	341	213	211
	10 < 20%	0	0	0
	20 < 30%	0	0	0
	30 < 40%	0	0	0
	> 40%	0	0	0

14.6.41 Table 14.29 shows that in the Do-Minimum situation the majority of dwellings would experience a <10% change in nuisance level. A total of 4181 dwellings would experience an increase in nuisance level with 341 dwellings experiencing a decrease in nuisance level.

14.6.42 With the proposed mitigation and the proposed scheme in place 4255 dwellings would experience an increase in nuisance level of <10%, with 82 dwellings experiencing a 10 to <20% increase, and four dwellings experiencing a 20 to <30% increase in nuisance level. Meanwhile 211 dwellings would experience a <10% decrease in noise level.

14.6.43 With mitigation in place, there is a reduction in the number of dwellings experiencing a 20 to <30% increase in nuisance level from six to four, while the equivalent number in the DM scenario is zero. The number of dwellings experiencing a 10 to <20% increase in nuisance level reduces from 91 to 82 with mitigation in place, with the equivalent in the DM scenario higher at 116. While the number of dwellings experiencing a <10% increase in nuisance level reduces by one with mitigation, from 4256 to 4255, with the number in the DM scenario being 4065.

Noise Change Contours

14.6.44 The noise changes in the short and long-term with the proposed scheme in place are highlighted in Figures 14.2a-d which show the potential noise change contours in terms of the magnitude of impacts categories provided in HD 213/11.

14.6.45 It should be noted that the noise change contours include the noise mitigation (i.e. noise barriers) proposed within this chapter.

14.7 References

Environmental Noise Directive 2002/49/EC.

Environmental Noise (Scotland) Regulations 2006.

Transportation Noise Action Plan produced by the Transportation Noise Working Group for the Scottish Government.

British Standards Institution (1993). BS 7385-2 Evaluation and Measurement for Vibration in Buildings – Guide to Damage Levels from Groundborne Vibration, British Standards Institution.

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Department of Transport Welsh Office (1988). Calculation of Road Traffic Noise, HMSO.

Highways Agency et al., (2011). Design Manual for Roads and Bridges (DMRB) HD 213/11-Revision 1, Volume 11, Part 7. The Highways Agency, Scottish Government, Welsh Assembly Government, The Department for Regional Development Northern Ireland.

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ANC (2001). Measurement & Assessment of Groundborne Noise & Vibration. The Association of Noise Consultants.

Scottish Government (undated). Guidance for Possible Measures to Manage Noise from Road and Rail. http://www.scottishnoisemapping.org/downloads/guidance/Mitigation_Guidance.pdf

TRL report Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping

TRRL Report No RR53 – Ground Vibration Caused by Civil Engineering Works.

DMRB Volume 11 Section 2 Part 5 (HA 205/08), Assessment and Management of Environmental Effects.

15 Effects on all Travellers

This chapter presents an assessment of the potential impacts of the proposed scheme on pedestrians, cyclists and equestrians (referred to as Non-Motorised Users (NMUs)) in terms of journey lengths and amenity, and vehicle travellers in terms of changes to driver stress. It outlines measures for mitigating these impacts where possible and describes any residual impacts that may occur with mitigation in place.

The assessment considers paths and outdoor areas including core paths, rights of way, National Cycle Routes, local cycle routes and local footpaths. Effects of changes to NMU journey lengths and amenity value were assessed, and used to determine potential impacts on access to the outdoors. The assessment takes into account mitigation embedded in the proposed scheme design such as new cycle routes/footpaths and NMU crossing points.

With the implementation of mitigation, beneficial impacts for NMUs have been identified as a result of the provision of additional footpaths and cycle routes. These will maintain existing access and also provide safer access across the proposed scheme. Some adverse visual and noise impacts are predicted for NMUs using paths in the immediate vicinity of the proposed scheme, however, this will be offset by improvements to safety for NMUs passing through the study area. There will also be Slight (beneficial) noise and air quality impacts predicted for a number of NMUs using paths in the immediate vicinity of the proposed scheme. Overall, journey lengths and the amenity value of paths are not significantly affected with the proposed scheme in place and residual impacts on NMUs using paths during operation are mostly assessed as Negligible or Slight Beneficial.

Overall, impacts on access to outdoor areas have been assessed as Slight during operation of the proposed scheme. There is expected to be a Slight (beneficial) impact on users of public transport (i.e. bus users) in the study area through an overall reduction in journey times.

Driver stress can be caused by frustration, fear of accidents and uncertainty of the route being followed. Driver stress levels on the existing roads at Haudagain Roundabout are assessed as Moderate to High. Driver stress levels for the Do-minimum and Do-Something scenarios in 2033 are also assessed as being generally Moderate to High.

15.1 Introduction

15.1.1 This chapter presents the assessment of potential impacts on the journeys made by pedestrians, cyclists, equestrians and vehicular travellers in the area local to the proposed scheme. In line with the Design Manual for Roads and Bridges (DMRB) Interim Advice Note (IAN) 125/09 Supplementary Guidance for users of DMRB Volume 11, Environmental Assessment (The Highways Agency, 2009) (hereafter referred to as IAN 125/09), this chapter combines DMRB Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects and Part 9 Vehicle Travellers (The Highways Agency et al., 1993) (hereafter referred to as 'DMRB Pedestrians, Cyclists, Equestrians and Community Effects' and 'DMRB Vehicle Travellers'). The 'community effects' element of DMRB Pedestrians, Cyclists, Equestrians and Community Effects is included in Chapter 7 (Community and Private Assets).

15.1.2 The term Non-Motorised Users (NMUs) is used to describe pedestrians, cyclists and equestrians. This chapter considers the impact on NMUs using paths for commuting and recreational purposes and for accessing the outdoors. Paths are considered to be: core paths, rights of way, local paths, National Cycle Routes and local cycle routes. The overall impact on NMUs using paths is assessed by considering the impacts of the proposed scheme on paths, with regard to changes in journey length and changes in the amenity value for journeys.

15.1.3 In accordance with Scottish Natural Heritage (SNH) guidance, 'A Handbook on Environmental Impact Assessment' (2013), this assessment takes into consideration NMU access to the outdoors. Table 1 of Appendix 5 in the Handbook on Environmental Impact Assessment (SNH, 2009) provides a list of area based facilities (National Parks, Regional Parks and Local Nature Reserves) and linear access facilities (core paths, National Cycle

Network and rights of ways). The assessment of linear access facilities is included within the assessment of paths used by NMUs and the assessment of access to area based facilities is included under the sections entitled 'Access to Outdoor Areas'.

15.1.4 As no rights of ways were identified within the study area, these have been scoped out of the assessment and are not considered further.

15.1.5 The impacts of the proposed scheme on users of public transport, (i.e. bus users) are also assessed in relation to changes to journey length and potential disruption to services.

15.1.6 In line with DMRB, this chapter presents the assessment of impacts in terms of driver stress. DMRB also recommends undertaking sufficient assessment to identify factors and effects in relation to vehicle travellers' views from the road. However, this is more applicable to schemes within rural environments rather than urban environments, such as that surrounding the Haudagain Roundabout. In addition, no significant effects on the view from the road were identified for Option 5 at DMRB Stage 2. 'View from the Road' has therefore been scoped out of this assessment. Impacts on visual amenity for vehicle travellers are however assessed and considered within Chapter 11 (Landscape and Visual).

15.1.7 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to effects on all travellers has been undertaken and is detailed in Appendix 17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Non-Motorised Users (NMUs)

15.1.8 The use of paths can help to improve health, reduce social exclusion, and unlike other modes of transport generally has few associated costs (e.g. fuel, travel tickets etc). A good path network can also inspire visitors to access the local environment (e.g. the River Don), whilst potential secondary benefits include encouraging financial expenditure in the local economy.

15.1.9 Key pieces of legislation that are relevant to the NMUs are the Roads (Scotland) Act 1984, Land Reform (Scotland) Act 2003 and the Equality Act 2010. The requirements of these Acts, as they apply to road development schemes, are summarised below.

<u>Roads (Scotland) Act 1984</u>

15.1.10 The Roads (Scotland) Act 1984 sets out that the public has a right of passage over a variety of routes which fall under the statutory definition of a road, particularly routes where the right of passage is non-vehicular.

15.1.11 The Act defines the following terms:

- "public road" means a road which a Roads Authority has a duty to maintain;
- "road" means subject to Section 151(3) of the Roads (Scotland) Act 1984, any way (other than a waterway) over which there is a public right of passage (by whatever means and whether subject to a toll or not) and includes the road's verge, and any bridge (whether permanent or temporary) over which or tunnel through which, the road passes, and any reference to a road includes a part thereof;
- "footway" the right of passage by foot only where it is associated with a carriageway (i.e. the pavement);
- "footpath" the right of passage by foot only where it is not associated with a carriageway;
- "cycle track" the right of passage by pedal cycle only or by pedal cycle and foot only; and
- "carriageway" the right of passage by vehicles and pedal cycles.

15.1.12 This chapter uses the general terms 'path' or 'footpath' to describe any right of passage designated as 'footway' or 'footpath' in the Roads (Scotland) Act 1984. Furthermore, the general term 'cycle route' is used to describe any right of passage for cyclists designated a 'cycle track' or 'carriageway' in the Roads (Scotland) Act 1984.

Land Reform (Scotland) Act 2003

15.1.13 The Land Reform (Scotland) Act 2003 Part 1 came into effect in February 2005 and established statutory rights of responsible access on and over most land, and inland water.

15.1.14 Local authorities are granted powers and duties to uphold and facilitate responsible access rights. There is a duty on local authorities to prepare a plan for a path network, to keep a list of 'core paths' and, under Sections 13 and 19 of the Act, to:

"Protect and keep open and free from obstruction or encroachment any route, waterway or other means by which access rights may reasonably be exercised".

15.1.15 Section 10 of the Act states that it is the duty of SNH to draw up and issue a Scottish Outdoor Access Code which sets out guidance in relation to access rights and responsibilities. The Scottish Outdoor Access Code was approved by the Scottish Parliament in July 2004 (SNH, 2005). It is the duty of SNH and local authorities to publicise the Code and for SNH to promote understanding of it.

Equality Act 2010

15.1.16 Under the Equality Act 2010, it is unlawful for service providers to treat disabled people less favourably than they would treat other people, when offering public services and facilities. This includes paths and associated access structures such as ramps and bridges. Accordingly, any structures which could be used as a mitigation measure to maintain access e.g. cycle routes, footpaths or ramps, would need to take into account potential barriers to disabled people such as gradient, verge width, radius of bends and surfacing.

Driver Stress

15.1.17 For the purposes of this assessment, driver stress is defined as 'the mental and physiological effects experienced by a driver using a road network'. Factors influencing the level of driver stress include the road layout and geometry, surface riding characteristics, junction frequency and the speed and flow per lane. In general, drivers will choose the route that they believe to give the shortest reliable journey time, taking account of expected variability and coping with associated stress.

15.1.18 The three main components of driver stress are frustration, fear of a potential accident and uncertainty of the route which is being followed. These components are discussed below:

- Frustration: caused by a driver being unable to drive at a desired speed based on the road conditions. Frustration levels increase as travelling speed falls relative to expectation. May be caused by high traffic volume, intersections, roadworks, or difficulties overtaking slower traffic.
- Fear of Potential Accident: the main factors leading to this are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians stepping on to the road. Other factors include complex junctions and roundabouts, and poorly maintained road surfaces. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high.
- Route Uncertainty: caused primarily by signage that is inadequate for the individual's purposes. Poor lighting may also cause uncertainty as turnings and junctions may not be seen in advance.

15.2 Approach and Methods

NMUs

Study Area

15.2.1 The study area for the assessment of impacts on NMUs includes paths within a 500m buffer of the proposed scheme and any potential outdoor areas linked by these paths. DMRB does not specify within guidance a study area buffer to use, therefore by applying professional judgement a 500m buffer has been selected, that captures the extent of potentially impacted areas.

Baseline Conditions

15.2.2 Baseline data were collected through desk-based studies, consultation and site survey:

Desk-Based Assessment

- A review of Ordnance Survey Maps:
  - Aberdeen Streetfinder Map (Collins, 2003); and
  - OS Streetview with overlaid OS Mastermap topography lines.
- A review of relevant local plans and strategies:
  - Aberdeen City Council Core Paths Plan (Aberdeen City Council, 2009);
  - Aberdeen City Council Cycle Map (Aberdeen City Council website, accessed 2014);
  - Aberdeen Local Development Plan (Aberdeen City Council, 2012a);
  - Aberdeen Open Space Strategy 2011 – 2016 (Aberdeen City Council, 2012b); and
  - NHS Grampian Health Walks 04 leaflet (NHS, 2014).
- A web based search to identify:
  - existing and proposed paths (recreational and functional) used by NMUs;
  - outdoor access facilities as specified in Appendix 5, Table 1 of 'A Handbook on Environmental Impact Assessment' (SNH, 2009) – e.g. parks, local open spaces, rivers, woodlands and linear facilities e.g. paths, rights of way, cycle routes; and
  - public transport links, including bus routes and railway lines.

Consultation

15.2.3 Consultation responses from the following organisations have also been considered in the assessment (refer to Chapter 6: Consultation and Scoping and supporting Appendix A6.2: Summary of Consultation Responses for further details):

- Aberdeen City Council (ACC);
- Aberdeen Cycle Forum;
- British Horse Society;
- Cycle Touring Club (CTC);
- Disability Advisory Group;
- Mobility and Access Committee Scotland;
- Scotways; and
- Sustrans Scotland.

15.2.4 Consultation meetings were held with relevant cycling groups, access panels and bus groups during the design process. Details of these meetings are provided in the Accessibility Audit Objective Setting and Context Report (Jacobs UK Ltd, 2015a) and the Cycle Audit Context Report (Jacobs UK Ltd, 2015b).

Site Survey

15.2.5 To verify the baseline data collected through desk-based assessment and consultation, a walkover survey of all paths and cycle routes within the study area was undertaken in July 2014 by two Environmental Scientists.

Path Network

Core Paths

15.2.6 As noted above, local authorities have a duty to make a Core Paths Plan publicly available for inspection under the Land Reform (Scotland) Act 2003. The local authority responsible for access within the study area is ACC. Following formal consultation between August 2008 and October 2008, the ACC Core Paths Plan was adopted in April 2009. It forms a key part of the outdoor access provision and helps to support the wider national, regional and local policy objectives on health, recreation and education (Aberdeen City Council, 2009). The plan aims to:

"…*provide the basic framework of routes sufficient for the purpose of giving the public reasonable access throughout their area. The basic framework of routes will link into, and support, wider networks of other paths*."

15.2.7 Core paths may include the following: rights of way, footpaths, tracks, cycle routes, paths which are, or may be, covered by path agreements or path orders under the Land Reform (Scotland) Act 2003, Sections 20 and 21, waterways, or other means by which persons may cross land. The Core Paths Plan will have regard to the likely usage and desirability of paths, and a balance with landowner interests.

15.2.8 The core paths within ACC's Core Paths Plan combines existing paths with newly created paths to create a cohesive network throughout the city. The majority of these paths are close to residential areas and can range from tracks worn into natural ground to constructed paths. The core paths identified cater for all types of users including walkers, cyclists, horse riders, canoeists and people with disabilities, and are a key part of outdoor access provision for the city (Aberdeen City Council, 2009).

Aspirational Core Paths

15.2.9 Aspirational core paths were identified through consultation with ACC as having the potential to provide key linking routes between existing core paths. Although aspirational core paths do not currently exist on the ground, they have been included in this assessment.

Local Paths

15.2.10 Paths recognised within the local path network are those that may provide important links between designated paths (such as core paths), outdoor areas and communities. Local paths are also considered here to be any path that fall within the criteria of 'footway' or 'footpath' as described in the Roads (Scotland) Act 1984 (refer to paragraph 15.1.10 – 15.1.12).

15.2.11 Several local (non designated) paths were identified by ACC through consultation as being key routes as they provide connectivity to the wider path network.

15.2.12 For the purposes of this assessment, local paths also include footpaths (pavements) located

adjacent to the following trunk roads:

- A90(T) Mugiemoss Road (north of the Haudagain Roundabout);
- A90(T) North Anderson Drive (south of the Haudagain Roundabout);
- A96(T) Auchmill Road (west of the Haudagain Roundabout); and
- A96 Great Northern Road (east of the Haudagain Roundabout).

National Cycle Routes

15.2.13 The National Cycle Network is a UK network of cycle routes and was created by Sustrans in 1995 (Sustrans, 2014). The routes are a *'series of safe, traffic-free lanes and quiet on-road routes'*. These routes can also be designated as core paths.

Local Cycle Routes

15.2.14 These may be segregated or combined cycle routes/footpaths, on-road routes or shared bus/taxi lanes. A local cycle route may also fall within the criteria of 'cycle track' or 'carriageway' (in relation to cycles only) as described in the Roads (Scotland) Act 1984 (refer to paragraph 15.1.10 – 15.1.12). Other regional and local cycle routes were identified through information collated from the site visit and desk based assessment.

Number and Type of User

15.2.15 DMRB guidance recommends the use of origin/destination surveys where '*travel patterns* [of pedestrian and other users] *are complex and a scheme could have a major impact*'. These surveys could include the use of 'counts' to provide information including numbers and types of user.

15.2.16 NMU count surveys were undertaken on 25 February 2014, as reported in the Accessibility Audit Objective Setting and Context Report (Jacobs UK Ltd, 2015a) and the Cycle Audit Context Report (Jacobs UK Ltd, 2015b). The surveys were undertaken between 06:00 and 19:00 and comprised the recording of NMU movements along local paths and cycle routes in the immediate vicinity of the proposed scheme. For the purposes of this assessment, these results have been used to inform the identification of the types of NMUs using paths in the study area only. NMU counts have not been used to inform the sensitivity rating given to NMU paths.

15.2.17 The Land Reform (Scotland) Act 2003 imposes certain requirements on local authorities in terms of maintaining public access. In addition, Scottish Planning Policy (SPP) (Scottish Government, 2014) and the National Planning Framework 3 (Scottish Government, 2014) aim to maintain, enhance and promote access to open space, recreation opportunities and amenities to build stronger, healthier communities. It is therefore considered that regardless of levels of use and types of user, all routes should be maintained and/or improved where practicable.

15.2.18 For this assessment, the type of user (including vulnerable users) was determined primarily from information provided during consultation with relevant bodies and from a site survey.

Impact Assessment

15.2.19 The approach and method used includes assessment of impacts on:

- NMUs (journey length and amenity value).
- NMU access to the outdoors (ease of access).

15.2.20 The significance of potential impacts on NMUs has been determined as a function of sensitivity and magnitude, as specified below. Unless otherwise stated, impacts are

considered to be adverse. An assessment of residual impacts of the proposed scheme is also provided, taking into account any identified mitigation measures.

Sensitivity

15.2.21 In recognition of the duties placed on local authorities by the Land Reform (Scotland) Act 2003, sensitivity was determined primarily based on importance (the level of formal recognition of a pathway) rather than on numbers of users. However, the sensitivity criteria were refined to take account of the types of main user.

15.2.22 Table 15.1 outlines sensitivity criteria applied in this assessment. Where a path could be attributed to more than one category (e.g. a core path may also be a National Cycle Route) the highest sensitivity rating was applied.

Table 15.1: Sensitivity Criteria

Sensitivity	Characteristics
High	Core paths / aspirational core paths.
Medium	National Cycle Routes.
Low	Local paths or cycle routes outwith the above categories.

15.2.23 Community facilities used by vulnerable groups, such as schools, elderly care homes and doctors' surgeries, have been identified in Chapter 7 (Community and Private Assets) and are shown on Figure 7.3. Where applicable, the sensitivity rating of paths was adjusted using professional judgement to take into consideration the vulnerability of users.

Potential Impacts (Paths)

15.2.24 The potential impact on NMUs was determined taking into consideration changes in both journey length and amenity value using the approach detailed below. Specific locations where impacts were expected for either journey length and amenity value are referred to as 'conflict areas' (CAs).

Changes in Journey Length

15.2.25 Changes in journey length can result from direct impacts (e.g. closure of paths/cycle routes and/or diversion routes as a result of the proposed scheme) or indirect impacts (e.g. as a result of increases in traffic flows, which may result in NMUs deciding to use an alternative route). Changes to journey lengths were calculated using geographical information systems (GIS). Where required, alternative NMU routes were identified in order to maintain access.

15.2.26 Taking into account guidance provided in DMRB, criteria were developed to determine magnitude of impact resulting from changes to journey length as shown in Table 15.2.

Table 15.2: Magnitude of Impact Criteria for Changes to Journey Length

Magnitude	Characteristics	Magnitude	Characteristics
High	≥ 500m or greater.	**Low**	100 to < 250m.
Medium	250 to <500m.	**Negligible**	<100m.

15.2.27 The significance of impact was then determined using the matrix in Table 15.3.

Table 15.3: Significance of Impact on Journey Length

Sensitivity / Magnitude	Low	Medium	High
High	Moderate	Moderate/Substantial	Substantial
Medium	Slight/Moderate	Moderate	Moderate/Substantial

Low	Negligible/Slight	Slight	Moderate
Negligible	Negligible	Negligible/Slight	Slight

15.2.28 For the purposes of this assessment, impacts were considered to be 'significant' where the assessment results indicated impacts of Moderate or higher significance. All paths with no change in journey length were assessed as Negligible.

Changes in Amenity

15.2.29 The amenity of a journey is defined in DMRB as *'the relative pleasantness of a journey'*. This relates in particular to the exposure of NMUs to traffic and associated noise, air quality, visual and safety aspects.

15.2.30 DMRB recommends that when assessing amenity in relation to safety, comparison is made between traffic flow data in opening year (2018), with and without the proposed scheme. This provides a measure of traffic flow changes that NMUs using or crossing the roads will encounter on their journeys. Due to the proposed scheme roads passing directly through the Middlefield Estate, many of the existing roads will be severed or shut off, resulting in a redistribution of traffic. Therefore, direct comparison between the opening year (2018) traffic flow data with and without the proposed scheme is not an accurate assessment of changes experienced by NMUs who currently travel through the Middlefield Estate. Consequently, impacts in amenity value related to safety were considered using professional judgement where the proposed scheme introduced changes for NMUs using the path network including:

- severance, widening or shortening of footpaths;
- changes in the distances NMUs are expected to travel;
- introduction or removal of barriers between pedestrians and vehicle traffic;
- provision or removal of NMU crossing points such as toucan crossings;
- alternative routes for cyclists; and
- changes in amenity value of NMU journeys.

15.2.31 The assessment of change to amenity value associated with noise, air quality and visual aspects is determined qualitatively, using professional judgement and taking into account the magnitude of change with respect to views, air quality and noise, as reported in Chapter 11 (Landscape and Visual), Chapter 13 (Air Quality) and Chapter 14 (Noise and Vibration).

15.2.32 The assessment of change to amenity value associated with air quality used the results from nearest air quality receptors to inform the significance values for changes to NMU paths (see Chapter 13 (Air Quality) and Figure 13.2). The assessment of change to amenity value associated with noise levels was based on the noise impact magnitude assessed for these areas (see Chapter 14 (Noise and Vibration) and Figure 14.2a).

15.2.33 The significance of impact criteria for change in amenity are described in Table 15.4.

Table 15.4: Significance of Impact on Amenity Value

Significance	Characteristics
Substantial	Where there is a substantial change in the existing view and/or air quality and/or a major change in noise levels and/or a substantial change in safety for NMUs.
Moderate	Where there is moderate or noticeable change in the existing view and/or air quality and/or a moderate change in noise levels and/or moderate change in safety for NMUs.
Slight	Where there is slight or barely perceptible change in the existing view and/or air quality and/or a slight change in noise levels and/or change in safety for NMUs.
Negligible	Very little or no discernible change from baseline conditions equating to a no-change situation.

Overall Impacts on Paths (Journey Length and Amenity)

15.2.34 To determine overall significance of impacts on NMUs using paths, the significance for changes in journey length and amenity were considered together using professional judgement. Overall significance was determined based on these two factors having an equal weighting of importance. Where an impact is only identified for one factor, the degree of overall significance was reduced accordingly.

Potential Impacts (Access to the Outdoors)

15.2.35 The objective of the outdoor access assessment is to determine any likely significant impacts on access to the outdoors (SNH, 2009). This includes the ability to make use of an outdoor area or path and the ease with which access is gained. The assessment was undertaken for area based facilities as outlined above, using the outcomes of the NMU assessment described above. Area based facilities include public parks and gardens; play spaces; allotments; golf courses; cemeteries; and playing fields.

Mitigation

15.2.36 The development of mitigation is based on the approach as described in Planning Advice Note (PAN) 1/2013 and to meet the legislation requirements of the Equality Act (2010) and the Land Reform (Scotland) Act 2003.

15.2.37 The development of the proposed scheme design followed an iterative process in which provision for maintaining NMU journeys was taken into account (i.e. the proposed scheme design already has 'embedded' mitigation). Embedded mitigation (EM) included within the design is shown on Figure 15.3 and described as follows:

- Extension of existing crossing point on the A90(T) North Anderson Drive in order to provide NMUs safe crossing of the additional lane for left turns only (EM1).
- Replacement of existing pedestrian crossing point on Manor Drive at the proposed A96(T) Auchmill Road junction. Provision of a pedestrian crossing point on A96(T) Auchmill Road providing direct access to the existing bus stop located on the eastbound carriageway (west of the proposed junction) (EM2).
- Provision of pedestrian crossing points through the proposed signalised junction to maintain access between the realigned Manor Avenue and Logie Avenue (EM3).
- Provision of steps to provide pedestrian access between the existing Manor Avenue and the proposed dual carriageway link road including direct access to a proposed bus stop (EM4).
- Provision of steps to provide pedestrian access between the existing Manor Terrace and Manor Avenue and access to the realigned Manor Avenue (EM5).
- Footpath providing access between Logie Place and the proposed dual carriageway link road (EM6).
- Footpath/cycle route alongside the existing Manor Avenue (EM7).
- Footpath between the existing Logie Terrace and the realigned Manor Avenue (EM8).
- Provision of a 2m wide footpath (with an additional 1m separation strip) along the full length of the northbound carriageway of the proposed dual carriageway link road and both sides of the realigned Manor Avenue (EM9).
- Provision of a 3m wide shared cycle route/footpath (with an additional 1m separation strip) along the full length of the southbound carriageway of the proposed dual carriageway link road (EM10).

- Provision of a 2m wide footpath along both sides of the realigned Logie Avenue with a proposed footpath providing access between Logie Avenue (West) and the proposed dual carriageway link road (EM11).
- Footpath providing access between the existing Manor Drive and the proposed dual carriageway link road (EM12).
- Provision of a signalised NMU crossing point on the proposed dual carriageway link road (east of the proposed dual carriageway link road / A90(T) Auchmill Road junction) (EM13).
- Provision of two signalised NMU crossing points on the proposed dual carriageway link road / A90(T) North Anderson Drive junction (EM14).

15.2.38 The potential impacts identified in Section 15.4 (Potential Impacts), take into consideration the above 'embedded' mitigation. Further general mitigation is proposed to reduce any potential impacts remaining, as described in Section 15.5 (Mitigation).

Residual Impact Assessment

15.2.39 Residual impacts were identified following the same methodology as described above for the identification of potential impacts taking into account the mitigation proposals as described in Section 15.5 (Mitigation).

Vehicle Travellers (Driver Stress)

Baseline Conditions and Impact Assessment

15.2.40 Driver stress has been assessed using a three point scale of High, Moderate or Low.

15.2.41 This assessment is based on predicting the average peak hourly flow per lane in 'flow units' and the average journey speed along each section of the road. Flow units are calculated whereby a car or light van is equal to one flow unit and a commercial vehicle is equal to three flow units.

15.2.42 Tables 15.4 and 15.5 present the guidance provided by DMRB on the appropriate category of stress levels for varying flows and speeds on single carriageway and dual carriageway roads respectively. This assessment classifies the study area as falling within an 'urban' area when classifying driver stress.

Table 15.4: Driver Stress Levels on Single Carriageways

Average peak hourly flow per Lane (flow units/hour)*	Average Journey Speed Km/hr		
	Under 50	50-70	Over 70
Under 600	Moderate**	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

Table 15.5: Driver Stress Levels on Dual Carriageways

Average peak hourly flow per Lane (flow units/hour)*	Average Journey Speed Km/hr		
	Under 60	60-80	Over 80
Under 1200	Moderate**	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

* A car or light van equals one flow unit. A commercial vehicle over 1½ tons unladen weight or a public service vehicle equals 3 flow units.
** 'High' in non-urban areas.

15.2.43 Forecast traffic composition and speeds were derived from a local transport model. The model was developed as part of the Stage 3 DMRB engineering assessment and analysed patterns between the traffic levels of the base year (2012) for determining the baseline and design year (2033) for the impact assessment. Driver stress was considered taking into account the relative change in traffic levels for the design year of 2033, both with (Do-something) or without (Do-minimum) the proposed scheme.

Limitations to Assessment

NMUs

15.2.44 Journey lengths are calculated using GIS on NMU paths within the boundary of the study area and are therefore not intended to be representative of the entire NMU route.

15.2.45 The locations of temporary construction activities are not known at this stage and therefore the assessment of construction impacts of the proposed scheme is based on general assumptions.

Driver Stress

15.2.46 The DMRB methodology set out in Tables 15.4 and 15.5 apply to speeds and flows that exist for at least one kilometre of a road. The following links along the proposed scheme assessed are less than one kilometre in length:

- proposed dual carriageway link road.
- A96(T) Auchmill Road (west of proposed dual carriageway link road).
- A96 Auchmill Road (east of proposed dual carriageway link road).
- A90(T) North Anderson Drive (north of proposed dual carriageway link road).
- A90(T) North Anderson Drive (south of proposed dual carriageway link road).

15.2.47 Although the links highlighted above are shorter than is advised in the DMRB guidance, they have still been assessed using the categories provided in Tables 15.4 and 15.5 above in order to provide an indication of the stress levels experienced by vehicle travellers on these routes.

15.3 Baseline Conditions

NMUs

Study Area Characteristics

15.3.1 The study area is predominantly urban in nature with some footpaths located adjacent to roads and some off-road. The A90 and A96 trunk roads pass through the study area with a number of footpaths adjacent to the carriageways and NMU crossing points.

Core Paths

15.3.2 There are five core paths within the study area. Refer to Table 15.6 and Figure 15.1 for details of all core paths within the study area.

Aspirational Core Paths

15.3.3 There is one aspirational core path in the study area that does not currently exist on the ground (Aberdeen City Council pers comms, 2014). It would provide a link from the A90(T) Mugiemoss Road along the River Don (ACP6). Also refer to Table 15.6 and Figure 15.1 for the details of this aspirational core path.

Local Paths

15.3.4 Local paths have been identified through consultation with ACC (Aberdeen City Council pers comms, 2014), desk based assessment and site visit as providing key links within the local path network. These include footpaths (i.e. pavements) located adjacent to the A90(T) and A96(T) trunk roads. Refer to Table 15.6 and Figure 15.1.

National Cycle Routes

15.3.5 NCR1 is located to the north of the Haudagain Roundabout and provides cyclists with access to the River Don. NCR1 is a key strategic cycle route that links Dover to the Shetland Isles mainly via the east coast (Sustrans website, 2014). Refer to Table 15.6 and Figure 15.1 for details of NCR1.

Local Cycle Routes

15.3.6 There are a number of non designated local cycle routes within the study area, as shown on Figure 15.1 and described in Table 15.6. A number of the core paths shown on Figure 15.1 were noted during the site visit to be used by cyclists.

Equestrians

15.3.7 There is currently no provision for equestrians (such as bridleways) within the study area. The study area is urbanised and therefore it is unlikely that the roads are or will be used by equestrians. This was also confirmed by the British Horse Society during their consultation response (see Chapter 6: Consultation and Scoping and Appendix A6.2: Summary of Consultation Responses). Furthermore, the NMU count surveys undertaken did not record any equestrian activity in the study area (Jacobs UK Ltd 2015a; Jacobs UK Ltd 2015b).

Access to the Outdoors

15.3.8 There are a number of outdoor areas used for recreation/amenity in close proximity to the proposed scheme. It should be noted that only areas deemed to be used for recreation as defined in the relevant SNH guidance (2009) have been identified as outdoor areas. These are listed below:

- Auchmill Golf Course;
- Grassland Area at Manor Avenue;
- Grove Cemetery;
- Heathryfold Allotment Garden;
- Hilton Allotment Garden;
- Logie Gardens Playground;
- Manor Park (including a children's playground, bmx track and wildlife area);
- Persley Crescent Gardens Playground;
- the River Don;
- Stewart Park;
- Sunnybank FC Football Ground;
- Walled Garden to the south-east of Persley Bridge; and
- Woodside Sports Fields.

Table 15.6: Path Network within Study Area

Path Reference	Designation	Predominant Users	Path type	Description	Baseline Journey Length (m)*	Access to Outdoors Link
CP7	Core Path	Pedestrians	Footpath	Path consisting of paved and unpaved sections. This scenic route along the south bank of the River Don is also known as the Woodside Trail. It is mentioned in the NHS Leaflet 'Health Walks 04: Woodside/Persley', highlighting the importance of the route in terms of engaging people in healthy lifestyles in the local community (NHS Grampian, 2014).	449	Provides access to the playing fields at the Woodside Sports Fields, the Walled Garden to the south-east of Persley Bridge and the south bank of River Don.
CP8	Core Path	Pedestrians	Footpath	Paved and unpaved path. Provides a link from the A96(T) Auchmill Road through small areas of greenspace and Auchmill Golf Course before linking up with the Heathryfold housing estate in the east. The route also passes by Sunnybank FC and links to CP47.	569	Route provides direct access to and around Auchmill Golf Course, the playing fields at Sunnybank FC, Manor Park.
CP15	Core Path	Pedestrians/ Cyclists	Footpath	Paved path alongside Provost Drive. Provides access for NMUs along Provost Rust Drive between Manor Avenue and the A90 at Rosehill Roundabout. From Rosehill Roundabout the path continues south-west until it reaches Eric Hendrie Park. Links to CP47 and LCR5.	853	Route provides access to entrance of Manor Park.
CP22	Core Path	Pedestrians	Footpath	Path consisting of paved and unpaved sections from the River Don to Rosehill Drive via Stewart Park loop.	51	Provides access to and around Stewart Park and the south bank of the River Don outside of the study area.
CP47	Core Path	Pedestrians/ Cyclists	Footpath/ Cycle Route	Paved and unpaved path. Provides a link from the A96(T) Auchmill Road past Sunnybank FC. CP47 is also a local cycle route (as shown on the Sustrans website, 2014). Links to CP8, CP15 and LCR5.	554	Route provides access to playing fields at Sunnybank FC and Manor Park and the Heathryfold allotment garden.
ACP6	Aspirational Core Path	n/a	No path currently present	An aspirational core path that follows the north bank of the River Don meeting with CP6 east of Persley Bridge. Path does not currently exist on the ground.	553	Would provide access to the River Don and link into CP6.

Path Reference	Designation	Predominant Users	Path type	Description	Baseline Journey Length (m)*	Access to Outdoors Link
LP1	Local Path/Cycle route	Pedestrians/ Cyclists	Footpath/ Cycle route	Paved path from Logie Avenue to the A96(T) Auchmill Road. Provides access for NMUs wishing to shortcut through the Middlefield Estate from the south-west towards the Haudagain Roundabout.	77	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP2	Local Path	Pedestrians	Footpath	Paved path from Logie Avenue to the A90(T) North Anderson Drive. Provides access for NMUs wishing to shortcut through the Middlefield Estate from the east to the A90. This route also links to a puffin crossing on the A90(T) North Anderson Drive.	65	No direct access to outdoor areas identified in paragraph 15.3.8.
LP3	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the northbound A90(T) North Anderson Drive carriageway with three signalised crossings.	853	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP4	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the southbound A90(T) North Anderson Drive carriageway with three signalised crossings.	831	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP5	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the eastbound A96(T) Auchmill Road carriageway with two puffin crossings.	835	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP6	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the westbound A96(T) Auchmill Road carriageway with two puffin crossings.	835	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP7	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the eastbound A96 Great Northern Road carriageway, with a pelican crossing.	590	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP8	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath adjacent to the westbound A96 Great Northern Road carriageway, with a pelican crossing.	607	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP9	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath for the northbound A90(T) Mugiemoss Road carriageway. This road has no dedicated crossing points within the study area.	871	Provides direct access to Grove Cemetery.
LP10	Local Path	Pedestrians/ Cyclists	Footpath	Paved footpath for the southbound A90(T) Mugiemoss Road carriageway. This road has no dedicated crossing points within the study area.	858	No direct access to the outdoors areas identified in paragraph 15.3.8.

Path Reference	Designation	Predominant Users	Path type	Description	Baseline Journey Length (m)*	Access to Outdoors Link
LP11	Local Path	Pedestrians/ Cyclists	Footpath	Paved path providing access from Logie Place to Logie Avenue via Logie Gardens.	156	Provides access to the Logie Gardens Playground.
LP12	Local Path	Pedestrians/ Cyclists	Footpath	Paved path leading from Provost Rust Drive to Strachan Place. Also connects to CP15 to the south of the path.	92	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP13	Local Path	Pedestrians/ Cyclists	Footpath	Paved path leading from Newton Road to Kemp Street.	144	Provides access to the Persley Crescent Playground.
LP14	Local Path	Pedestrians/ Cyclists	Footpath	Paved path leading from Hilton Drive to Smithfield Lane.	179	Provides access to the Hilton Allotment Gardens.
LP15	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved narrow road leading from the A96(T) Great Northern Road connecting with CP8.	103	Provides access to Auchmill Golf course from the A96(T) Great Northern Road.
LP16	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path through a grassed area parallel to the A96 Great Northern Road.	572	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP17	ACC Local Path	Pedestrians/ Cyclists	Footpath	Path leading from CP8 to Manor Avenue.	242	Provides access to the BMX track and playground within Manor Park.
LP18	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path leading from Provost Rust Drive through Manor Park and joining up with ALP4.	165	Provides access to the BMX track and playground within Manor Park.
LP19	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path leading from Provost Rust Drive through Manor Park and joining up with ALP4.	146	Provides access to the BMX track and playground within Manor Park.
LP20	ACC Local Path	Pedestrians	Footpath	Paved path around Grove Cemetery.	692	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP21	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved and unpaved path leading around the walled garden.	275	Provides access to the River Don.
LP22	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved path running parallel to CP7 and to Persley Castle. Also joins with ALP9 in the east.	454	Provides access to the River Don via CP7.
LP23	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved path running from the A90(T) Mugiemoss Road to the River Don, crosses over with NCR1.	418	Provides access to the River Don and Woodside Sports Fields from the A90(T) Mugiemoss Road.
LP24	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path running from ALP9 to the River Don past Woodside Care Home.	153	Provides access to the River Don and Woodside Sports Fields.
LP25	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path leading from NCR1 to the River Don.	34	Provides access to the River Don and Woodside Sports Fields.

Path Reference	Designation	Predominant Users	Path type	Description	Baseline Journey Length (m)*	Access to Outdoors Link
LP26	ACC Local Path	Pedestrians/ Cyclists	Footpath	Unpaved path leading around the back of buildings to the north side of the A96(T) Great Northern Road.	575	No direct access to the outdoor areas identified in paragraph 15.3.8.
LP27	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved path network within Stewart Park. Connects to CP27.	53	Provides access to and around Stewart Park.
LP28	ACC Local Path	Pedestrians/ Cyclists	Footpath	Paved path leading from Laurel drive to Bannantyne's Health Club.	77	No direct access to the outdoor areas identified in paragraph 15.3.8.
NCR1	National Cycle Route	Cyclists	Cycle route	The route runs through Aberdeen City centre from the south, before heading west along the River Don as it passes through the study area.	1414	Provides access to the playing fields at the Woodside Sports Fields, the River Don, the Walled Garden and Grove Cemetery.
LCR1	On road provision for cyclists	Cyclists	Markings on road	Shared lane for cyclists, buses and taxis along the A96(T) Auchmill Road.	341	No direct access to the outdoors provided.
LCR2	On road provision for cyclists	Cyclists	Markings on road	Shared lane for cyclists, buses and taxis along the A96 Great Northern Road. Lane ends approximately 60m from Haudagain Roundabout.	452	No direct access to the outdoor areas identified in paragraph 15.3.8.
LCR3	On road provision for cyclists	Cyclists	Markings on road	Shared cycle and bus lane. Allows cyclists and buses to turn right out of Manor Avenue onto the southbound A90(T) North Anderson Drive. Other road users are only permitted to turn left out of Manor Avenue onto the northbound A90(T) North Anderson Drive.	64	No direct access to the outdoor areas identified in paragraph 15.3.8.
LCR4	On road provision for cyclists	Cyclists	Markings on road	Segregated cycle route adjacent to the western footpath of the A90(T) North Anderson Drive which leads away from Manor Avenue and connects to a toucan crossing. The toucan crossing provides access to Hilton Drive at its junction with the northbound A90(T) North Anderson Drive.	65	No direct access to the outdoor areas identified in paragraph 15.3.8.
LCR5	On road provision for cyclists	Pedestrians/ Cyclists	On road cycle route	Recommended route for cycling shown on the ACC Cycle Map for the Dyce and Bucksburn Areas (Aberdeen City Council, 2014).	1678	Route provides access to Manor Park and Heathryfold allotment garden.
LCR6	Local cycle route	Pedestrians/ Cyclists	Markings on road	Designated shared cycle route/footpath on the northern side of both the A96(T) Auchmill Road and the A96(T) Great Northern Road.	1455	No direct access to the outdoor areas identified in paragraph 15.3.8.

*Baseline journey lengths are calculated within the study area only and are not representative of the entire route.

Public Transport

15.3.9 There are a number of bus routes through the Haudagain Roundabout with the majority travelling along the A96(T) Auchmill Road and A96(T) Great Northern Road. Bus services operating in the study area are listed in Table 15.7.

Table 15.7: Key Bus Services within the Study Area

Bus No.	Route	Service Provider
10	Aberdeen – Inverness (via Elgin and Nairn)	Stagecoach
10A	Aberdeen – Inverness (via Elgin and Nairn)	Stagecoach
10B	Aberdeen – Inverness (via Elgin and Nairn)	Stagecoach
17	Faulds Gate - Dyce/Newhills (Via Duthie Park City Centre Bucksburn)	First
17A	Faulds Gate - Dyce/Newhills (Via Duthie Park City Centre Bucksburn)	First
18	Gateway - Altens - Kincorth - Dyce	First
27	City Centre - Airport	First
35	Aberdeen – Inverness (via Elgin and Nairn)	Stagecoach
35A	Aberdeen – Inverness (via Elgin and Nairn)	Stagecoach
37	Inverurie - Aberdeen	Stagecoach
37A	Inverurie - Aberdeen	Stagecoach
220	Aberdeen - Strathdon	Stagecoach
305	Oldmeldrum - Aberdeen	Bains Coaches
727	Aberdeen – Aberdeen Airport	Stagecoach
N1	Holburn Junction – Danestone (via Ashwood)	First
N17	Holburn Junction – Dyce (via Newhills)	First
N37	Inverurie - Aberdeen	Stagecoach
4	Aberdeen City Centre - Dubford	First
23	Heathryfold - Summerhill	First
13	Scatterburn - Golf Links	First
12	Heathryfold - Torry - Heathryfold	First
X10	Kingswells Park & Ride (via Woodend – Seafiel)	First
X20	Aberdeen - Strathdon	First

15.3.10 Dedicated bus lanes are provided eastbound on the A96(T) Auchmill Road (LCR1) and westbound on the A96(T) Great Northern Road (LCR2) when approaching the Haudagain Roundabout. In addition, a segregated bus lane allows buses to turn right out of Manor Avenue onto the southbound A90(T) Great Northern Road (LCR3) (refer to Figure 15.1).

Driver Stress

15.3.11 Current levels of driver stress are shown in Table 15.8 for roads intersecting at the Haudagain Roundabout. Average peak hourly flows per lane, average vehicle speeds and driver stress levels calculated for the existing road corridor in 2012 are shown in Table 15.8 below. In the AM peak period all are assessed as High with the exception of the A96 Great Northern Road which is assessed as Moderate. In the PM peak period all are assessed as Moderate with the exception of the A90(T) Mugiemoss Road which is assessed as High.

Table 15.8: Driver Stress Levels on Existing Road Network (2012)

Link Description	Direction	Road Class	Average Peak Hourly Flow per Lane (Flow Units/Hour)		Average Vehicle Speed (km/h)		Driver Stress Rating	
			AM	PM	AM	PM	AM	PM
A90(T) Mugiemoss Road	northbound	Single Carriageway	825	1418	33	35	High	High
	southbound		917	1195	13	12	High	High
A90(T) North Anderson Drive	northbound	Dual Carriageway	1222	1054	33	28	High	Moderate
	southbound		1200	946	44	51	High	Moderate
A96(T) Auchmill Road	eastbound	Dual Carriageway	1261	882	35	11	High	Moderate
	westbound		1267	884	49	44	High	Moderate
A96(T) Great Northern Road	eastbound	Dual Carriageway	520	494	44	46	Moderate	Moderate
	westbound		457	503	27	20	Moderate	Moderate

15.4 Potential Impacts

NMUs

Construction

15.4.1 The potential impacts during construction cannot be quantified accurately at this stage, as they will depend on the detail and timing of construction activities. However, during the construction period NMUs have the potential to be disrupted by:

- temporary diversions of paths, cycle routes and minor roads, which may increase journey times;
- temporary severance where construction works disrupt or deter NMUs from using paths and residents from accessing local facilities;
- temporary severance of existing at-grade access across roads;
- construction traffic on local roads which may create busier crossing points;
- location of site compounds on recreation areas which would reduce accessibility; and
- impacts on the amenity value of paths and cycle routes due to noise, dust and also the visual intrusion of the works.

15.4.2 During construction, potential impacts on NMUs using the paths and cycle routes listed above will be temporary in nature and are therefore anticipated to be of Slight/Moderate significance.

Operation

15.4.3 No potential impacts are anticipated on any core paths, aspirational core paths or NCR1 during the operation of the proposed scheme. Potential impacts are predicted on a number of local (undesignated) paths, as described in Tables 15.9 to 15.11 below.

15.4.4 Paths and cycle routes likely to be affected in operation are those that intercept, or are in close proximity to, the proposed scheme and its connecting roads. This is likely to include the following (refer to conflict areas (CA) shown on Figure 15.2):

- LP1 (at CA2) and LP2 (at CA4): potential closures at the southern end of these paths;

- LP6 (at CA6) and LP3 (at CA5): potential closures and diversions at the junctions between the proposed dual carriageway link road and Manor Avenue / Manor Drive;
- LP11 (at CA1): potential severance for NMUs accessing Logie Avenue from Logie Place;
- LCR5 (at CA3 and CA4): potential severance of access for cyclists travelling along Logie Place; and
- LCR3 and LCR4 (at CA5): potential severance of access for cyclists between A90(T) North Anderson Drive and Manor Avenue.

15.4.5 In terms of journey length, overall potential impacts are anticipated to be of Negligible significance, with the exception of LCR5 where a Slight (beneficial) impact is predicted as a result of a decrease in journey length. Refer to Table 15.9 below.

15.4.6 In terms of amenity, potential impacts of Negligible (two), Slight (ten) and Moderate (three) significance are anticipated. Refer to Table 15.10 below.

15.4.7 A summary of the overall journey length and amenity impacts are provided in Table 15.11.

Table 15.9: Potential Impacts on Journey Length (without mitigation) during Operation

Path Reference	Conflict Area (CA)	Path Type	Potential Impacts	Description of Potential Impacts	Baseline Journey Length (m)	Potential New Journey Length (m)	Potential Change (m)	Sensitivity	Potential Impact	
									Magnitude	Significance
LP1	CA2	Footpath/ cycle route	Increase in journey length.	Removal of existing access to Logie Avenue from the A96(T) Auchmill Road. Access maintained via a small diversion along proposed footpath/cycle route (Figure 15.3, EM11).	77	101	+24	Low	Negligible	Negligible
LP3	CA5	Footpath	Increase in journey length.	Removal of existing crossing on Manor Avenue. Access maintained via proposed footpath and new crossings (Figure 15.3, EM14).	853	886	+33	Low	Negligible	Negligible
LP6	CA6	Footpath	Increase in journey length.	Removal of existing crossing of points on Manor Drive. Access maintained via proposed footpath and new crossings (Figure 15.3, EM2).	835	850	+15	Low	Negligible	Negligible
LP11	CA3	Footpath	Increase in journey length.	Severance of LP11 from Logie Place to Logie Avenue. Access to Logie Avenue maintained via proposed footpath/ cycle route (Figure 15.3, EM3, EM6 and EM11). The impact on journeys to Logie Gardens Playground is discussed separately above.	156	229	+73	Low	Negligible	Negligible
LCR3	CA5	On road cycle route	No change	Realignment of cycle route along a new shared footpath/cycle route adjacent to the northbound carriageway on the A90 North Anderson Drive. No change to journey length.	N/A	N/A	N/A	N/A	N/A	No change
LCR4	CA5	On road cycle route	No change	Realignment of cycle route along a new shared footpath/cycle route adjacent to the westbound carriageway of Manor Avenue. No change to journey length.	N/A	N/A	N/A	N/A	N/A	No change
LCR5	CA3, CA4	On road cycle route	Decrease in journey length.	Severance of existing access along Logie Place. Access maintained via realigned LCR5 along Manor Avenue (EM7).	1678	1570	-108	Low	Low (beneficial)	Slight (beneficial)

Table 15.10: Potential Changes in Amenity Value (without mitigation) during Operation

Path Ref.	Conflict Area (CA)	Path Type	Potential Impact on Safety	Potential Change in Visual, Air Quality and Noise			Overall Significance (Amenity Value)
				Visual*	Air Quality	Noise	
LP1	CA2	Footpath / cycle route	No anticipated change in safety for NMUs using this path.	Slight	Substantial (beneficial)	Slight/Slight (beneficial)	Slight (beneficial)
LP2	CA4	Footpath / cycle route	No anticipated change in safety for NMUs using this path.	Slight	Slight (beneficial)	Slight (beneficial)	Slight (beneficial)
LP3	CA5	Footpath	Increase in safety for NMUs crossing the proposed dual carriageway link road via the provision of embedded crossing points. This is assessed as having a Slight (Beneficial) impact.	Slight (Receptor O6, Figure 11.3)	Moderate to Substantial (beneficial)	Slight (beneficial)	Slight (beneficial)
LP4	n/a	Footpath	No anticipated change in safety for NMUs using this path.	Slight (Receptor O6, Figure 11.3)	Moderate to Substantial (beneficial)	Slight (beneficial)	Slight (beneficial)
LP5	n/a	Footpath	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3)	Substantial to Substantial (beneficial)	Slight (beneficial)	Slight (beneficial)
LP6	CA6	Footpath	Increase in safety for NMUs crossing the proposed dual carriageway link road via the provision of proposed signalised junctions. This is assessed as having a Slight (Beneficial) impact.	Slight (Receptor O5, Figure 11.3)	Substantial to Substantial (beneficial)	Slight (beneficial)	Slight (beneficial)
LP7	n/a	Footpath	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3)	Slight to Slight (beneficial)	Negligible	Negligible
LP8	n/a	Footpath	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3)	Slight to Slight (beneficial)	Negligible	Negligible
LP11	CA1	Footpath / cycle route	No change in safety for NMUs as they will be redirected to cross the proposed dual carriageway link road via the provision of proposed signalised junctions.	Moderate / Substantial (Receptor O3, Figure 11.3)	Moderate	Substantial	Moderate
LCR1	n/a	On road cycle route	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3)	Substantial to Substantial (beneficial)	Slight (beneficial)	Slight (beneficial)
LCR2	n/a	On road cycle route	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3)	Slight to Slight (beneficial)	Negligible	Negligible
LCR3	CA5	On road cycle route	Realigned via a shared footpath/ cycle route provided close to the orginal alignments of LCR3 and LCR4. This is assessed as having a Slight (beneficial) impact.	Moderate / Substantial (Receptor O2, Figure 11.3)	Slight to Moderate	Negligible	Slight
LCR4	CA5	On road cycle route	Realigned via a shared footpath/ cycle route provided close to the orginal alignments of LCR3 and LCR4. This is assessed as having a Slight (beneficial) impact.	Slight (Receptor O6, Figure 11.3)	Slight to Moderate	Slight (beneficial)	Slight (beneficial)

Path Ref.	Conflict Area (CA)	Path Type	Potential Impact on Safety	Potential Change in Visual, Air Quality and Noise			Overall Significance (Amenity Value)
				Visual*	Air Quality	Noise	
LCR5	CA3, CA4	On road cycle route	Severance of existing access along Logie Place. Access maintained via realigned LCR5 along Manor Avenue. This is assessed as having a Slight (beneficial) impact.	Moderate / Substantial (Receptor O3, Figure 11.3)	Moderate to Slight (beneficial)	Moderate (beneficial)	Negligible
LCR6	n/a	Cycle route	No anticipated change in safety for NMUs using this path.	Slight (Receptor O5, Figure 11.3).	Substantial to Substantial (beneficial)	Slight (beneficial))	Negligible

*Some visual impacts are derived directly from the assessment of Outdoor Receptors in Chapter 11: Landscape and Visual and Appendix 11.2: Built and Outdoor Receptor Assessment Tables.

Table 15.11: Summary of Potential Impacts on NMU using paths (without mitigation) during operation phase

Path Reference	Path Type	Significance of Potential Impact		
		Journey Length	Amenity Value	Overall
LP1	Footpath / cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LP2	Footpath / cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LP3	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP4	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP5	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP6	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP7	Footpath	Negligible	Negligible	Negligible
LP8	Footpath	Negligible	Negligible	Negligible
LP11	Footpath / cycle route	Negligible	Moderate	Slight
LCR1	On road cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LCR2	On road cycle route	Negligible	Negligible	Negligible
LCR3	On road cycle route	N/A	Slight	Slight
LCR4	On road cycle route	N/A	Slight (beneficial)	Slight (beneficial)
LCR5	On road cycle route	Slight (beneficial)	Negligible	Slight (beneficial)
LCR6	Cycle route	Negligible	Negligible	Negligible

Access to the Outdoors

Construction

15.4.8 It is anticipated that Logie Gardens Playground and the grassland area at Manor Avenue will both be utilised by the Contractor during construction and therefore access will not be available to these areas. For the purposes of this assessment, it is assumed NMUs will use the nearest alternative outdoor area at Manor Park (refer to Figure 15.1). The impact on NMUs has therefore been calculated by comparing the difference in journey time to this alternative outdoor area. This has been assessed as a Negligible/Slight impact for NMUs that would have previously taken access to Logie Gardens Playground via LP11.

15.4.9 It is considered unlikely that the grassland area at Manor Avenue will be accessible during construction. It is therefore also anticipated that NMUs will walk to Manor Park instead. This has been assessed as a Slight/Moderate impact for NMUs taking access via LP11 and a Slight/Moderate impact for those accessing via LCR5.

15.4.10 No further impacts are anticipated on NMUs wishing to access outdoor areas during construction.

Operation

15.4.11 Operational impacts on NMUs accessing Logie Gardens Playground and the grassland area at Manor Avenue remain as described above for construction. No other impacts on access to the other outdoor areas are anticipated during operation. Refer to Table 15.12 below.

15.4.12 The impact on the outdoor areas referred to above in terms of land-take is assessed in Chapter 7 (Community and Private Assets).

Table 15.12: Potential Impacts on Access to the Outdoors (without mitigation) during Operation

Outdoor Access Area	Path affected	Potential Impact (without mitigation)	Significance of Potential Impact
Logie Gardens Playground	LP11	It is assumed that Logie Gardens Playground will not be reinstated following construction. The nearest alternative outdoor area for NMUs would be Manor Park, which is approximately 217m from where LP11 meets with Logie Place. This represents an increase in journey length of 133m for NMUs and a Negligible / Slight impact.	Negligible / Slight
Grassland area at Manor Avenue.	LP11	It is assumed that the grassland area at Manor Avenue will not be reinstated following construction. During operation, NMUs travelling from the north end of LP11, (where it meets with Logie Avenue) will experience a journey length increase of 443m, resulting in a Slight / Moderate impact.	Slight / Moderate
	LCR5	NMUs accessing Manor Park via LCR5 will experience a journey length increase of 497m, resulting in a Slight/Moderate impact.	Slight/Moderate

Public Transport

Construction

15.4.13 The construction phase may disrupt users of public transport within the immediate vicinity of the proposed scheme due to temporary severance and diversions whilst construction takes place. The construction phase is likely to affect all bus routes that pass through the study area (those shown in Table 15.7). In the absence of mitigation this has been assessed as having a Slight adverse impact.

Operation

15.4.14 Journey times for buses travelling in the westbound direction along the A96(T) are anticipated to remain unchanged in operation. However, those buses travelling in the eastbound direction along the A96(T) can expect journey time savings of up to five minutes in operation.

15.4.15 For bus services travelling between the A90 (T) North Anderson Drive and the A96 (T) Auchmill Road, it is assumed that they will divert to use the proposed dual carriageway link road where there will be two new bus stops (northbound and southbound carriageways).

15.4.16 Impacts during operation for users of public transport have been assessed as having a Slight (beneficial) impact.

Driver Stress

Construction

15.4.17 Due to a reduction in average journey speeds and increased driver frustration caused by temporary traffic management requirements during construction, driver stress levels during the construction phase are anticipated to be High.

Operation

Do-minimum Scenario

15.4.18 The traffic flows and speeds shown in Table 15.13 are based on the scenario that the existing road corridors would remain on their current alignment i.e. the Do-minimum scenario.

Table 15.13: Do-minimum (Design Year – 2033), Predicted Future Baseline without the Proposed Scheme

Link Description	Direction	Road Class	Average Peak Hourly Flow per Lane (Flow Units/Hour)		Average Vehicle Speed (km/h)		Driver Stress Rating	
			AM	PM	AM	PM	AM	PM
A90(T) Mugiemoss Road	northbound	Single Carriageway	968	1493	35	27	High	High
	southbound		1225	1413	9	21	High	High
A90(T) North Anderson Drive	northbound	Dual Carriageway	1259	995	34	19	High	Moderate
	southbound		1064	842	43	48	Moderate	Moderate
A96(T) Auchmill Road	eastbound	Dual Carriageway	1009	755	19	6	Moderate	Moderate
	westbound		1217	834	38	39	High	Moderate
A96 Great	eastbound	Dual	541	519	46	46	Moderate	Moderate

Link Description	Direction	Road Class	Average Peak Hourly Flow per Lane (Flow Units/Hour)		Average Vehicle Speed (km/h)		Driver Stress Rating	
			AM	PM	AM	PM	AM	PM
Northern Road	westbound	Carriageway	427	486	23	22	Moderate	Moderate

15.4.19 Table 15.13 presents the levels of driver stress predicted in the absence of the proposed scheme for the design year. In the AM peak period driver stress levels on the A90(T) Mugiemoss Road, A90(T) North Anderson Drive (northbound) and A96(T) Auchmill Road (westbound) are assessed as High. In the AM peak period driver stress levels on the A90(T) North Anderson Drive (southbound), the A96(T) Auchmill Road (eastbound) and the A96 Great Northern Road are assessed as Moderate. In the PM peak period all are assessed as Moderate with the exception of the A90(T) Mugiemoss Road which is assessed as High.

Do-something Scenario

15.4.20 The traffic flows, speeds and the assessed driver stress levels for the proposed scheme in the Do-something design year are presented in Table 15.14.

Table 15.14: Do-something (Design Year – 2033), with the Proposed Scheme

Link Description	Direction	Road Class	Average Peak Hourly Flow per Lane (Flow Units/Hour)		Average Vehicle Speed (km/h)		Driver Stress Rating	
			AM	PM	AM	PM	AM	PM
A90(T) Mugiemoss Road	northbound	Single Carriageway	1039	1225	45	25	High	High
	southbound		1303	1378	13	36	High	High
A90(T) North Anderson Drive (north of proposed dual carriageway link road)	northbound	Dual Carriageway	589	529	26	7	Moderate	Moderate
	southbound		794	580	26	24	Moderate	Moderate
A90(T) North Anderson Drive (south of proposed dual carriageway link road)	northbound	Dual Carriageway	947	772	38	35	Moderate	Moderate
	southbound		952	770	40	28	Moderate	Moderate
A96(T) Auchmill Road (east of proposed dual carriageway link road)	eastbound	Dual Carriageway	704	382	30	9	Moderate	Moderate
	westbound		601	427	26	22	Moderate	Moderate
A96(T) Auchmill Road (west of proposed dual carriageway link road)	eastbound	Dual Carriageway	1208	887	19	31	High	Moderate
	westbound		1251	1083	47	43	High	Moderate
A96 Great Northern Road	eastbound	Dual Carriageway	575	502	51	50	Moderate	Moderate
	westbound		546	499	36	31	Moderate	Moderate
Proposed dual carriageway link road	eastbound	Dual Carriageway	570	630	26	34	Moderate	Moderate
	westbound		782	431	37	31	Moderate	Moderate

15.4.21 In the 2033 AM peak period, driver stress levels for the A90(T) North Anderson Drive northbound carriageway (north of the proposed dual carriageway link road) are predicted to

be Moderate for the proposed scheme compared to High for the Do-Minimum scenario. Also in the 2033 AM peak period, driver stress levels for the A96(T) Auchmill Road eastbound carriageway (west of the proposed dual carriageway link road) are predicted to be High compared to Moderate for the Do-Minimum scenario.

15.4.22 In the 2033 PM peak period, driver stress levels for the proposed scheme are predicted to be the same as those for the Do-minimum scenario.

15.4.23 Driver stress levels on the proposed dual carriageway link road are assessed as Moderate with the proposed scheme in the design year.

15.5 Mitigation

15.5.1 As noted in Section 15.4 (Potential Impacts), the proposed scheme design already has embedded mitigation such as the provision of footpaths/cycle routes. The mitigation measures set out below are proposed to further reduce impacts.

15.5.2 In addition to the mitigation proposed specifically for NMUs, mitigation for other environmental impacts may have the additional benefit of ameliorating impacts on NMUs, such as proposed landscape planting to provide screening and noise barriers to reduce levels of noise.

Non-Motorised Users (NMUs)

Construction

15.5.3 Measures to reduce potential impacts on NMUs during construction include (**Mitigation Item AT1**):

- The construction works are to be programmed in such a manner to reduce the length of closures or restrictions of access as far as practicable. Any diversion routes must be safe for NMUs and all inclusive in accordance with the Roads for All: Good Practice Guides for Roads, 2013 (Transport Scotland, 2013).
- The construction site is to be fenced and access by non-authorised personnel will generally not be permitted.
- Temporary diversion routes are to be provided to maintain access for NMUs throughout the works, and any closure or re-routing of routes used by NMUs will be agreed in advance with the local authorities.
- Where necessary, bus stops are to be relocated safely with a safe access route provided for NMUs.
- Best Practicable Means are to be employed to avoid the creation of a statutory nuisance associated with noise, dust and air pollution.
- Reasonable precautions are to be undertaken to reduce the visual impact of the construction works where practicable.

Operation

15.5.4 Development of the proposed scheme design has taken into account the need to maintain access for NMUs along and across roads and paths directly affected by the new road infrastructure (i.e. 'embedded' mitigation). Embedded mitigation measures are shown on Figure 15.3.

15.5.5 For NMUs travelling along LP3, LP4, LP5, LP6, LP7, LP8, LCR1, LCR2, LCR4, LCR5 and LCR6, mitigation in the form of landscape planting is proposed to provide screening of the proposed scheme. For further details refer to Outdoor Receptors O2, O3, O5, O6 and O7 in

Chapter 11: Landscape and Visual, Appendix 11.2: Built and Outdoor Receptor Assessment Tables and Figure 11.3.

15.5.6 The visual and noise mitigation proposals are shown on Figure 11.3 and Figure 14.2 respectively.

15.5.7 The following general principles for maintaining and improving access for NMUs should be implemented (**Mitigation Item AT2**):

- The requirements of the Equality Act 2010 and Transport Scotland's Good Practice Guide for Roads shall be incorporated into the proposed scheme wherever practicable; e.g. any ramps or footpaths should take into account potential barriers to vulnerable users such as the gradient or surfacing (Transport Scotland, 2013).
- Surfacing of any new paths including alongside roads should be considered with regard to the type of user and should comply with current standards.
- Safety of paths can be improved by the use of pedestrian guardrails to guide NMUs from paths to safe crossing points.

Access to the Outdoors

15.5.8 As noted above, Manor Park will provide an alternative outdoor area, assuming both Logie Gardens Playground and the grassland area at Manor Avenue will no longer be accessible.

15.5.9 Proposals will be developed and agreed with ACC regarding provision of a replacement playground, to mitigate the loss of Logie Gardens Playground.

Public Transport

Construction

15.5.10 Temporary bus stops will be provided during construction where required (**Mitigation Item AT3**).

Operation

15.5.11 There is anticipated to be an overall beneficial impact on users of public transport in the study area and therefore no specific mitigation recommendations are recommended during operation.

Driver Stress

Construction

15.5.12 Measures to mitigate potential impacts on driver stress during construction include the following (**Mitigation Item AT4**):

- Traffic management during construction should seek to reduce disruption and delays, and be provided in accordance with the Traffic Signs Manual (Department of Transport, 2009).
- Seek to avoid or reduce disruption to the road traffic, including consideration of the timing of works, earthworks balance, haul roads to reduce site traffic on the public roads and a well maintained traffic management system with sweeping of roads to reduce construction debris on the carriageway.
- Seek to avoid or reduce road closures.
- Road diversions should be clearly indicated with road markings and signage as appropriate. Closures to be notified in advance and signage provided.

- Appropriate lighting should be provided during any necessary night-time working.

Operation

15.5.13 No specific measures to mitigate potential impacts on driver stress during operation are proposed.

15.6 Residual Impacts

NMUs

Construction

15.6.1 During construction, the proposed mitigation measures will help reduce impacts on NMUs using paths and cycle routes in close proximity to the proposed scheme. However, disruption to journeys is still likely to be experienced as a result of temporary diversions. In addition, there are expected to be localised temporary amenity impacts in the vicinity of the construction activities as a result of construction noise and potential dust.

15.6.2 During some construction activities, impacts may be temporarily worsened as a result of construction noise and dust. However, with the mitigation outlined above in place, residual impacts on NMUs using the paths and cycle routes listed in Table 15.11 are anticipated to be reduced to Slight significance.

Operation

15.6.3 Residual impacts on journey length are the same as the potential impacts identified in Section 15.4 (Potential Impacts).

15.6.4 Residual impacts in terms of visual amenity have been reduced at the following footpaths/cycle routes as a result of landscape planting: LP3, LP4, LP5, LP6, LP7, LP8, LCR1, LCR2, LCR4, LCR5 and LCR6. Refer to Outdoor Receptors O3, O5 and O6 identified in Chapter 11: Landscape and Visual, Appendix 11.2: Built and Outdoor Receptor Assessment Tables and Figure 11.3. Overall impacts on amenity due to landscape planting are reduced for LCR5 only.

15.6.5 There are a number of NMU paths that are expected to provide an overall Slight (beneficial) residual impact during operation, due to an improvement in the overall amenity value of NMU journeys with the proposed scheme in place.

15.6.6 Overall residual impacts on NMUs are identified in Table 15.14 below.

Table 15.14: Summary of Residual Impacts on NMUs using paths (with mitigation) during operation phase

Path Reference	Path Type	Significance of Potential Impact		
		Journey Length	Amenity Value	Overall
LP1	Footpath / cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LP2	Footpath / cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LP3	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP4	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP5	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP6	Footpath	Negligible	Slight (beneficial)	Slight (beneficial)
LP7	Footpath	Negligible	Negligible	Negligible
LP8	Footpath	Negligible	Negligible	Negligible

Path Reference	Path Type	Significance of Potential Impact		
		Journey Length	Amenity Value	Overall
LP11	Footpath / cycle route	Negligible	Moderate	Slight
LCR1	On road cycle route	Negligible	Slight (beneficial)	Slight (beneficial)
LCR2	On road cycle route	Negligible	Negligible	Negligible
LCR3	On road cycle route	N/A	Slight	Slight
LCR4	On road cycle route	N/A	Slight (beneficial)	Slight (beneficial)
LCR5	On road cycle route	Slight (beneficial)	Slight (beneficial)	Slight (beneficial)
LCR6	Cycle route	Negligible	Negligible	Negligible

Access to the Outdoors

Construction

15.6.7 Residual impacts on access to the outdoors during construction are the same as the potential impacts identified Section 15.4 (Potential Impacts).

Operation

15.6.8 Residual impacts on access to the outdoors during operation are the same as the potential impacts identified Section 15.4 (Potential Impacts) for NMUs wishing to access Logie Gardens Playground and the grassland area at Manor Avenue via LP11 and LCR5. Overall, impacts on access to outdoor areas have been assessed as Slight during operation of the proposed scheme.

Public Transport

Construction

15.6.9 With the proposed mitigation in place above (i.e. the safe management of temporary bus stops during construction activities), it is anticipated that the residual impact will be reduced to Negligible / Slight during construction for users of public transport within the study area.

Operation

15.6.10 As there is no mitigation recommended for users of public transport during operation, the residual impacts associated with the proposed scheme are the same as the potential impacts identified in Section 15.4 (Potential Impacts).

Driver Stress

15.6.11 The residual impacts associated with the proposed scheme are the same as the potential impacts identified in Section 15.4 (Potential Impacts).

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16 Materials

This chapter presents a detailed assessment of the potential impacts of the proposed scheme associated with the use of material resources and the management of waste. It outlines measures for mitigating these impacts where possible and describes any residual impacts that may occur with mitigation in place.

The use of material resources has been estimated based on the likely requirements of the Design Manual for Roads and Bridges (DMRB) Stage 3 design, as assessed and reported within this Environmental Statement (ES). The wastes likely to be generated by the proposed scheme are also outlined in this chapter.

By applying key material and waste management principles, such as the waste management hierarchy, the effects on natural resources and the need for permanent disposal of wastes would be minimised. In particular, this would be achieved by re-using existing soils and redundant or demolition material, wherever practicable, and by taking into consideration the environmental impacts of products during their purchase and sourcing materials from local suppliers.

The potential for residual impacts on material resources or waste disposal facilities is principally related to the performance of the Contractor during completion of the construction works. Any surplus materials or waste sent off site could have a resultant impact on the available waste management infrastructure and resources. The risk of such impacts occurring would be managed and reduced through the development and application of several plans addressing different aspects of construction site management, such as a Construction Environmental Management Plan (CEMP) and a Site Waste Management Plan (SWMP)

With the implementation of proposed mitigation no significant impacts affecting material resources or waste infrastructure is predicted. The construction of the proposed scheme is expected to give rise to small-scale, localised, impacts only.

16.1 Introduction

16.1.1 For the purposes of this assessment, 'Materials' are defined as comprising the:

- use of material resources; and
- the generation and management of waste.

16.1.2 The assessment focuses on the identification of the environmental impacts associated with materials resource use and waste during the construction phase, and the measures which would be implemented to mitigate them.

16.1.3 Operational impacts in terms of resource use and waste generation were assessed in the DMRB Stage 2 route options appraisal through a simple assessment reporting matrix. Under this process the operational impacts in terms of material resource use and waste generation were deemed to be insignificant in the context of the proposed scheme. As such, the operational impacts have not been assessed in this chapter except in relation to carbon impacts of replacement materials as these contribute the greatest emissions of carbon. The assessment of any environmental impacts associated with material resource use and waste, during any future maintenance, renewal or improvement works, would be the responsibility of Aberdeen City Council who would adopt the new road on completion.

16.1.4 While the use of materials and the production of waste can affect the full range of environmental media and assessment topics, their effect on the wider environment has been assessed within each of the other technical chapters in this ES, as follows:

- Surface water environment. The River Don, Scatter Burn and Woodside Burn are located in the surrounding area (for more baseline information see Chapters 9: Road Drainage and the Water Environment and 10: Ecology and Nature Conservation).
- Groundwater resources; the groundwater within the study has been classified by the Scottish Environment Protection Agency (SEPA) as susceptible to pollution (see Chapter 8: Geology,

Contaminated Land and Groundwater and Chapter 9: Road Drainage and the Water Environment).

- Human beings, particularly local residents, and commercial businesses (see Chapter 7: Community and Private Assets and Chapter 14: Noise and Vibration).
- Wildlife and its habitats; information on habitats and protected species is provided in Chapter 10 (Ecology and Nature Conservation) and associated appendices and figures.
- Global climate and emissions, through the use of energy and resultant greenhouse gas emissions (see Chapter 13: Air Quality).

16.1.5 This chapter focuses on generic environmental effects of materials in terms of their depletion and embodied carbon, and assesses the effects of the project on waste management infrastructure as required in draft DMRB Volume 11, Section 3, Part 6, Materials guidance HD 212/11 (Highways Agency et al, March 2012) and IAN 153/11 (Highways Agency et al, 2011).

Material Resources

16.1.6 Material resources include both primary raw materials, such as aggregates and minerals, and secondary manufactured products. Some material resources for construction of the proposed scheme would originate off-site and some would arise on-site, such as excavated soils, redundant street furniture or recovered material from demolished buildings and carriageways. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, have the potential to affect the environment adversely.

Generation and Management of Waste

16.1.7 In considering material resource use and waste management, it is important to define when, under current legislation, a material is considered to be a waste. The Waste Framework Directive (European Directive 2006/12/EC, as amended by Directive 2008/98/EC) defines waste as any substance, or object, that the holder discards or is required to discharge.

16.1.8 Some types of waste are harmful to human health, or to the environment, either immediately or over an extended period of time. These are called special (or hazardous) wastes.

16.1.9 Once a material has become waste, it remains a waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health, at which point it is no longer subject to the controls required by the Directive. These principles are applied by the SEPA to waste used as aggregate/construction material in civil engineering applications.

16.1.10 Construction wastes account for approximately three times as much waste as domestic waste from all UK households combined. Scotland's 'Zero Waste Plan 2010' sets out the Scottish Government's vision for a zero waste society. This describes a Scotland where all waste is seen as a resource; waste is minimised; valuable resources are not disposed of in landfills; and most waste is sorted, leaving only limited amounts to be treated. To achieve this, the Plan sets out measures, including:

- development of a Waste Prevention Programme for all wastes, ensuring the prevention and re-use of waste is central to all the Scottish Government's actions and policies; and
- two new targets applying to all waste by 2025: 70% recycled and maximum 5% sent to landfill.

Legislative and Policy Background

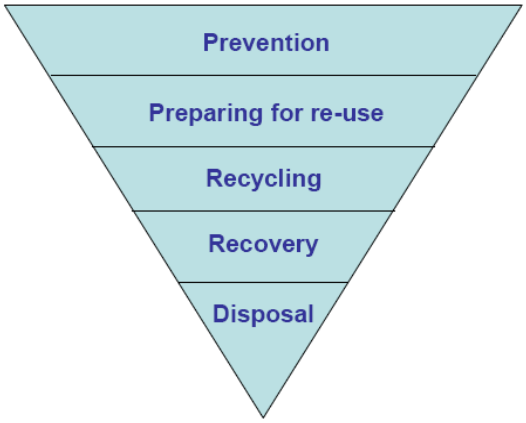
16.1.11 An assessment of planning policies at national, regional and local level can be found in Chapter 17 (Policies and Plans). In addition, the following legislation, regulations or guidelines are applicable to the materials assessment of the proposed scheme:

- Waste Framework Directive 2008, as amended;

- The Climate Change (Scotland) Act 2009;
- Waste (Scotland) Regulations 2012;
- Waste Management Licensing (Scotland) Regulations 2011;
- Special Waste Regulations 1996;
- Special Waste Amendment (Scotland) Regulations 2004;
- Pollution Prevention and Control (Scotland) Regulations 2000;
- Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances) (Scotland) Regulations 2000;
- Environment Act 1995;
- Environmental Protection Act 1990;
- Environmental Protection (Duty of Care) Regulations 1991;
- Wildlife and Countryside Act 1981;
- Weeds Act 1959;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009);
- SEPA "Regulatory guidance - Promoting the sustainable reuse of greenfield soils in construction (March 2010)"
- SEPA Technical Guidance Note Paragraph 19 Exemption Waste for construction and other "relevant work";
- Land Remediation and Waste Management Guidelines, SEPA, 2009;
- The Control of Asbestos Regulations 2012;
- Landfill (Scotland) Regulations 2003;
- Strategy for Sustainable Construction DEFRA 2008;
- Strategy for Sustainable Construction, Progress Report 2009; and
- Scotland's Zero Waste Plan 2010.

16.1.12 Waste management is structured around a 'waste hierarchy', which defines the order of preference of the various options. Plate 16.1 illustrates the waste hierarchy in diagrammatic form.

Plate 16.1: The Waste Hierarchy



16.1.13 Generally, all legislation and policy drivers aim to increase the efficiency of resource use, minimise waste, maximise the re-use/recycling/recovery of waste and reduce carbon emissions. Examples of the main policy drivers relevant to this scheme include the following:

Transport Scotland Corporate Plan (2012 – 2015)

16.1.14 Published in 2012, Transport Scotland's Corporate Plan sets out guidance for delivering increased sustainable economic growth. Ensuring the protection and enhancement of Scotland's environment is a key consideration during the construction and maintenance of transport infrastructure. As such the following commitments are relevant to Materials and Waste:

- *"Fully integrate our Carbon Management System (CMS) to influence and support low carbon decision-making across the design and delivery of transport infrastructure projects and network maintenance;*
- *Utilise our CMS, in tandem with our Carbon Management Plan, to facilitate annual sustainability reporting;*
- *Embed resource efficiency into our practices and adopt the next generation of Waste & Resources Action Programme (WRAP) Construction Commitments; and*
- *Support sustainable design, construction, maintenance and operations through the adoption of infrastructure assessment schemes."*

Climate Change (Scotland) Act (2009)

16.1.15 The Act sets out the strategy for the reduction of greenhouse gas emissions and the transition to a low carbon economy.

16.1.16 Part 1 of the Act, creates the statutory framework for greenhouse gas emission reductions in Scotland by setting an interim 42% reduction target for 2020, with the power for this to be varied based on expert advice, and an 80% reduction target for 2050.

16.1.17 Part 4 of the Act places duties on public bodies relating to climate change. These duties require that a public body must, in exercising its functions, act in a way best calculated to contribute to the delivery of emissions reduction targets (known as 'mitigation'), plus help deliver any statutory climate change adaptation programme, and is considered most sustainable.

Scotland's Zero Waste Plan (2010)

16.1.18 Scotland's Zero Waste Plan outlines a vision for a zero waste society. The Plan's objectives include:

- Eliminating the unnecessary use of raw materials. This leads to further reductions in Greenhouse Gas emissions in areas such as mining raw materials, manufacturing and transport and includes financial savings.
- Producing energy savings from making products from recycled materials, rather than from virgin materials.
- Construction and Demolition waste are highlighted as an area in which future policy can be developed to support higher targets in recycling and recovery levels in this area.

16.1.19 An assessment of the compliance of the proposed scheme against national, regional and local planning policies, including those of relevance to material resources and waste management, has been undertaken and is detailed in Appendix A17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

16.2 Approach and Methods

16.2.1 This chapter focuses on the assessment of construction impacts arising from the transport, storage and use of material resources within the construction site, and the production, movement, transport, processing and disposal of wastes.

16.2.2 The assessment of materials has not yet been incorporated into the current DMRB guidance, but this chapter follows interim guidance on the scope of the 'Materials' topic and the approaches / methodologies to be applied as set out in draft DMRB Volume 11, Section 3, Part 6, Materials guidance HD 212/11 (March 2012) and DMRB Interim Advice Note (IAN) 153/11 Guidance on the Environmental Assessment of Material Resources (Highways Agency et al, 2011).

16.2.3 The assessment uses the '*Detailed Assessment'* method as set out in the draft guidance (HD 212/11) to consider materials and waste aspects of the scheme and aims to identify and quantify the following:

- The types and quantities of materials required for the project.
- Details of the source/origin of materials, including site-won materials to replace virgin materials.
- The cut and fill balance.
- The types and quantities of forecast waste arisings, including any hazardous wastes.
- Surplus materials and waste falling under regulatory controls.
- Waste that requires storage on-site prior to re-use, recycling or disposal.
- Waste to be pre-treated and/or disposed of off-site.
- The impacts that would arise in relation to materials and waste.
- A discussion of the sensitivity of receptors, and the magnitude, nature and significance of those impacts.
- Identification of measures to mitigate the identified impacts.

16.2.4 An assessment of the compliance of the proposed scheme against national, regional and local planning policies of relevance to material resources and management of waste has been undertaken and is detailed in Appendix A17.2 (Assessment of Compliance) and summarised in Chapter 17 (Policies and Plans).

Study Area

16.2.5 The study area for this topic has two boundaries. The first boundary encompasses Aberdeen and Aberdeenshire in terms of the locations to source materials and waste management infrastructure (although the wider area of eastern Scotland is also discussed where appropriate). The second is limited to the boundaries of the construction site within which materials would be used and wastes generated and managed. Chapter 4 (The Proposed Scheme) provides a detailed description of the proposed works. The construction site is defined as including the full footprint of the proposed scheme, together with any land that would be used temporarily during construction. Such temporary land may include temporary storage areas for soils and other materials, haul-roads and land for temporary construction site drainage. Identification of existing baseline waste management capacity has been considered to inform the assessment of the proposed scheme according to conditions likely to be present at the commencement of construction (assumed for the purposes of this assessment to be in 2018).

Impact Assessment

16.2.6 Details and indicative quantity estimates of materials and wastes have been prepared by the project engineering team, based on the Stage 3 design. The assessment of potential impacts has been undertaken with consideration of:

Materials

- regulatory and policy drivers;
- availability of natural resources; and
- materials re-use / recycling / recovery.

Waste

- regulatory and policy drivers;
- waste prevention, materials re-use, recycling and recovery;
- capacity of existing waste handling facilities (incl. disposal sites); and
- waste classification, volumes and disposal routes.

Assessment Criteria

16.2.7 Sensitivity, Magnitude and Significance criteria have been derived from guidance in draft DMRB Volume 11, Section 3, Part 6, Materials guidance HD 212/11 (March 2012) as follows:

Materials

16.2.8 The magnitude of effects associated with material use has been derived from a calculation of embodied carbon associated with those materials known to be required for the construction of the proposed scheme using Transport Scotland's CMS Road Infrastructure Projects Tool. The methodology in the draft guidance (HD 212/11) does not include sensitivity criteria which would need to be accounted for in order to derive the significance of any effect. Only magnitude is used to describe the effect. Levels of magnitude are defined as follows from Table 4.4 of HD 212/11, reproduced in Table 16.1 below:

Table 16.1: Materials (Carbon) Assessment Magnitude Criteria

Scale of Impact Magnitude	Total CO2equivalent (CO2e) of materials (tonnes)
No change	<1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	>40,000

Waste

16.2.9 From draft DMRB Volume 11, Section 3, Part 6, Materials guidance HD 212/11 (March 2012) sensitivity is determined on the basis of capacity as follows:

- Very High - There is no available waste management capacity for any waste arising from the project.
- High - There is limited waste management capacity in relation to the forecast waste arisings from the project.
- Medium - There is adequate waste management capacity for the majority of wastes arising from the project.
- Low - There is adequate available waste management capacity for all wastes arising from the project.

16.2.10 Magnitude is defined as follows:

- Major - Waste is predominantly disposed of to landfill or to incineration without energy recovery with little or no prior segregation.
- Moderate - Wastes are predominantly disposed of to incineration with energy recovery.
- Minor - Wastes are predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility.
- Negligible - Wastes are predominantly re-used on-site or at an appropriately licensed or registered exempt site elsewhere.

16.2.11 Significance is derived by combining sensitivity and magnitude as set out in Table 16.2 below (based on Table 4.5 of HD 212/11):

Table 16.2: Determination of Significance of Impacts on Waste

Sensitivity / Magnitude	Very High	High	Medium	Low
Major	Very Large	Large / Very Large	Moderate / Large	Slight / Moderate
Moderate	Large / Very Large	Moderate / Large	Moderate	Slight
Minor	Moderate / Large	Slight / Moderate	Slight	Neutral / Slight
Negligible	Slight	Slight	Neutral / Slight	Neutral

Limitations of the Assessment

16.2.12 Baseline information, potential impacts and mitigation are described based on known information. The level of detail provided at this time is limited by the design information available to estimate material use and waste management requirements. Therefore, estimates would need to be refined at later stages in the design development process when further information is available during pre-construction preparation or during the construction period. Estimated quantities in this assessment can only be taken as approximate and indicative based on the Stage 3 design and available information.

16.2.13 In addition, some environmental impacts associated with the extraction and transport of primary raw materials and manufactured products would occur off-site. The source and processing / manufacture of materials cannot be determined at this stage and the production of these materials is likely to have been the subject of separate consent procedures (such as applications for planning permission and environmental permits) which may have included environmental assessment. Therefore, it is outside the scope of this assessment to consider the environmental impacts associated with the extraction of raw materials and the manufacture of products. However, in accordance with draft DMRB Volume 11, Section 3, Part 6, Materials guidance HD 212/11 (March 2012) it is within the scope of the assessment to consider the embodied carbon impacts associated with the extraction and manufacture of products (i.e. cradle to gate) as a proxy for the 'overall' scale of impacts associated with raw material extraction and use.

16.3 Baseline Conditions

Potential Receptors

16.3.1 Receptor types likely to be at risk of impacts under this topic heading include:

- Resource depletion from quarries, other sources of minerals and other finite raw material resources.

- The capacity of waste management infrastructure, such as landfills, materials recovery facilities, composting sites, energy from waste plant and waste transfer stations etc.
- National and local policy and targets relevant to materials and wastes (see above).

Materials

16.3.2 Within the Aberdeen City and Aberdeenshire regions there is capacity to supply minerals and aggregates. Aberdeenshire Supplementary Guidance - Rural Development 4: Minerals - states that at all times a minimum land-bank of at least 10 years supply of construction aggregates should be maintained within 50km of Aberdeen City. The UK Government statistics from 'Mineral Extraction in Great Britain' 2013 (https://www.gov.uk/government/statistics/mineral-extraction-in-great-britain-2013) shows a total of 2,346,000 tonnes of sand, gravel and crushed rock was extracted in north-east Scotland in 2013.

16.3.3 Due to European Union competition regulations, it is not possible to prescribe materials sources. However, given the above, it can be inferred that there is likely to be an adequate supply of aggregate from local sources. Nevertheless, it is expected that some materials would have to be transported from areas further afield than Aberdeen City and Aberdeenshire; for example, steel, plastic and pre-cast concrete elements.

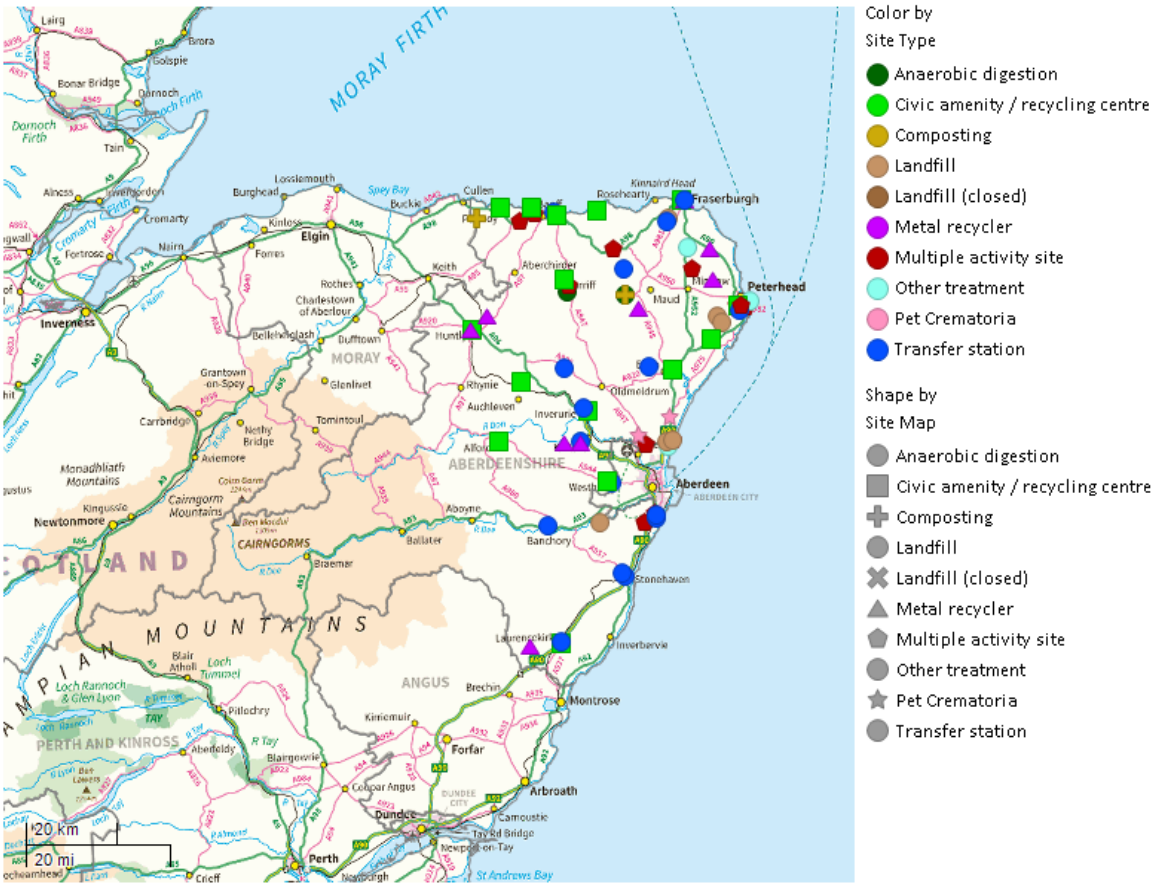
Waste Site Capacity

16.3.4 The SEPA Waste Site and Capacity report for Scotland 2013 (http://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/waste-site-information/) identifies a total of 96 operational waste sites within Aberdeen and Aberdeenshire. Table 16.3 below details the annual capacity of these sites (excluding civic amenity sites and pet crematoria). The location of these sites is shown in Plate 16.2 (taken from SEPAs Waste Site and Capacity tool (http://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/)).

Table 16.3: Operational waste site permitted capacity in Aberdeen City and Aberdeenshire

Waste Site	Operational site permitted capacity (Tonnes / annum)		
	Aberdeen City	Aberdeenshire	Total
Transfer Stations	735,000	1,123,000	1,858,000
Composting	N/A	170,000	170,000
Anaerobic digestion	N/A	50,000	50,000
Metal Recycling	60,000	55,000	115,000
Other treatment	122,000	210,000	332,000
Landfill	N/A	780,000	780,000

Plate 16.2: Location of Waste sites within Aberdeen City and Aberdeenshire



16.3.5 Existing waste landfill capacity information has been sourced from the SEPA 'Landfill sites and capacity report for Scotland 2013' (SEPA, 2013), which is based upon data from SEPA's public register of licensed / permitted sites and supplied by landfill site operators.

Scotland

16.3.6 The total amount of controlled waste sent to landfills in Scotland in 2013 was 4,016,998 tonnes. Of this, 446,532 tonnes were landfilled in Aberdeenshire and no waste was landfilled in Aberdeen. In 2013 there were 57 operational landfills in Scotland (17 inert, 39 non-hazardous and one hazardous).

16.3.7 The 17 operational inert waste landfills had a remaining capacity of 7,405,791 tonnes at the end of 2013, which combines with the seven non-operational inert landfills (total capacity of 1,482,100 tonnes) to give a total of 8,887,891 tonnes remaining capacity for inert landfill.

16.3.8 The remaining capacity of the 39 operational non-hazardous landfills in 2013 was 58,148,644 tonnes, with an additional 8,611,230 tonnes of capacity at seven non-operational non-hazardous landfills, giving a total remaining capacity of 66,759,874 tonnes of non-hazardous landfill.

16.3.9 The only active hazardous landfill site in Scotland in 2013 was Avondale in Falkirk. 24,439 tonnes were landfilled at this site in 2013, leaving a remaining capacity of 215,847 tonnes.

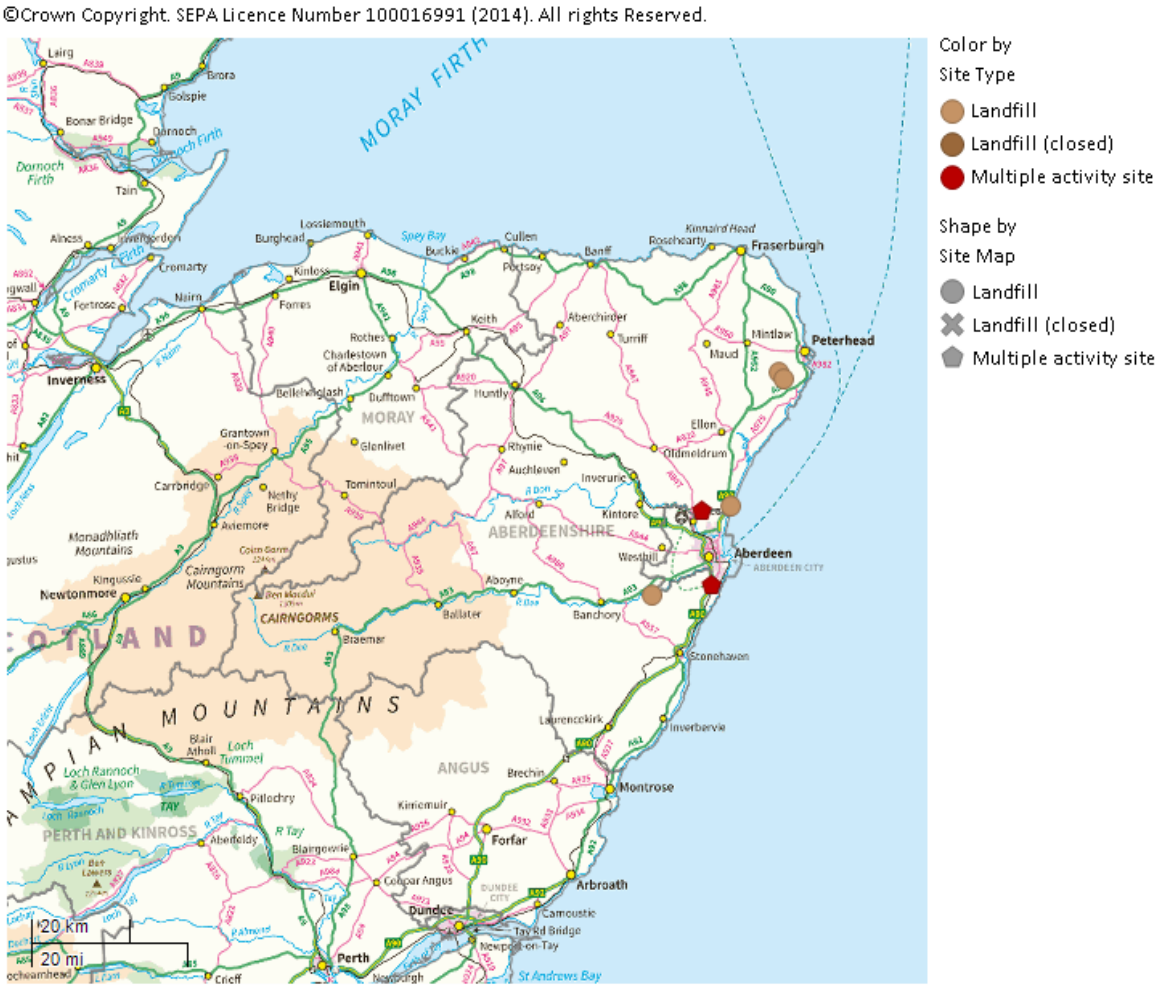
Aberdeenshire

16.3.10 In Aberdeenshire, 22,373 tonnes of inert waste was landfilled in 2013 leaving a remaining capacity of 2,377,954 tonnes. There are no landfill sites for inert or non-hazardous waste in Aberdeen. In Aberdeenshire 373,988 tonnes of non-hazardous waste were landfilled in 2013 with a remaining capacity of 8,388,368 tonnes of total capacity, or 3,412,395 tonnes of operational capacity. In 2013 three operational non-hazardous and three inert landfills were recorded in Aberdeenshire. Table 16.4 below provides more details of these sites, and their location is given in Plate 16.3 taken from SEPA's Waste Site and Capacity tool.

Table 16.4: Permitted and remaining capacity of operational landfills in Aberdeenshire

Aberdeenshire operational landfills, 2013	Annual Capacity on Permit (tonnes) 2013	Remaining Capacity as at 31 December 2013 (tonnes)	Distance and orientation
Inert landfills			
Loch Hills Quarry, Parkhill, Dyce	100,000	1,434,683	Circa 5 miles (8km) to the north
Park Quarry, South Deeside Road	75,000	884,000	Circa 15 miles (24km) to the south west
A & M Smith, Bankhead, Portlethen	25,000	59,271	Circa 10 miles (16km) to the south
Non-hazardous landfills			
Savoch Landfill, Newton of Savoch	30,000	70,000	Circa 25 miles (40km) to the north
Stoneyhill Landfill Site	355,000	3,098,829	Circa 25 miles (40km) to the north
Easter Hatton Farm, Balmedie	200,000	243,566	Circa 10 miles (16km) to the north east
Total	**780,000**	**5,790,349**	

Plate 16.3: Location of Aberdeenshire's operational landfills

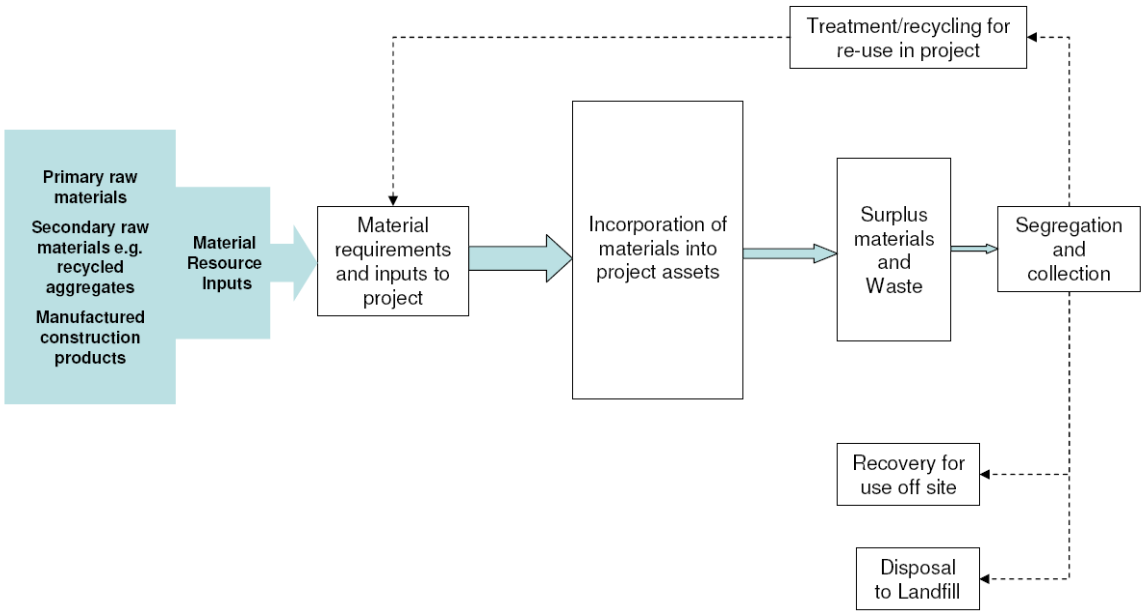


16.3.11 Given the above, it can be inferred that there is likely to be adequate waste management capacity locally to deal with the waste arising from the construction site. As such, sensitivity is determined to be low.

16.4 Potential Impacts

16.4.1 Environmental impacts associated with material resources and wastes occur at each stage of the project's material flow cycle. A simplified diagrammatic representation of materials resource flows is shown on Plate 16.4 below.

Plate 16.4: A Project's Material Flow Cycle (from IAN153/11)



Material Resources

16.4.2 The types of materials likely to be required for construction are common to all road schemes. Indicative estimated quantities of the major materials required are provided in Table 16.5.

Table 16.5: Summary of Estimated Material Volumes

Material	Units	Approximate Estimated Quantity *	Assumed Indicative Replacement Frequency
Bulk Earthworks (soils and/or rock)	m^3	58,500	
Pavement (surfacing, binder and base)	m^3	6,200	Surface – 10 years Binder – 20 years Base – 40 years
Sub-base	m^3	7600	40 years
Concrete	m^3	2000	100 years
Steel	tonnes	250	100 years
Drainage Filter Material	m^3	900	10 years
Kerbs	m	9,050	40 years
Road markings	m	3,921	10 years
Safety Fencing & Barriers	m	1,010	25 years
Signs	m^2	30	20 years

* Based on DMRB Stage 3 design. Amounts are approximate and indicative only.

16.4.3 The depletion of finite natural resources could occur through extraction of primary aggregates (e.g. sands and gravels) from local or other quarries. Structures, drainage and signage products would need to be procured with consideration of the environmental impacts associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long-life performance, visual impacts, durability and cost (refer to Section 16.5: Mitigation for further detail). Both reinforced concrete and steel structures include a measurable recycled content in their manufacture.

16.4.4 Existing soils, infrastructure and demolition materials are considered to be potential material resources, including the following which would be generated during construction of the proposed scheme:

- Excavated natural soils and/or rocks (and made ground) produced during topsoil stripping and the construction of cuttings and embankments (collectively referred to as 'earthworks'). These could be re-used on-site for landscaping or, potentially, for construction projects off-site.
- Road planings, which could be incorporated into new pavements on or off-site.
- Building demolition material.

16.4.5 The scheme design has sought to achieve a 'cut and fill balance' such that the amount of useable cut material produced from construction is matched by the amount of material required to build embankments and landscaping. However, some earthwork materials cannot be re-used from the existing site, for structural reasons, and therefore the proposed scheme would require additional materials to be imported and excess, unusable, materials exported, as illustrated by the estimated earthworks quantities for construction provided in Table 16.6 below. The import quantity shown is additional to any material re-used on-site, whilst the disposal quantities of material are for those materials unsuitable for re-use on site.

Table 16.6: Earthworks Volume Estimates (excluding on-site acceptable material which does not require import or disposal)

Earthworks	Approximate Volume (m^3)
Estimated Import	18,200
Estimated Disposal	31,700 (or 63,400 tonnes)

Aggregates

16.4.6 Imported aggregates are likely to be required for earthworks, structures, drainage and road pavement construction. These can be either primary aggregates, such as sand, natural gravels and rock, or secondary aggregates, such as recycled concrete, recycled road planings, Incinerator Bottom Ash (IBA) aggregate, reclaimed railway ballast and materials from building demolition.

16.4.7 The choice of whether to use primary or secondary aggregates (or a combination of both) would be made considering a combination of factors such as materials source, specification, production and transport. Secondary (recycled) aggregates may not always have the lowest impact on the environment and materials would be selected based on a consideration of all relevant impacts. The procurement process would be implemented through the CEMP and SWMP (Mitigation measures M2 and M3 respectfully) which are further explored in Section 16.5.

16.4.8 Within Aberdeen City and Aberdeenshire there is capacity to supply minerals and quarry material. However, due to European Union competition regulations, it is not possible to prescribe materials sources (refer to Section 16.3: Baseline Conditions).

Earthworks

16.4.9 Some of the materials for earthworks would be imported to the site for specialist purposes. For example, the incorporation of geo-textiles in earthworks (i.e. textiles that are permeable to water that can be used for reinforcement) can considerably reduce the quantity of fill material required by improving the strength of the structure.

Vehicle Movements

16.4.10 Poor planning of materials use could lead to excessive use of plant and vehicles to move and handle bulk materials, resulting in inefficient use of energy.

16.4.11 The site is located close to roads infrastructure capable of accommodating vehicle movements for materials and waste transportation. A rough estimate of potential on-site trips over the duration of the works is estimated to be approximately 1740 based on the quantity of acceptable material being re-used within the site boundary. The number of disposal trips off site is estimated at 6430 over the duration of the works and delivery trips to site is in the region of 3640 (one trip = 2 movements). Demolition would add approximately a further 2000 trips. Transport to the proposed scheme is anticipated to be by road, due to good existing links to the trunk road network and potential for 'double handling' when utilising rail network.

Carbon Footprinting

16.4.12 A detailed assessment of the potential carbon dioxide equivalent (CO_2e) impacts of the proposed scheme has been carried out (based on the indicative material and waste volumes from the DMRB Stage 3 design) using Transport Scotland's Carbon Management System 2014 (CMS) (http://www.transportscotland.gov.uk/environment/carbon-management-system). This tool was developed to measure carbon emissions associated with construction and maintenance activities of road and rail schemes. The tool allows users to estimate whole life carbon emissions for projects based on the embodied carbon associated with material use, transport of materials and waste, site plant energy consumption and energy consumption during operation as well as emissions associated with structural maintenance. This assessment focuses on the material and waste, maintenance, and transport impacts of the materials and waste associated with the civil engineering structures, road pavement and safety barriers during the design phase. The tool can also be used during the construction phase to report the project carbon footprint.

16.4.13 The expected material types, volumes and design life shown in Table 16.7 have been used in the CMS along with the waste volumes shown in Table 16.8. The source of material will not be finalised until the construction contractor has been appointed but materials would be sourced locally where possible. However, for this assessment a conservative distance of 100km is assumed for sourcing all materials. Similarly, contracts for the disposal and recycling of waste have not been finalised but local markets would be used wherever possible so a disposal distance of 25km has been assumed, except for waste wood, to be sent for combustion, that is assumed to be transported 200km.

16.4.14 It is estimated that there would be 19,660 tonnes of demolition waste (see Table 16.8 below) and it is assumed that 90% of this construction waste would be recycled or reused, with the remaining 10% sent to landfill. Glass and slate are assumed to be recycled as aggregate and half of the wood is assumed to be reused and half combusted, plaster and insulation material is assumed to be landfilled. It is estimated that 63,400 tonnes (31,700m^3) of soil would be exported from the site for re-use locally.

16.4.15 Based on the assumptions above the CMS tool estimates the projects whole life carbon emissions to be 9,174 tCO_2e. The magnitude of the impact of the proposed scheme is therefore considered to be minor based on HD 212/11 (see Table 6.1 for details) that considers emissions between 5,000 to 20,000 tCO_2e to be minor using benchmark data from previous road projects. A breakdown of the results can be seen in Table 16.7 below. Note, the data used to develop the CMS are indicative estimates from the Stage 3 design and are subject to change.

Table 16.7: Carbon Footprint

Materials and Waste	Materials embodied	Waste treatment	Transport of materials	Maintenance (materials & transport)	Total
	Carbon emission tCO_2e				
Civil Engineering Structures (detention basin, retaining walls, sign/ light foundations etc)	717	N/A	46	763	**1,526**
Road Pavement, kerbs, markings	1,368	N/A	219	5,500	**7,087**
Safety Barriers and signage	68	N/A	0.5	270	**339**
Waste	N/A	16	215	N/A	**231**
Total	**2,153**	**16**	**481**	**6,533**	**9,174**

Waste

16.4.16 Most of the waste generated from the project would be Construction and Demolition (C&D) waste. The Waste and Resources Action Programme (WRAP) defines C&D wastes as waste materials arising from UK commercial C&D sites. It includes, but is not limited to, off-cuts and waste timber, plastics (such as uPVC & HDPE), glass (such as windows), packaging (for example card, wood and plastic film) and inert materials such as soils and rubble. The definition also includes aggregate materials (such as masonry, brick and block, paving, tiles and ceramics) and plasterboard in mixed waste.

16.4.17 For wastes and surplus or defective materials, impacts are primarily associated with the production, movement, transport and processing (including recycling/recovery) of the wastes on and off-site, and, if required, their disposal at licenced off-site facilities. A waste management concern of high importance would be the risk of sterilising waste management/disposal facilities, by filling a facility up to capacity. This would force locally-produced wastes to be transported greater distances for disposal elsewhere.

Demolition Wastes

16.4.18 The proposed scheme would require the demolition of 124 residential properties and five properties associated with three community facilities. The demolition of these buildings would contribute to the quantity of the overall demolition waste generated by construction of the scheme and associated recycling activities. The demolition waste generated by the proposed scheme would also include items such as redundant safety barriers and lighting columns, but the overall quantity would be limited and re-used or recycled wherever feasible.

16.4.19 The following demolition wastes are likely to be produced. It is considered that the majority (~90% barring earthwork soils) would be returned to the manufacturer, re-used or recycled. However, a proportion of the wastes from demolition may require disposal to landfill. Estimated tonnages of the various demolition waste types expected are set out in Table 16.8 below.

Table 16.8: Estimated Waste Arisings from Demolition

Material	Quantity (tonnes) *
Blockwork	16,900
Concrete	850
Timber	1,100
Plaster	400
Slate	210
Metals	150
Insulation	10
Glass	50
Total	**19,660**

* Based on DMRB Stage 3 design. Amounts are approximate and indicative only

Earthworks Balance

16.4.20 Based on the DMRB Stage 3 design, estimated quantities have also been calculated for pavement sub-base, top-soils and earthworks materials that are likely to require re-use / disposal off-site. These will amount to ~63,400t (~31,700m^3).

16.4.21 Although the proposed scheme seeks to achieve an earthworks balance in order to reduce the need for earthworks materials to be disposed of off-site, there would be some surplus fill material which would require export from the site. Under section 7 of the Land Remediation and Waste Management Guidelines (SEPA, 2009), existing soils and infrastructure removed during the construction works would be considered as a waste if there is no possibility of recovering the material through recycling (on-site or off-site), or other processing that would enable re-use of the materials in the construction or elsewhere. Where re-use of any material is not possible, the material would need to be discarded and would thus become classified as waste. As illustrated in Section 16.3 there is currently landfill capacity in Aberdeenshire for all the forecast earthworks waste arisings.

16.4.22 However, in accordance with the Zero Waste Plan, wastes would be re-used or recycled off-site where possible. For example, Table 16.6 indicates that the amount of earthworks material needed to be imported is approximately just over a half of that which is to be exported for disposal. It is likely that a proportion of the materials imported would be secondary (recovered/recycled materials) and that materials exported off-site could potentially be used on other construction sites. Mixing imported and existing in-situ materials with recycled content may divert other third party wastes away from landfills, thereby minimising the volume of waste disposed to landfill overall.

Other Wastes

16.4.23 Other wastes may include:

- Surplus organic materials including vegetation from shrub or tree clearance.
- Special wastes including asbestos (likely to be of minimal volume);
- Municipal Solid Waste from construction workers (likely to be of minimal volume); and
- Surplus materials (likely to be of minimal volume).

16.4.24 With regards to the items listed above, quantities for specific items cannot be estimated at this time. This information will become available at the detailed design stage and once further assessment of the proposal site, including detailed asbestos surveys, are undertaken in advance of construction. However, they are discussed briefly below.

Vegetation Clearance

16.4.25 Surplus organic materials, including vegetation from shrub, tree or garden clearance or deposits removed from within redundant drainage channels, could generate waste material for disposal. Where suitable, such waste would be re-used or recycled, such as through on-site landscaping or ecological improvement works. Composting at an external waste management facility may also be an option.

Special Wastes

16.4.26 Special wastes may comprise any contaminated soils or demolition waste that cannot be treated to make them suitable for use, such as any material contaminated with asbestos or Volatile Organic Compounds (VOC), oils, metals etc. Disturbance or storage of contaminated soils or demolition waste during construction can also lead to the release of chemical pollutants into the air, ground or water (remobilisation of contaminants). The potential for waste materials or land uses to generate contaminated soils or groundwater is discussed in Chapter 8 (Geology, Contaminated land and Groundwater).

16.4.27 Refurbishment surveys were carried out by Vega Consulting on behalf of Aberdeen City Council (June 2014) on vacated Middlefield properties that are now scheduled to be demolished. These surveys included assessment of the presence of asbestos. The surveys determined that no asbestos was present in the areas that could be accessed, however in areas that could not be entered, a presumption that asbestos was present was adopted. Prior to demolition, all properties would be subject to a disruptive and fully intrusive survey to determine the presence of asbestos prior to work commencing. The waste produced from removal activities would be disposed of in accordance with the Special Waste Amendment (Scotland) Regulations 2004, The Control of Asbestos Regulations 2012 and SEPA (2015) Guidance: Asbestos in Demolition Wastes. Any asbestos found is likely to require disposal at the Avondale Hazardous Waste landfill (Polmont) 215km away near Falkirk, which is the only hazardous waste landfill in Scotland.

Municipal Solid Wastes

16.4.28 Accommodation units for construction workers would generate general municipal wastes in small volumes. Again, there is adequate capacity for the disposal of such wastes. However, segregation facilities would be provided to ensure that recovery and recycling of such wastes is maximised.

Surplus Materials

16.4.29 Surplus materials would be avoided wherever possible by efficient quantity surveying and procurement. If any do arise they would be segregated and returned to the manufacturer.

Impact Summary and Magnitude / Significance Evaluation

16.4.30 The impacts identified for both materials and waste above, and their magnitude / significance are summarised, as appropriate, in Table16.9 below:

Table 16.9: Detailed Assessment Reporting Matrix

Project Activity	Potential Impacts Associated With Material Use / Waste Production	Description of the Impacts	Brief Description of Mitigation Measures
Site remediation / Preparation / Demolition	Disposal of demolition wastes and soils unsuitable for use on-site	If waste requires landfill disposal / treatment off site, there is adequate waste management capacity, Impact = Low sensitivity, but Major magnitude, short term, localised and adverse impact. **Significance = Slight / Moderate.** If waste can be re-used at other construction sites the magnitude of effect could be reduced thereby reducing significance.	Site Waste Management Plan (SWMP) including use of targets as Key Performance Indicators (KPIs). Market testing for the potential for wastes to be used off site.
	On-site use of demolition wastes, soils and green waste	Relatively limited volumes of materials can be used for construction works but some soils and green wastes can be used for landscaping. Impact and significance – as above **Significance = Slight / Moderate.**	SWMP and KPIs.
	Production of special wastes (e.g. asbestos)	No or low volumes expected. Transport for disposal 215km away in Falkirk. No or low volumes of asbestos expected. Contamination issues dealt with in Chapter 8. Impact = Low sensitivity, but Major short term, localised and adverse impact as asbestos must be landfilled. **Significance = Slight / Moderate** if realised.	SWMP. Detailed surveys for asbestos in buildings prior to demolition. On-or off-site treatment of contaminated soils for any other hazardous wastes on-site, as appropriate.
Construction	Material use and depletion (e.g. virgin aggregates)	**Minor magnitude** – materials predominantly available locally and, as the scheme is relatively small (one junction), material demand is relatively low.	CEMP. Use of procurement policies and KPIs to maximise local sourcing of materials and the inclusion of as much recycled content as practicable, in accordance with the required specifications of the construction material. Maximisation of the use of on-site material, wherever practicable.
	Carbon footprint of materials use	**Negligible Magnitude** – Carbon footprint of construction materials and waste (not including transport) = <2200tCO_2e. (i.e. between 1000-5000).	As above
	Transport of materials and wastes	Magnitude = **No Change** (carbon footprint estimated at <500tCO_2e (i.e. <1000). However, poor planning of materials use could lead to excessive use of plant and vehicles to move and handle bulk materials,	As above and use of 'just-in-time' delivery to minimise double handling. Also sensitive routing to minimise amenity effects.

Project Activity	Potential Impacts Associated With Material Use / Waste Production	Description of the Impacts	Brief Description of Mitigation Measures
		resulting in inefficient use of energy.	
	Wastes from materials use and municipal solid waste production	Except in relation to soils and demolition wastes it is anticipated that ~90% of wastes would be recycled. There is adequate recycling capacity such that sensitivity is Low, but there is the likelihood that some waste would be sent off-site for recycling or back to the manufacturer so the magnitude is Minor. Municipal solid waste production is expected to be minimal. **Significance = Neutral / Slight**	SWMP and KPIs, use of segregation facilities for municipal wastes.
Operation	Carbon footprint of replacement materials	**Minor magnitude** – Carbon footprint of materials for maintenance (including transport) = ~6200tCO_2e (between 5000 and 20,000).	Use of procurement policies to maximise local sourcing of materials and the inclusion of as much recycled content as practicable during operation.

16.5 Mitigation

General

16.5.1 There is significant synergy between materials re-use and the avoidance of the generation of waste and a substantial overlap between the mitigation measures for materials and waste. Measures would be implemented to minimise both the use of materials and the generation of waste in relation to the proposed scheme.

16.5.2 The importance of careful management of materials to promote re-use and reduce waste has been widely recognised by the construction industry. Both legislation and voluntary best practice mechanisms have been developed and implemented. These provide measurable and accountable processes that form the basis for mitigating adverse environmental impacts associated with materials and waste.

16.5.3 Structures, drainage, road restraint systems, street lighting, traffic signals and signage products are to be procured for the proposed scheme with consideration of the environmental impacts associated with their manufacture, as well as other considerations such as structural design, carbon footprint, energy consumption, long-life performance, visual impacts, durability and cost. Both reinforced concrete and steel structures include a measurable recycled content in their manufacture. Where possible, the availability of responsibly sourced local and recycled materials should be considered in order to reduce potential environmental effects, such as from transport emissions.

16.5.4 The principles of the waste hierarchy (see Plate 16.1) would be applied to minimise waste generation and maximise re-use of materials on-site, where possible. Where re-use is not possible within the proposed scheme, alternative options would be sought off-site such as reprocessing into aggregate or the use of inert materials on local farms. For this purpose, the Zero Waste Scotland (ZWS) Construction Materials Exchange Register would be utilised to identify potential users of the wastes. For all potential waste arisings, the Contractor would be required to comply with The Waste Management Licensing (Scotland) Regulations 2011 (WML). Consideration would also be given to SEPA guidance on sustainable waste management, such as the 'Regulatory Guidance: Promoting the Sustainable Re-use of Greenfield Soils in Construction' (March 2010), 'Guidance on the Production of Fully Recovered Asphalt Road Planings' and appropriate SEPA Pollution Prevention Guidelines (PPGs) including PPG06 – Working at Construction and Demolition Sites (amongst others). If necessary, the Contractor would consult SEPA for advice. If wastes could not be legitimately re-used on site, they would be removed to a licensed recycling or disposal facility in line with regulatory requirements (**Mitigation Item M1**).

16.5.5 Given the scale of the proposed demolition, a pre-demolition audit of any existing buildings and structures would be completed using an appropriate method (e.g. the Institute of Civil Engineers (ICE) has produced guidance on pre-demolition audits, including 'The Demolition Protocol' (2008) and ZWS / WRAP also provide guidance). The audit would be referenced in the Site Waste Management Plan (SWMP) (see below).

16.5.6 In addition, ZWS Designing out Waste Guide for Civil Engineering; and Transport Scotland's CMS Road Infrastructure Projects Tool to support low-carbon decision-making during specimen design, detailed design and construction, would be utilised by the contractor (in accordance with Transport Scotland's Corporate Plan). This would be referenced in the SWMP.

Implementation of a Construction Environmental Management Plan (CEMP)

16.5.7 A principal mitigation measure relating to this topic would be the development and implementation of a Construction Environmental Management Plan (CEMP) (**Mitigation Item M2**). The CEMP would be developed by the appointed Contractor during the detailed design phase (i.e. before the start of construction works) and implemented as part of any advance demolition contract and during the construction phase. The CEMP would include the following:

- Details of the approach to environmental management throughout the construction phase, with the primary aim of mitigating any adverse impacts from construction activity on identified sensitive receptors;
- Procurement and waste management protocols/KPIs and targets designed to minimise impacts on the environment and maximise local procurement of materials and waste management options;
- Good materials management methods, such as co-location of temporary haul routes on permanent capping and recovery and re-use of temporary works materials from haul routes, plant and piling mattresses, as well as use of 'just-in-time' delivery to minimise double handling etc;
- In order to minimise effects on amenity, materials for import and waste disposal would be transported appropriately along prescribed routes which are likely to include the A90 and A96. Prescribed routes would be included in the main construction contract documents. The Contractor would be required to seek approval from the relevant authority should they wish to use any other routes; and
- Risk / impact-specific method statements and strategic details of how relevant environmental impacts would be addressed throughout the proposed scheme, embodying the requirements of the relevant SEPA PPGs.

16.5.8 The CEMP can inform the completion of a sustainability assessment such as the Civil Engineering Environment and Quality Award Scheme (CEEQUAL) examination which the proposed scheme would be subject to. CEEQUAL is an evidence-based sustainability assessment rating tool and awards scheme for civil engineering, infrastructure, landscaping and public realm projects. It aims to deliver improved project specification, design and construction of civil engineering works. CEEQUAL rewards project and contract teams in which clients, designers and Contractors go beyond the legal minima to achieve environmental enhancement.

Implementation of a Site Waste Management Plan (SWMP)

16.5.9 Though not mandatory in the UK, a SWMP would be developed, either as part of the CEMP or as a separate document, and would be regularly updated during construction of the route (**Mitigation Item M3**). The plan would identify, prior to the start of construction works, the types and likely quantities of wastes that may be generated. It would set out, in an auditable manner, how waste would be reduced, re-used, managed and disposed of in accordance with WRAP Guidance. The SWMP would be developed by the Contractor before commencement of the construction phase and any advance demolition contract and would include waste minimisation targets and associated KPIs. It would be written in accordance with ZWS and Waste and Resources Action Programme (WRAP) guidance.

16.5.10 The SWMP would set out how all construction phase materials would be managed. This may include specific soils management plans developed under the following voluntary and industry regulated Codes of Practice such as:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009) provides practice guidance for the excavation, handling, storage and final placement of soils; and
- Land Remediation and Waste Management Guidelines (SEPA, 2009) provides a process whereby contaminated soils can be re-used on the site of origin (i.e. they do not become a waste) if they are proven, through appropriate risk assessments, to be suitable for use. It also provides for soils with naturally elevated contamination levels to be used directly on another site provided that they are suitable for use at that site.

16.5.11 Implementation of the SWMP would minimise waste at source, during detailed design and construction, by facilitating measures to maximise re-use of materials on-site and reduce the need for new construction materials. Regular reviews of, and updates to, the SWMP would enable the

monitoring of the effectiveness of the mitigation measures at minimising waste generation, especially disposal to landfill.

16.5.12 Where materials generated during demolition / construction cannot be used for the proposed scheme, opportunities would be sought to re-use the materials on other local projects (**Mitigation Item M4**); for example, the Middlefield Regeneration Project, as part of Aberdeen's strategic commitment to waste management which is detailed in the Aberdeen City Waste Strategy 2010-2025. It may be possible to recycle all, or most, of the road surface (planings) for incorporation in other schemes or for sale to other local construction projects, but it would not be possible to confirm this until closer to the time of implementing the works. It is acknowledged that any soils or peat stored for greater than three years would require a permit under The Landfill (Scotland) Regulations 2003.

16.5.13 Where suitable, green waste would be re-used or recycled, such as through on-site landscaping or ecological improvement works; for example for habitat creation, or spread as chippings or mulch, with appropriate consideration and control of any watercourse pollution risk. Off-site disposal through a green waste disposal contractor could also offer recycling through composting (note: there is 170,000tpa of composting capacity in Aberdeenshire). Details of any specific proposed ecological improvement works are outlined in Chapter 10 (Ecology and Nature Conservation).

Special Wastes

16.5.14 If contaminated soils are encountered during the construction works, further investigation, testing and risk assessment would be undertaken to determine whether the soils could stay on-site, require treatment to make them suitable to remain on-site or would need to be disposed of off-site (**Mitigation Item M5**). Details for dealing with unexpected contaminated soils would be included in the CEMP. Asbestos surveys of the properties to be demolished would also be undertaken prior to any demolition works commencing (**Mitigation Item M6**) and appropriate management and disposal routes identified.

Mitigation Summary

16.5.15 Table 16.10 summarises mitigation measures that would be adopted in accordance with Annex 4 of the draft HD 212/11 guidance.

Table 16.10: Mitigation Measures Reporting Matrix

Project Activity	Potential Impacts Associated With Material Resource Use / Waste Management	Description of the Mitigation Measures	Mitigation Reference	How the Measures Would be Implemented, Measured, and Monitored
Site remediation / Preparation / Demolition	Disposal of demolition wastes and soils unsuitable for use on-site	Site Waste Management Plan (SWMP) including use of targets as Key Performance Indicators (KPIs). Market testing for the use of wastes off-site via the materials exchange. Pre-demolition audit to identify wastes.	M1, M3	Implemented by Contractor. Use of weighbridge records and waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works
	On-site use of demolition wastes, soils and green waste	SWMP and KPIs. Pre-demolition audit.	M3	Incorporation of on-site recovered materials in detailed design. Implemented by Contractor. Audited regularly by Environmental Coordinator / Clerk of Works
	Production of special wastes (e.g. asbestos)	SWMP. Detailed surveys for asbestos in buildings prior to demolition. On-or off-site treatment of contaminated soils for any other hazardous wastes identified on-site, as appropriate.	M3, M5, M6	Detailed asbestos survey results, Use of weighbridge records and special waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works
Construction	Material use and depletion (e.g. virgin aggregates)	Construction Environment Management Plan (CEMP). Use of procurement policies, targets and KPIs to maximise local sourcing of materials and the inclusion of as much recycled content as practicable in accordance with the required specifications of the construction material. Pre-demolition audit to identify resources.	M1, M2, M3, M4	Procurement policies to be implemented by the Contractor. Measured via weighbridge records and receipts and analysis of procurement criteria used for specific materials. Audited regularly by Environmental Coordinator / Clerk of Works
	Carbon footprint of materials use	As above	As above	As above. Procurement policies to include whole life CO_2e emissions data as a KPI for all materials.
	Transport of materials and wastes	As above and use of 'just-in-time' delivery to minimise double handling. Sensitive traffic management to minimise effects on amenity.	M1, M2, M4	Procurement and waste management policies and sensitive routing arrangements to be implemented by the Contractor. Measured via weighbridge records

Project Activity	Potential Impacts Associated With Material Resource Use / Waste Management	Description of the Mitigation Measures	Mitigation Reference	How the Measures Would be Implemented, Measured, and Monitored
				and receipts and analysis of procurement criteria used for specific materials. Audited regularly by Environmental Coordinator / Clerk of Works
	Wastes from materials use and municipal solid waste production	SWMP and KPIs. Provision of segregation facilities.	M1, M2, M3, M4	Implemented by Contractor. Use of weighbridge records and waste transfer notes. Audited regularly by Environmental Coordinator / Clerk of Works
Operation	Carbon footprint of replacement materials	Use of procurement policies to maximise local sourcing of materials and the inclusion of as much recycled content as practicable during operation.	NA	Ongoing procurement policies to include whole life CO_2e emissions data as a KPI for all maintenance materials.

16.6 Residual Impacts

16.6.1 A high proportion of the potential residual impacts associated with materials cannot be absolutely predicted, as many would only occur if something went wrong (i.e. they would be the result of unplanned, accidental occurrences, such as spillages, or as a result of failure by a Contractor or sub-Contractor to follow procedures established in the various management plans described in this chapter).

16.6.2 These risks can be reduced or eliminated through well-planned and well-controlled construction site management, planned and expressed through procedures such as the CEMP and SWMP. The proper application of these management procedures should reduce the significance of all of the impacts described in this chapter to Slight/Neutral.

16.6.3 It should be noted that at all stages the project would seek to minimise waste, re-use as much material as possible on-site, recycle/recover as much waste that cannot be used on site as possible and minimise carbon emissions. Thus the proposals accord with relevant legislation, policy and guidance as set out in this chapter.

16.6.4 The magnitude and/or significance of each residual impact are described in Table 16.11.

Table 16.11: Residual Impacts Matrix

Project Activity	Potential Impacts Associated With Material Use / Waste Production	Description of the Impacts Prior to Mitigation	Description of the Impacts After Mitigation
Site remediation / Preparation / Demolition	Disposal of demolition wastes and soils unsuitable for use on-site	If waste requires landfill disposal / treatment off site, there is adequate waste management capacity, Impact = Low sensitivity, but Major short term, localised and adverse impact. **Significance = Slight / Moderate**. If waste can be re-used at other construction sites the magnitude of effect could be reduced thereby reducing significance.	If waste can be re-used at other construction sites the magnitude of effect is reduced to negligible and thus significance could be reduced to **Neutral.**
	On-site use of demolition wastes, soils and green waste	Relatively limited volumes of materials can be used for construction works but some soils and green wastes can be used for landscaping. Impact and significance – as above **Significance = Slight / Moderate**.	If the use of such wastes can be maximised the magnitude of the effect can be reduced to moderate resulting in a significance level of **Slight.**
	Production of special wastes (e.g. asbestos)	No or low volumes expected. Transport for disposal 214km away in Falkirk. No or low volumes of asbestos expected. Contamination issues dealt with in Chapter 9. Impact = Low sensitivity, but Major short term, localised and adverse impact as asbestos must be landfilled. **Significance = Slight / Moderate** if realised.	If no asbestos / contamination is found through survey there would be **No Impact**.
Construction	Material use and depletion (e.g. virgin aggregates)	**Minor magnitude** – materials predominantly available locally and, as the proposals are a relatively small scheme (one junction) material demand is relatively low.	If the use of local materials can be maximised magnitude would remain **Minor.**
	Carbon footprint of materials use	**Negligible magnitude** – Carbon footprint of construction materials (not including transport) = <2200tCO_2e.	Magnitude would remain **Negligible.**
	Transport of materials and wastes	**Magnitude = No Change** (carbon footprint estimated at <500tCO_2e. However, poor planning of materials use could lead to excessive use of plant and vehicles to move and handle bulk materials, resulting in inefficient use of energy.	Magnitude would remain as **No Change.**
	Wastes from materials use and municipal solid waste production	Except in relation to soils and demolition wastes (see above) it is anticipated that ~90% of wastes would be recycled. There is adequate recycling capacity such that sensitivity is Low but there is the likelihood that some waste would be sent off-site for recycling or back to the manufacturer so the magnitude is Minor. **Significance = Neutral / Slight**	If waste of construction materials can be avoided and/or re-use on site can be maximised the magnitude of the effect can be reduced to negligible resulting in a significance level of **Neutral**.
Operation	Carbon footprint of replacement materials	**Minor magnitude** – Carbon footprint of materials for maintenance (including transport) = ~6200tCO_2e.	If carbon efficient procurement can be maximised during the operational period then there is the potential to reduce the magnitude to **Negligible**.

16.7 References

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PPG22 – Incident response: dealing with spills; and PPG26 – Safe storage: Drums and Intermediate Bulk Containers.

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17 Policies and Plans

This chapter presents an assessment of the compliance of the proposed scheme with plans and policies. The principle of development of the proposed scheme is established and supported in national, regional and local planning policy. The Scottish Government's commitments to the proposed scheme and wider improvements to the A96 corridor between Aberdeen and Inverness are outlined in National Planning Framework 3 as enabling opportunities to link the energy sectors in the two city regions as well as improving the quality of place inbetween the two cities.

The proposed scheme also supports regional transport policy objectives as part of a wider strategy to assist in providing enhanced connectivity to deliver prosperity and connect communities across the region.

The assessment has identified where potential impacts associated with the proposed scheme could result in potential non-compliance with aspects of policy. The proposed measures to mitigate potential impacts have been identified in the specialist environment assessment chapters of the Environmental Statement. Taking this into account the proposed scheme is considered to be broadly compliant with national, regional and local planning policies.

17.1 Introduction

17.1.1 This chapter presents the assessment of the compliance of the proposed scheme with plans and policies. The chapter is supported by the following appendices, which are cross-referenced in the text where relevant:

- Appendix A17.1: Planning Policy Context for Environmental Assessment.
- Appendix A17.2: Assessment of Development Plan Policy Compliance.

17.1.2 The 'Town and Country Planning (Scotland) Act 1997' ['the 1997 Act'] (as amended by the Planning etc. (Scotland) Act 2006) ["the 2006 Act"] provides the framework for land use planning and the development of planning policy in Scotland. The 'Planning etc. (Scotland) Act 2006' is an enabling Act. Its purpose is to amend existing planning legislation and provide a mechanism for the delivery of a modernised planning system.

17.1.3 A key feature of the 2006 Act is the statutory role and application of the National Planning Framework (NPF). The National Planning Framework 3 (NPF3) contains a statement of priorities and a strategy for the long-term spatial development of Scotland. The approved NPF3 was published by the Scottish Government in June 2014 and identifies national developments including major strategic transport proposals. It also requires Scottish Ministers to include a statement of their reasons for considering a need for such developments.

17.1.4 The Scottish Government's influence on the planning system also extends to the production of Scottish Planning Policy (SPP), Circulars, Planning Advice Notes (PANs) and approval of strategic planning documents. Each of these policy documents is material to the development of local and regional policy and provides thematic guidance on planning for a broad range of land uses and developments.

17.1.5 Under the 1997 Act, each planning authority in Scotland has a responsibility to publish a Development Plan, the content of which is informed by national policy. The Development Plan system forms the basis on which decisions about development and future land use are made, and effectively incorporates national and strategic policies within a local framework.

17.1.6 The Development Plan has been modernised as a result of the Planning etc. (Scotland) Act 2006 system for Scotland and now requires the four largest city regions to prepare Strategic Development Plans (SDPs) and local authorities to prepare Local Development Plans (LDPs). SDPs should set out a vision and context for the long-term development of the city regions and deal with cross boundary issues including transport. For those authorities outside the city regions the LDPs will set out the area's strategic priorities and must be replaced every five years. Local Development Plans should be concise, map-based documents focusing on specific proposals for a

time horizon of a minimum of 10 years (where they are also covered by an SDP) or 20 years (outwith SDP areas). To enable the LDP to remain concise, they will be accompanied by a suite of supplementary guidance which will provide detailed policy and advice.

17.1.7 The Development Plan is material to decisions about development and future land uses, including major infrastructure works such as the proposed scheme. The route of the proposed scheme lies within the boundaries of Aberdeen City Council (ACC) which is part of the Aberdeen City and Shire city region. The relevant Development Plan documents are listed in Table 17.1 below.

Table 17.1: Development Plan Documents

Document	Title	Status
Strategic Development Plan	Aberdeen City and Shire Strategic Development Plan (ACSSDP)	Approved by Scottish Ministers 28 March 2014
Local Development Plan	Aberdeen Local Development Plan (ALDP)	Adopted by Aberdeen City Council 29 February 2012

17.1.8 ACC adopted its Local Development Plan (ALDP) in 2012. The SDP for the wider city region, the Aberdeen City and Shire Strategic Development Plan (ACSSDP), supersedes the previous 2009 Aberdeen City and Shire Structure Plan (ACSSP) which the current ALDP 2012 was prepared to accord with. Preparation of a replacement ALDP is underway, which will require to accord with the current ACSSDP 2014, and once adopted will supersede the ALDP 2012.

17.2 Approach and Methods

17.2.1 Interim Advice Note (IAN) 125/09 'Environmental Assessment' (The Highways Agency et al, 2009), provides supplementary advice on carrying out assessments of such projects until such time as all topic chapters in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3 have been updated and published. IAN 125/09 sets out a revised structure for DMRB, Volume 11, Section 3, Parts 1-12, and advises that the reporting of the impact of road schemes on policies and plans is absorbed into each of the new topic chapters.

17.2.2 In accordance with IAN 125/09, plans and policies were reviewed in the context of each of the topic chapters of this Stage 3 Report (Chapters 7-16), and the results are presented in Appendix A17.1 (Planning Policy Context for Environmental Assessment). Given that many of the policies are relevant to more than one topic chapter, it is considered appropriate that the assessment of compliance against each policy is provided together in Appendix A17.2 (Assessment of Development Plan Policy Compliance) and summarised in this chapter.

17.2.3 The methodology used for this Stage 3 assessment has involved the following:

- describing the existing and, where appropriate, emerging planning policy guidance framework as applicable to the proposed scheme;
- describing the existing, and where appropriate, emerging development plan framework as applicable to the proposed scheme;
- assessing the likely impacts of the proposed scheme on the achievement of the objectives and policies identified; and
- reporting the likely conflicts or compliance of the proposed scheme on key strategic and local planning policy objectives.

17.2.4 The assessment of policies and plans was undertaken through an appraisal of policy and strategy objectives and whether the development of the proposed scheme would be likely to comply or conflict with those objectives.

17.2.5 A full assessment of potential impacts on identified development land (based on ALDP allocations, proposals and current planning consents) is provided in Chapter 7 (Community and Private Assets).

17.2.6 Co-operative working with ACC has been an on-going process throughout the development of the proposed scheme with meetings taking place for the purpose of topics such as strategising community engagement, discussing proposed pedestrian and cycle routes and identifying mitigation strategies in relation to landscape and urban design.

17.2.7 As previously noted in Chapter 6 (Consultation and Scoping), consultation is an iterative and on-going process. Table 6.1 summarises all meetings with both Statutory and Non-Statutory consultees.

Limitations to the assessment

17.2.8 Section 3, Part 12 of the DMRB, which relates to the assessment of Policies and Plans, has not been updated since 1994. Major changes have occurred to the Scottish planning system since then including the introduction of the NPF, of which NPF3 is the current iteration, and the replacement of Structure and Local Plans with Strategic and Local Development Plans. Therefore references to certain documents and/or organisations in the DMRB are no longer applicable. This is not considered to affect this assessment.

17.3 Summary of Plans and Policies

17.3.1 An assessment was undertaken of policies and plans at national, regional and local level. A summary of the theme and objectives of each relevant development plan policy is presented in Appendix A17.2 (Assessment of Development Plan Policy Compliance). In addition, an analysis of relevant land use allocations and the precise locations of planned developments adjacent to or within the vicinity of the proposed scheme were also completed. Figures 7.2 – 7.4 show relevant land use allocations and planned developments.

National Strategies

National Planning Framework 3 (NPF3)

17.3.2 The Scottish Government published the third iteration of NPF in June 2014 superseding the previous NPF2 (Scottish Government, 2009). The NPF3 is a statutory document and a material consideration in planning decisions.

17.3.3 The framework guides Scotland's spatial development over the next 20 to 30 years setting out strategic development priorities to support the Scottish Government's central purpose - to promote sustainable economic growth. One of the key drivers for the revision has been to emphasise place-making. It also focusses on the following four priorities for Scotland:

- A low carbon place;
- A natural place to invest;
- A successful and sustainable place; and
- A connected place.

17.3.4 NPF3 describes spatial priorities for change in improving connections. It states in paragraph 5.20 that "*The road network has an essential role to play in connecting cities by car, public transport and active travel….. We will complete dualling of the trunk roads between cities, with dualling of the A9 from Perth to Inverness complete by 2025 and dualling of the A96 from Inverness to Aberdeen by 2030. In addition, the Scottish Government's Infrastructure Investment Plan includes measures to improve the safety, capacity and performance of the strategic inter-city road network*".

17.3.5 NPF3 identifies 14 major transport, energy and environmental infrastructure projects that are of national significance to Scotland. Designation in NPF3 is the mechanism for establishing the need for these developments within the national interest. The developments which the Scottish Ministers have designated as national developments are considered to be essential to the delivery of the

spatial strategy set out in NPF3. They are considered to assist in contributing to the Scottish Government's objective of building a Scotland that is wealthier and fairer; greener; safer and stronger; smarter and healthier.

17.3.6 The following national developments that have been identified in NPF3 which have relevance to the proposed scheme are:

Table 17.2: National Developments

NPF Ref. No.	National Development
8	National Cycling and Walking Network
10	Strategic Airport Enhancements
13	Aberdeen Harbour

17.3.7 Statements of need in respect of each of the national developments listed in Table 17.2 have been included in NPF3 (Annex A). The Annex notes that the Scottish Government expects design to be of a high quality as these are developments of national importance and for the design to minimise carbon impacts in line with the Government's climate change targets. All developments will require the appropriate level of environmental assessment and public consultation, and will need to demonstrate that environmental impacts can be avoided, or mitigated to an acceptable level at the consenting stage.

17.3.8 The NPF City Investment Plan sets out an ambition "*to maintain Aberdeen's position as one of the world's key energy capitals and to maximise its growth potential and diversification into other sectors*." National Developments relating to the area include improvements to Aberdeen Harbour, and Aberdeen Airport which illustrate the economic significance that infrastructure improvements, including improvements to the Third Don Crossing and Aberdeen Western Peripheral Route (AWPR), bring to the area.

The Government Economic Strategy

17.3.9 The current Government Economic Strategy was published in November 2011 with the purpose of creating a more successful country, through increasing sustainable economic growth (Scottish Government, 2011). The strategy is based on the principle that an efficient transport system is one of the key enablers for enhancing productivity and delivering faster, more sustainable growth. Enhancing transport infrastructure and services can open up new markets, increase access to employment and help to build a critical mass of businesses that drive up competitiveness and deliver growth.

17.3.10 The strategy also acknowledges the importance of Scotland's cities and towns as centres of growth and prosperity. It states that the strategy *'…looks to harness the strength and quality of our cities, towns and rural areas, including coastal communities, and to ensure that Scotland is positioned to take full advantage of the opportunities offered by the digital age and the transition to a low carbon economy'.* To support this aspiration, the strategy seeks to enhance connections between Scotland's urban areas.

17.3.11 Financial and other resources will be aligned to ensure that policy development and spending programmes are sharply focused on the delivery of the strategy's purpose which is centred upon *'…growing the economy and creating opportunities for all to flourish'.*

Infrastructure Investment Plan (IIP)

17.3.12 The current IIP was published in 2011 and provides an overview of the Scottish Government's plans for infrastructure investment. The vision for the IIP is to create a *'secure, prosperous, confident, healthy, fair, well-connected, low carbon Scotland'.*

17.3.13 The investment decisions outlined in the plan are focused on supporting the delivery of the Government Economic Strategy. The IIP recognises that an efficient transport system is '*a key enabler for enhancing productivity and hence expanding the economic potential of the country*.' It is therefore focussed on improving connections across, within and to / from Scotland. The IIP highlights that the Scottish Ministers have committed to improvements to Haudagain Roundabout following completion of the AWPR (Page 114).

Scotland's Transport Future

17.3.14 The Scottish Government's vision and objectives for transport in Scotland are set out in the White Paper, 'Scotland's Transport Future' (Scottish Executive, 2004). This provides the policy framework for transport in Scotland with an overall aim to *'…promote economic growth, social inclusion, health and protection of our environment through a safe, integrated, effective and efficient transport system'*.

17.3.15 Paragraph 71 of the White Paper states that *'…in order to enhance Scotland's global competitiveness and to enable Scotland's economy to maximise its productivity, Scotland needs to ensure that it has a well-connected, sustainable transport network…Transport can help unlock the economic and regeneration potential of particular places. It can also ensure connections for people who live and work in more remote and rural areas'*.

National Transport Strategy (NTS)

17.3.16 The NTS (Scottish Executive, December 2006) considers Scotland's transport needs and outlines the long-term strategy to meet the aims identified in 'Scotland's Transport Future'. The following key strategic outcomes have been identified within the NTS to achieve these aims:

- *'improve journey times and connections, to tackle congestion and the lack of integration and connections in transport which impact on high level objectives for economic growth, social inclusion, integration and safety;*
- *reduce emissions, to tackle the issues of climate change, air quality and health improvement which impact on high-level objectives for protecting the environment and improving health; and*
- *improve quality, accessibility, and affordability, giving people a choice of public transport where availability means better quality services and value for money, providing an alternative to the car.'*

National Planning Policy

Scottish Planning Policy (SPP) (2014)

17.3.17 The current SPP was published in June 2014 and is accompanied by other documents such as Creating Places (Scottish Government, 2013), Designing Streets (Scottish Government, 2010), Planning Advice Notes, Planning Circulars and the aforementioned NPF3, which together comprise national land use planning guidance in Scotland. The current SPP replaces both the previous SPP (2010) document and Designing Places (2001). It directs the form and content of Development Plans, and is a material consideration in the assessment of planning applications. SPP sets out the core values and vision of planning set against the same four planning outcomes as NPF3 (paragraph 17.3.3 refers). The outcomes are consistent across the NPF3 and SPP and focus on creating a place which is sustainable, low carbon, natural, resilient and more connected. SPP sets out two principal policies; Sustainability and Placemaking and then outlines various subject policies. The principal and relevant subject policies contained in the consolidated SPP are summarised in Table 17.3.

Table 17.3: Scottish Planning Policy

Subject	SPP Paragraph	Summary
Introductory Sections	Paragraph 1 - 23	The introductory sections of the SPP set out a brief statement on the purpose of planning and detail the core principles that should underpin the modernised planning system. SPP states that successful operation of the planning system will only be achieved if all those involved commit themselves to engaging as constructively as possible in development planning and development management, so that the planning system contributes effectively to increasing sustainable economic growth. It directs the form and content of Development Plans, and is a material consideration in the assessment of planning applications. SPP sets out the core values and vision of planning and highlights the same four planning outcomes as NPF3. The outcomes are consistent across the NPF3 and SPP and focus on creating a place which is sustainable, low carbon, natural, resilient and more connected. The SPP sets out the two principal policies; Sustainability and Placemaking and then outlines various subject policies.
Sustainability	Paragraph 24 - 35	The SPP's central purpose is to focus government and public services on creating a more successful country through increasing sustainable economic growth. This can be achieved through the planning system by supporting economically, environmentally and socially sustainable places and responding to economic issues, challenges and opportunities. SPP states that policies and decisions should be guided by a number of key principles. These include: • giving due weight to economic benefit; • supporting delivery of energy infrastructure; • supporting climate change mitigation and adaptation including taking account of flood risk activity; • protecting, enhancing and promoting access to cultural heritage, including the historic environment; • protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment; and • avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.
Placemaking	Paragraph 36 -57	Placemaking is a creative, collaborative process that includes design, development, renewal or regeneration of our urban or rural built environments. Planning should take every opportunity to create high quality places by taking a design-led approach through the joint consideration of the relationships between higher quality places. Placemaking is supported through, amongst others, optimising the use of existing resources, using land within or adjacent to settlements for a mix of uses, developing brownfield land and locating development where investment in growth or improvement would have most benefit.
Valuing the Historic Environment	Paragraph 135 - 151	Recognises that the historic environment is a key cultural and economic asset which planning has an important role to play in maintaining and enhancing the distinctive and high-quality, irreplaceable historic places. Planning authorities should safeguard designated and non-designated historic environments including individual assets such as scheduled monuments and archaeological resources; related settings and the wider cultural landscape. The Government's Scottish Historic Environment Policy (SHEP) and the Managing Change in the Historic Environment guidance note series, both published by Historic Scotland, should also be taken into account for development.
Valuing the Natural Environment	Paragraph 193 - 218	Advises that planning authorities should conserve and enhance international, national and locally designated sites and protected species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities. Plans should address potential effects of development on the natural environment and authorities should apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur.
Flood Risk	Paragraph 254 -	Sets out a precautionary approach to flood risk from all sources by safeguarding flood storage and conveying capacity. Planning authorities are required to take into

Subject	SPP Paragraph	Summary
and Drainage	268	account probability of flooding and associated risks when determining planning applications and preparing development plans, and developers should take flood risk into account prior to committing to development.
Promoting Sustainable Transport and Active Travel	Paragraph 269 - 291	Sets out the planning policy on sustainable transport to optimise the use of existing infrastructure and reduce the need to travel by providing safe and convenient opportunities for walking, cycling and travel by public transport. Development plans and development management decisions should also take account of the implications of development proposals on traffic, patterns of travel and road safety.

Planning Advice Notes and Circulars

17.3.18 Planning Advice Notes (PANs) support SPP and provide advice on good practice and other relevant information to planning authorities. A summary of PANs of relevance to the proposed scheme is provided in Table 17.4.

Table 17.4: Relevant Planning Advice Notes

PAN	Title	Description
PAN 33	Development of Contaminated Land (2000)	Provides advice on the implications of the contaminated land regime for the planning system; and the development of, and approach to, contaminated land in development plans. It also contains guidance on the determination of planning applications when the site is, or may be, contaminated.
PAN 51	Planning, Environmental Protection and Regulation (Revised 2006)	Supports the existing policy on the role of the planning system in relation to the environmental protection regimes. This PAN also summarises the statutory responsibilities of the environmental protection bodies, as well as informing these bodies about the planning system.
PAN 60	Planning for Natural Heritage (2000)	Provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and will encourage developers and planning authorities to be positive and creative in addressing natural heritage issues. It complements the SPP, with examples of good planning practice in relation to natural heritage drawn from across Scotland highlighted in a number of case studies.
PAN 61	Planning and Sustainable Urban Drainage Systems (2001)	Provides good practice advice for planners and the development industry on the implementation of Sustainable Urban Drainage Systems (SUDS) (now referred to as Sustainable Drainage Systems in latest guidance) to aid the introduction of more sustainable developments.
PAN 65	Planning and Open Space (2008)	Provides advice on the role of the planning system in protecting and enhancing existing open spaces and providing high quality new spaces. The advice relates to open space in settlements: villages, towns and major urban areas.
PAN 69	Planning and Building Standards Advice on Flooding (2004)	Provides background information and best practice advice in support of SPP), and the Technical Handbooks published by the Scottish Building Standards Agency that provide guidance for the Building (Scotland) Regulations 2004. This PAN focuses on the responsibilities of local authorities and developers in ensuring that future built development is not located in areas with a significant risk of flooding, including functional flood plains.
PAN 75	Planning for Transport (2005)	Aims to create greater awareness of how linkages between planning and transport can be managed. It highlights the roles of different bodies and professions in the process and points to other sources of information on the overlap of the two sectors.
PAN 78	Inclusive Design (2006)	Supports the government's aim of promoting more equality in the areas where we live and work. The PAN explains the importance of inclusive design, identifies problems experienced in designing inclusive environments and describes the legislative context. It also outlines the roles of the different stakeholders in delivering inclusive design and identifies the particular challenges of applying inclusive design to the historic environment.
PAN 79	Water and Drainage (2006)	Clarifies the role of the planning authority in setting the direction of development to inform the planning and delivery of new water infrastructure in a coordinated way. It explains the roles of Scottish Water and the Scottish Environment Protection Agency (SEPA) and encourages joint working in order to ensure a common understanding of capacity constraints and agreement on the means of their removal. It advises on the appropriateness of private schemes and the handling of Scottish Water developments.

PAN	Title	Description
PAN 1/2013	Environmental Impact Assessment	The PAN replaces PAN 58 and provides guidance on the integration of EIA procedures into the development management process, as a step towards more efficient and effective EIA.
PAN 3/2010	Community Engagement	The PAN provides advice to communities on how they can get involved and advice to planning authorities and developers on ways of effectively engaging with communities on planning matters. It advocates the use of 10 National Standards and provides detailed advice on each standard as follows: Involvement; Support; Planning; Methods; Working Together; Sharing Information; Working with Others; Improvement; Feedback; and Monitoring and Evaluation.
PAN 1/2011	Planning and Noise	The PAN promotes the principles of good acoustic design and a sensitive approach to the location of new development. It promotes the appropriate location of new potentially noisy development, and a pragmatic approach to the location of new development within the vicinity of existing noise generating uses, to ensure that quality of life is not unreasonably affected and that new development continues to support sustainable economic growth.
PAN 2/2011	Planning and Archaeology	This Planning Advice Note sits alongside SPP, SHEP and the Managing Change in the Historic Environment Guidance Notes, which together set out the Scottish Ministers' policies for planning and the historic environment. This PAN is intended to inform the day-to-day work of a range of local authority advisory services and other organisations that have a role in the handling of archaeological matters within the planning process.
PAN1/2013	Environmental Impact Assessment	PAN 1/2013 replaces the outdated PAN:58 and brings EIA guidance fully into line with the latest regulations. It contains new guidance on the integration of EIA procedures into the development management process, as a step towards more efficient and effective EIA.

17.3.19 Table 17.5 contains relevant Planning Circulars which provide statements of Scottish Government policy and guidance on implementation and/or procedural change.

Table 17.5: Other Relevant National Policy Guidance

Circular	Title	Description
3/2011	The Town and Country Planning (EIA) (Scotland) Regulations 2011	This Circular provides guidance on the Environmental Impact Assessment (Scotland) Regulations 2011 which update the 1999 Regulations.

17.3.20 An overview of other national planning policy and guidance is provided in Table 17.6.

Table 17.6: Other Relevant National Policy Guidance

Policy	Title	Description
SHEP	Scotland's Historic Environment Policy - (December 2011)	This document has consolidated the previous SHEP series into one policy document. The SHEP sets out Scottish Ministers' policies for the historic environment, provides greater policy direction for Historic Scotland and provides a framework that informs the day-to-day work of a range of organisations that have a role and interest in managing the historic environment. The SHEP complements and has the same authority as the SPP series and other relevant Ministerial policy documents, and is a material document in the statutory planning, EIA and Strategic Environmental Assessment (SEA) processes. It was published in parallel with SPP23 on the Historic Environment (now superseded by the consolidated SPP).
Guidance Note Series	Managing Change in the Historic Environment (2010)	The series explains how to apply the policies contained in the SHEP and SPP.

Regional and Local Planning Policy

17.3.21 The regional and local planning policy documents which comprise the Development Plan are listed in Table 17.1. A brief overview of the relevant regional and local planning policy for the proposed scheme is described in the following sections.

Aberdeen City and Shire Strategic Development Plan (ACSSDP) (2014)

17.3.22 The ACSSDP was approved by Scottish Ministers in March 2014, and supersedes the 2009 Aberdeen City and Shire Structure Plan (ACSSP). It has an overall purpose to set a clear direction for the future development of the North East up to 2035.

17.3.23 The Vision for the ACSSDP is that '*Aberdeen City and Shire will be an even more attractive, prosperous and sustainable European city region and an excellent place to live, visit and do business.'*

17.3.24 In support of this vision, the key aims of the ACSSDP are to:

- provide a strong framework for investment decisions which help to grow and diversify the regional economy, supported by promoting the need to use resources more efficiently and effectively; and
- take on the urgent challenges of sustainable development and climate change.

17.3.25 To support these main aims, the plan also aims to:

- make sure the area has enough people, homes and jobs to support the level of services and facilities needed to maintain and improve the quality of life;
- protect and improve our valued assets and resources, including the built and natural environment and our cultural heritage;
- help create sustainable mixed communities, and the associated infrastructure, which meet the highest standards of urban and rural design and cater for the needs of the whole population; and
- make the most efficient use of the transport network, reducing the need for people to travel and making sure that walking, cycling and public transport are attractive choices.

17.3.26 The ACSSDP continues the spatial strategy of the ACSSP and promotes three Strategic Growth Areas (SGAs) which will be the focus for development over the period up to 2035. These SGAs are 'Aberdeen City', the 'Huntly - Aberdeen – Laurencekirk' transport corridor and the 'Aberdeen – Peterhead' transport corridor. In order to serve new development and reduce traffic congestion, improvements to the Haudagain Roundabout are highlighted as a priority for both the 'Aberdeen City' and 'Aberdeen to Peterhead' SGAs. The ACSSDP states that the Haudagain Improvements is one of a number of vital infrastructure projects required in the first plan period to encourage economic growth. The proposed scheme will be beneficial to the wider area and contribute to *'…developing and diversifying the economy with a strong focus on the quality of development.'* (Paragraph 3.30).

Aberdeen Local Development Plan (ALDP) (2012)

17.3.27 The ALDP was adopted by ACC on 5th April 2012. The ALDP sets out the overarching vision statement, spatial strategy and planning policies for Aberdeen. The vision is for Aberdeen in 2030 to be '…*a sustainable city at the heart of a vibrant and inclusive north east of Scotland'*. This supports the aims of the ACSSDP.

17.3.28 The ALDP promotes the delivery of supporting infrastructure in mitigating the impact of development and helping to '…*create balanced, accessible and sustainable communities'* (paragraph 3.2). The plan recognises that good transport connections contribute a fundamental factor to the economic prosperity of Aberdeen and the quality of life of people living and working in the City.

Local and Regional Transport Policies, Strategies and Other Policies

17.3.29 There are a number of proposals relating to transportation included in various other regional and local policy frameworks, as described in Table 17.7.

Table 17.7: Transport Policies and Strategies

Document	Title	Published
Regional Strategy	Nestrans Regional Transport Strategy Refresh	Approved January 2014
Local Strategy	Aberdeen Local Transport Strategy 2008-2012	Adopted March 2008
Strategic Infrastructure Plan	Aberdeen City Council Strategic Infrastructure Plan	Adopted October 2013

Nestrans Regional Transport Strategy Refresh (2014)

17.3.30 North East Scotland Transport Partnership (Nestrans) has responsibility for the development and delivery of the regional transport strategy for the Aberdeen City and Aberdeenshire region. The Regional Transport Strategy (RTS) is a statutory document that sets out a framework for taking forward transport policy and infrastructure within Aberdeen and Aberdeenshire and was originally approved by Scottish Ministers in 2008. Since then, the RTS has been updated to take into account changes to policy and economic context. The RTS Refresh, approved by Scottish Ministers in January 2014, outlines the current objectives and programme of action to enhance transport in the city region.

17.3.31 The upgrading of the A90/A96 Haudagain junction is a key priority for action by Nestrans. The junction is identified as a part of the network that requires improvements under its 'internal connections strategy'.

The Aberdeen Local Transport Strategy (LTS) (2008)

17.3.32 The LTS (adopted March 2008) sets out local transportation policy and proposals for Aberdeen. It presents ACC's vision for transport in the City and sets out a comprehensive list of actions and policies for transport. The LTS includes aims to ensure the provision of an integrated and accessible transport system, minimise the environmental impact of transport and to ensure transport policies integrate with and support sustainable development, health and social inclusion. Policy SUP TR3 states that ACC will continue to press the Scottish Government to deliver improvements to the strategic trunk road network including resolving congestion issues at the A90/A96 Haudagain Roundabout.

Aberdeen City Council Strategic Infrastructure Plan (SIP) (2013)

17.3.33 The SIP focuses on the key strategic priorities for the Council and supports the aims and objectives of the Local Development Plan. It identifies *'…key planned projects to deliver the infrastructure to enable growth…'* and *'…identifies the main areas where there are deficiencies in relation to the city's needs and the actions to be taken to address the gaps in both the shorter and longer term'*(SIP, 2013. Page 9).

17.3.34 The SIP highlights that the north of Aberdeen currently suffers from serious congestion problems and indicates that the situation will become worse as future development identified in the Structure Plan (now superseded by the ACSSDP) and ALDP is implemented. Infrastruture projects such as the AWPR, Third Don Crossing and the proposed scheme will help alleviate this congestion. The SIP also recognises the regeneration oppourtunities that will created for the Logie area of Middlefield as a result of the work around the Haudagain Junction improvements.

17.4 Assessment of Compliance

17.4.1 This section summarises the assessment of compliance of the proposed scheme with the relevant national, regional and local policies, plans and strategies described in Section 17.3. Key development plan policies that are relevant to the proposed scheme are described in Appendix A17.2 (Assessment of Development Plan Policy Compliance) with a summary of the assessment of the proposed scheme against each policy.

Principle of Development

National Policy

17.4.2 The proposed scheme is supported in principle through national, regional and local strategies and policy documents. It will contribute to meeting overarching transportation and sustainable economic growth objectives in national planning and transportation strategies including the NPF3 and NTS. As described in paragraph 17.3.4 above NPF3 states that the road network has an essential role to play in connecting cities by car, public transport and active travel, and states that the Scottish Government's Infrastructure Investment Plan (IIP) includes measures to improve the safety, capacity and performance of the strategic inter-city road network. The IIP identifies the plans for infrastructure investment up to 2030. The phased improvement of the existing A96 up to 2030 is a key commitment of Scottish Ministers, and includes a commitment to the implementation of the proposed scheme after completion of AWPR.

17.4.3 The phased development of the A96, including the proposed scheme, is part of a strategic transport network for Scotland which will help enable sustainable economic growth. To achieve sustainable economic growth the IIP identifies that the transport network must be available for workers and employers to access those areas where employment can grow, provide efficient access to markets and ensure inward investment opportunities are captured.

17.4.4 Promoting economic development is a fundamental element of national policy. SPP indicates that sustainable economic growth can create a supportive business environment, achieve a low carbon economy and maintain a high-quality environment. In achieving this, policies and decisions should be guided by specific principles including supporting the delivery of infrastructure (Scottish Government, 2014).

17.4.5 The proposed scheme objectives as described in Chapter 1 (Introduction) support the strategic outcomes of the NTS (paragraph 17.3.16 refers), as described below:

- The proposed scheme objectives of reducing congestion and minimising the risk of transport related accidents at this part of the strategic trunk road network support the strategic outcome to improve journey times and connections, and reduce the impacts of congestion, lack of integration and transport connections on wider objectives for economic growth, social inclusion, integration and safety.
- The proposed scheme objectives to make socially-inclusive and healthy transport modes more attractive to use, and of minimising traffic induced community severance supports the strategic outcome of reducing emissions and tackling issues of climate change, air quality and health improvement.

Regional Policy

17.4.6 The proposed scheme complies with strategic planning and transportation objectives. A key objective of the ACSSDP is to promote transport linkages, infrastructure improvements and network improvements. The Nestrans RTS Refresh echoes this objective, seeking to deliver an efficient transport network which helps to deliver prosperity and connects communities across the region and beyond.

17.4.7 Improvements to the Haudagain Roundabout are highlighted as a key priority under ACSSDP Schedule 2. Haudagain Roundabout is identified as a fundamental infrastructure improvement to deal with congestion and allow growth over the next 20 to 25 years in and to the north of the city.

17.4.8 The proposed scheme would assist in supporting these objectives by relieving congestion and improving the efficiency of the local transport network.

Local Policy and Site Allocation

17.4.9 The general location of the proposed scheme, and the wider Middlefield area, is designated residential under ALDP Policy H1 (Land Allocated for Residential Development) however, Policy T1 (Land for Transport) safeguards some of the land in this area for the Haudagain Roundabout improvement.

17.4.10 This allocation under Policy T1 emerged as a consequence of the STAG appraisal (SIAS Limited, 2008) previously undertaken to consider road improvements in the area, which identified a preferred route similar to the proposed scheme. Following road improvements to the roundabout, as shown under Policy T1, ACC has identified that land will become vacant and surplus as a result. To the south-west of the existing roundabout, 4.34 ha of land referred to as 'Haudagain Triangle, Middlefield', has been identified in the LDP as an Opportunity Site (OP19) for a retail park and urban green space. Manor Walk, Middlefield has also been identified as an Opportunity Site (OP21) for replacement housing following the junction improvements. These opportunity sites and the land safeguarded for transport land are shown in Figure 7.4.

17.4.11 The proposed scheme is supported by policy T1, however it is noted that since the preparation of the ALDP, the design of the proposed scheme has been further developed and not all of the proposed scheme layout is shown on the ALDP Proposals Map under policy T1 but is covered by residential policy H1. Policy H1 aims to ensure that any non-residential development within an existing residential area should cause no conflict with, or any nuisance to, the existing amenity. In this respect the proposed scheme would not fully comply with the policy as significant impacts on landscape and noise are predicted for individual properties in close proximity to the proposed scheme, which would have an effect on their amenity.

17.4.12 However, as previously noted (17.4.7), the proposed scheme is identified as a strategic improvement at this location. The development of the design and assessment of impacts has, where possible, sought to protect residential amenity; notably from noise, landscape and effects on all travellers. An extensive suite of mitigation measures (see Chapter 19: Schedule of Environmental Commitments) is proposed. It is also relevant to note that existing pressure on the Haudagain Roundabout has led to increased numbers of vehicles diverting onto adjacent residential streets. In addition to addressing congestion at the existing roundabout the proposed scheme will enable the reduction of traffic volumes on existing residential streets, with consequent benefits to amenity.

17.4.13 The implementation of the proposed scheme will enable the progression of regeneration proposals for the Middlefield area, noted under Opportunity Sites OP19 (Haudagain Triangle, Middlefield – retail and green space proposal) and OP21 (Manor Walk, Middlefield – housing replacement following the proposed scheme).

17.4.14 Transport and infrastructure are considered key in ensuring the delivery of new development in the city, and it is noted that the Aberdeen Local Development Action Programme (2014) determines the Haudagain Roundabout Improvements to be of 'City Wide Significance'.

17.4.15 Such city wide benefits, as stated in Paragraph 2.24 of the ALDP, include significant land allocations that have been made to the area north of the River Don in the Bridge of Don / Grandhome area. The ALDP has allocated sites for more than 7,000 homes in this area and 32ha of employment land and identified the proposed road schemes which will provide benefits to this area including the AWPR, the Third Don Crossing and Haudagain roundabout improvement.

17.4.16 Chapter 7 (Community and Private Assets) reports that the proposed scheme will also positively give rise to potential temporary economic benefits as a result of construction employment and indirectly through additional spend at local businesses.

Design and Layout

17.4.17 An assessment of the compliance of the design and layout of the proposed scheme in relation to plans and policies has been undertaken with reference to the assessment of environmental impacts which is reported in this ES. Further information on the assessment of compliance of the proposed scheme in relation to specific development plan policies is provided in Appendix A17.2 (Assessment of Development Plan Policy Compliance). A summary of the outcome of the compliance assessment in relation to each environmental topic is provided below.

Community and Private Assets

17.4.18 Relevant policies and advice on community and private assets include the provisions of SPP, Sustainable Mixed Communities objectives and targets in the ACSSDP, and ALDP policies H1 (Residential Areas), T1 (Land for Transport), NE1 (Green Space Network), NE2 (Green Belt) and NE3 (Urban Green Space).

17.4.19 The proposed scheme would require land-take including residential properties and impacts on remaining adjacent residential properties are predicted. An assessment under policy H1 is provided in paragraphs 17.4.11 and 17.4.12 above. The proposed scheme will enable the progression of regeneration proposals, as stated in the ALDP (see paragraph 17.4.13 above).

17.4.20 ALDP Policy NE2 (Green Belt) seeks to control the spread of built development around Aberdeen and presumes against development in the green belt except for essential purposes (e.g. agricultural uses). An exception to this policy includes transport proposals identified in the ALDP, such as the Haudagain Roundabout improvements. As can be seen in Figure 7.3, ACC's Green Belt designations will not be impacted by the proposed scheme therefore it will not conflict with Policy NE2.

17.4.21 The 500m study area shown in Figure 7.3 does include an area of Urban Green Space which is covered by Policy NE3 (Urban Green Space). This policy seeks to retain urban green space for recreational activities such as parks, playing fields, sports pitches and allotments. The proposed scheme will not have an impact on this designation.

17.4.22 In terms of open space provision, Policy NE4 (Open Space Provision in New Development), accompanied by Supplementary Guidance on Open Space states that ACC will require the provision of at least 2.8 hectares of meaningful and useful public open space per 1,000 people in new residential developments. This policy is not applicable to the proposed scheme, as the proposal does not include the provision of new residential development.

17.4.23 Therefore, the assessment in Chapter 7 (Community and Private Assets) demonstrates that the proposed scheme will not result in any loss or detrimental impact on the character or integrity of the Green Belt or designated urban/open space and complies with the development plan in this respect.

Geology, Soils, Contaminated Land and Groundwater

17.4.24 Relevant policies and advice on geology, soils, contaminated land and groundwater include the provisions of SPP, PAN 33 (Development of Contaminated Land), Quality of the Environment objectives and targets in the ACSSDP, and ALDP policies R2 (Degraded and Contaminated Land) and NE8 (Natural Heritage).

17.4.25 A key policy objective from national to local level is to ensure the quality of the environment. The ACSSDP includes an objective to safeguard geodiversity, landscapes, and allow development where it does not adversely impact upon and preferably enhances these assets. The ALDP

ensures through Policy NE8 that developments will only be permitted if they can demonstrate that a mitigation strategy has been incorporated to minimise impacts from development. A detailed assessment has been undertaken in Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) and appropriate mitigation measures proposed.

17.4.26 Within the study area no Regionally Important Geological Sites (RIGS) or geological SSSIs have been identified within the 300m study area for the proposed scheme.

17.4.27 Chapter 8 (Geology, Soils, Contaminated Land and Groundwater) identifies twenty six potential sources of contamination within the study area, however ground investigation studies undertaken in 2014-2015 indicate that no levels of contamination of concern to human health are present in the study area, and appropriate mitigation measures have been outlined. The assessment concludes that after mitigation, the residual effects on contaminated land are expected to be of Low significance during the construction phase and Very Low significance during the operation phase. It is therefore considered that the proposed scheme is compliant with PAN 33: Development of Contaminated Land.

17.4.28 If, during the detailed design stage areas of contamination are confirmed, a full risk assessment will be undertaken and mitigation required will be specified on a site specific basis. Mitigation measures may include removal of contaminated soils from site, consolidation for treatment ex-situ and/or treatment in situ.

Road Drainage and the Water Environment

17.4.29 Relevant policies and advice on road drainage and the water environment include the provisions of SPP, PAN 61 (Planning and Sustainable Urban Drainage System), PAN 69 (Planning and Building Standards Advice on Flooding), PAN 79 (Water and Drainage). Sustainable Development and Climate Change objectives and targets in the ACSSDP, and ALDP policies NE6 (Flooding and Drainage) and NE8 (Natural Heritage) are relevant.

17.4.30 Chapter 9 (Road Drainage and Water Environment) identifies that there are three watercourses in the study area; the River Don and two of its small tributaries, Scatter Burn and Woodside Burn, which are extensively culverted within the heavily urbanised catchment. The River Don and its tributaries are classified as salmonid waters and classified as a sensitive area under the EU Urban Wastewater Treatment Directive (91/271/EEC).

17.4.31 Development that will result in the increased risk of flooding will not comply with SPP, the objectives of the ACSSDP or ALDP Policy NE6 (Flooding and Drainage). Additionally, policy NE6 also states that all new development will be required to employ SUDS measures. Objectives and policies relating to protection of the natural environment including ALDP policy NE8 are also relevant to this topic in relation to maintaining water quality.

17.4.32 Chapter 9 (Road Drainage and the Water Environment) reports that the site of the proposed scheme is categorised in accordance with the SPP Risk Framework to be at 'Little or No Risk' of fluvial flooding, i.e. the development site lies out with the predicted 0.1% AEP (1 in 1000 year) fluvial flood extent of the River Don and no flood risk is shown to be associated with the two minor watercourses. Therefore it is considered to comply with the flood prevention measures set out in policy NE6.

17.4.33 It is assessed that all residual impacts on flooding and water quality during both the construction and operational phases would be of Neutral significance, due to the adoption and implementation of appropriate mitigation measures, as stated in section 9.5 of ES Chapter 9. Mitigation for the operational phase has been incorporated into the Stage 3 design, and includes SUDS features such as a detention basin to manage surface water runoff and minimise pollution.

17.4.34 Furthermore to mitigation measures set out in Chapter 9, there has been significant environmental input to the design process to help inform the most sustainable design and drainage solution. SEPA has also been consulted at various stages to review the proposals and agree aspects such

as the number of treatment levels required. Therefore the proposed scheme is considered compliant with policies and advice relating to water quality protection, flood risk, and sustainable drainage design.

Ecology and Nature Conservation

17.4.35 Relevant policies and advice on ecology and nature conservation include the provisions of SPP, PAN 60 (Planning for Natural Heritage), Quality of the Environment objectives and targets in the ACSSDP, and ALDP policies NE1 (Green Space Network), NE5 (Trees and Woodlands) and NE8 (Natural Heritage).

17.4.36 No statutory designated sites of national significance are present within the study area. The nearest site is the Scotstown Moor Site of Special Scientific Interest (SSSI) which is located approximately 3 km away from the Haudagain Roundabout and is designated for wetland habitat (springs including flushes) (see Figure 10.1).

17.4.37 The assessment in Chapter 10 (Ecology and Nature Conservation) concludes that, after mitigation, there will be no implications on the integrity or conservation objectives for the qualifying species of the remaining designated sites thereby aligning with the good practice measures set out in PAN 60.

17.4.38 The ACSSDP aims to ensure there is a focus on maintaining and improving the biodiversity and wildlife habitats when planning for new developments. Throughout the assessment process, consultation with Scottish Natural Heritage (SNH) has been undertaken. As is explained in Chapter 10, Mitigation Item E4 will ensure that constrained working corridors, through the use of barriers, will minimise the damage to habitats located within and adjacent to working corridors. As such, the proposed scheme complies with ACSSDP policy in this respect..

17.4.39 ALDP Policies NE8 (Natural Heritage) and NE5 (Trees and Woodlands) require all development proposals to consider environmental impacts and introduce adequate mitigation measures to address adverse effects on protected species or an area designated because of its natural heritage value.

17.4.40 The proposed scheme will result in the loss of approximately 0.8ha of amenity grassland (see Table 10.13) which has the potential to have a negative impact on ecological receptors in terms of pollution, alteration of commuting routes and loss of /disturbance to habitats. The assessment concludes that the potential impacts are of negligible significance and are anticipated to be fully mitigated by the implementation of mitigation measures, including adherence to environmental and species management plans, replanting, and the application of best practice and appropriate construction guidelines.

17.4.41 Habitat loss associated with the proposed scheme is not predicted to be significant and will only be associated with the footprint of the road itself. Following the successful implementation of the proposed mitigation measures, there will be no significant residual impacts on the remaining receptors identified. Accordingly, the proposed scheme complies with Policy NE8.

17.4.42 With regard to Policy NE5, there would be no loss of woodland due to the proposed scheme, however some scattered mature trees would require to be removed. In order to minimise adverse impacts on existing trees implementation of the mitigation measures, as set out in Chapter 10 (Ecology and Nature Conservation) and Chapter 11 (Landscape and Visual), including the rentention and integration of existing trees and shrubs and supplementing with new planting (Mitigation item LV3) and the replacement of trees lost to the construction of the proposed scheme (Mitigation item LV4) is proposed. Therefore whilst there is the potential for non-compliance with this policy, the design of the proposed scheme and proposed mitigation accords with the objectives of ACC with regards to protection and improvement of trees. None of the trees are designated for their nature conservation or local amenity value (i.e. through Tree Preservation Order status).

Landscape and Visual

17.4.43 Relevant policies and advice on landscape and visual include the provisions of SPP, PAN 60 (Planning for Natural Heritage), Quality of the Environment objectives and targets in the ACSSDP, and ALDP policies H1 (Residential Areas), NE1 (Green Space Network), NE5 (Trees and Woodlands) and D6 (Landscape). Policy NE5 is assessed in paragraph 17.4.42.

17.4.44 ALDP Policy D6 (Landscape) is a key policy relevant to Chapter 11 (Landscape and Visual) and focuses on safeguarding views, viewpoints and landmarks from development that would detract from their visual integrity, identity or scenic quality. It states that any landscape design scheme will be expected to conform to Supplementary Guidance: Landscape Strategy Part 2 – Landscape Guidelines. The policy sets out four criteria, which are commented on below.

17.4.45 The first criterion seeks to ensure that the elements and character of an area are preserved in order to retain a 'sense of place'. Chapter 11 (Landscape and Visual) considers the impacts on the character of the urban landscape, physical features and the views experienced by people from buildings and areas of outdoor recreational space. It is acknowledged in this chapter that works and a new road alignment would significantly alter the predominantly residential townscape and result in loss of communal space and the fragmentation of the urban structure which would adversely affect the townscape character.

17.4.46 As stated in Chapter 11, the proposed planting would limit the landscape effects and assist in integrating into the surrounding townscape character. New planting is proposed to enhance a strong sense of place, acknowledging the fact that the existing sense of place and overall urban character and structure of the townscape would have substantial impacts from the new development. It should also be acknowledged that the proposed scheme will enable the subsequent development of Haudagain Triangle (OP19) and Manor Walk (OP21) which have been identified in the ALDP as Opportunity Sites and part of the Spatial Strategy as set out in paragraph 2.2 of the ALDP. Thereby the proposed scheme will contribute towards the creation of a regenerated 'sense of place' in broader compliance with Policy D6.

17.4.47 The proposed scheme does not conflict with the second criterion as it will not impact on the views of the City's townscape from busy and important publicly accessible vantage points. As can be seen in figure 11.4, the proposed scheme design integrates NMU path and cycleways into the scheme while the overall layout and design (prepared in cognisance of Criteria 3 and Section 7 of Landscape Strategy Part 2) has been landscaped with both soft and hard landscaping which enables greater definition of areas for open space, pedestrian movement and areas for wildlife.

17.4.48 The third criterion seeks to avoid disturbance to and loss of important recreational, wildlife or woodland resources and their linkages. The proposed scheme will not require direct landtake from such resources (although it is identified in Chapter 7: Community and Private Assets that some local residential amenity open space will be required). Figure 11.4 displays clearly defined proposed spatial distribution of trees, shrubs, hedges, other plants and grass seeded areas (Mitigation Items LV6). As noted above (17.4.42), the mitigation strategy adopted by the proposed scheme is to replace trees lost during construction and embed newly planted trees with existing planting.

17.4.49 The fourth criterion seeks to avoid development sprawling onto important or necessary green spaces which separate places and communities or which can provide opportunities for countryside recreation. It can be noted from Chapter 7 (Communities and Private Assets) that no important Urban Green Space or Green Belt land is required for the proposed scheme, although it is identified that some local residential amenity open space will be affected. In addition, the use of hedgerow planting and earth bunds / mounding will act as mitigating buffers which will avoid sprawl between communities and places. Furthermore the proposed scheme accommodates levels of open space around the areas identified for residential developments to the standards set in Section 11 of the Supplementary Landscape Strategy.

17.4.50 In regards to the loss of Green Space and trees, particularly in respect of receptor 01 (the park at Manor Terrace), Policy NE1 (Green Space Network) states that, '*where major infrastructure projects or other developments necessitate crossing the Green Space Network, such developments shall take into account the coherence of the network*'. Chapter 11 complies with this through the replacement of trees, ornamental planting and species rich grassland on earthworks that would help integrate into the surrounding landscape. The introduction of new pedestrian footways would reconnect Manor Park and enhance the character of the area with impacts reduced to Moderate by summer after 15 years.

17.4.51 The assessment in Chapter 11 (Landscape and Visual) concludes that significant impacts associated with the proposed scheme can be mitigated to ensure that, by summer 15 years after opening, significant residual impacts would be reduced and would affect 14 built receptors and 3 outdoor receptors. There is therefore the potential for significant residual environmental effects, however the proposed scheme is broadly in compliance with policies relevant to protection of important landscape assets. The overall landscaping strategy for the proposed scheme has been produced in congnisance of the guidelines set out in ALDP Supplementary Guidance:Landscape Strategy Part 2. In addition to this, specific Urban Design Objectives have been developed in consultation with ACC to focus the preparation of the design proposals, help meet the overall scheme objectives and mitigate the environmental impacts of the scheme (detailed in Appendix 11.3). Implementation of mitigation measures including replacement planting will reduce impacts over the longer term and assist in integrating the proposed scheme with the surrounding townscape.

Cultural Heritage

17.4.52 The provisions of SPP PAN 2/2011: Planning and Archaeology (Scottish Government, 2011), the SHEP (Historic Scotland, 2011) and Managing Change in the Historic Environment: Setting (Historic Scotland, 2010), the ACSSDP and ALDP policies D4 and D5 are relevant to the assessment of cultural heritage impacts.

17.4.53 The ACSSDP seeks to emphasise the importance and value of the conservation, enhancement and promotion of the local area's built heritage. The ACSSDP's 'Quality of the Environment' chapter advocates preserving the regional distinctiveness of the area through safeguarding townscapes, archaeology, historic buildings and monuments which are part of the region's character and identity. ALDP policy D5 refers to the provisions of SPP in assessing proposals affecting listed buildings and conservation areas, and supplementary guidance on archaeological resources. ALDP policy 4 encourages the retention of granite buildings.

17.4.54 The assessment reported in Chapter 12 (Cultural Heritage) identifies twenty-two archaeological remains, eleven historic buildings and nine historic landscape types within the study area and concludes that after mitigation the proposed scheme will not adversely impact the setting of any cultural heritage assets. As a result of the proposed scheme all potential residual impacts during both construction and operation have been assessed as being of Slight or Neutral significance.

17.4.55 The proposed scheme is not within a conservation area and no listed buildings would be affected as a result of the works. It is concluded in Chapter 12 (Cultural Heritage) that construction of the proposed scheme would not significantly impact the historic legibility of the landscape type.

17.4.56 No Scheduled Monuments are located within the assessment area. If unidentified remains are discovered, site investigation and excavation would be carried out if necessary.

17.4.57 Overall the proposed scheme would comply with the provisions of Policy D5 (Built Heritage) and related national policy and guidance. Policy D4 on the protection of Aberdeen's Granite Heritage is not relevant as no granite properties would be affected by the proposed scheme.

Air Quality

17.4.58 Relevant policies and advice on air quality include the provisions of SPP, PAN 51 (Planning, Environmental Protection and Regulation) and ALDP policy NE10 (Air Quality).

17.4.59 ALDP Policy NE10 (Air Quality) states that developments that have the potential to have a detrimental impact on air quality will not be permitted unless measures to mitigate the impact of air pollutants are proposed. The accompanying Air Quality Supplementary Guidance provides guidance to how the policy can be implemented, including through air quality assessments. The policy states that where national objectives and European limits of these pollutants have been exceeded the local authority is required to designate as an AQMA of which Anderson Drive (incorporating the whole of Anderson Drive and the area around the Haudagain Roundabout) is one of three within Aberdeen City.

17.4.60 Chapter 13 (Air Quality) finds that the proposed scheme would result in the temporary rise of fugitive dust emissions during the construction phase. In order to minimise any potential emissions of fugitive dust during the construction phase, the Construction Environmental Management Plan (CEMP) will adopt comprehensive measures to control fugitive dust. Upon mitigation, implemented through the CEMP it is predicted that no residual impacts will occur through dust nuisance.

17.4.61 The assessment has also predicted an exceedance of annual mean NO2 concentrations in the opening year however the exceedance is then removed with the proposed scheme in place resulting in an improvement in local air quality. This is considered to be a significant 'beneficial' impact and in line with ACC's Air Quality Action Plan (AQAP). During the operation of the proposed route no significant impacts are predicted and therefore it should be considered to accord with current policy.

Noise and Vibration

17.4.62 Relevant policies and advice on noise and vibration include the provisions of SPP, PAN 1/2011 (Planning and Noise), Quality of the Environment objectives and targets in the ACSSDP, and ALDP policy H1 (Residential Areas).

17.4.63 For the assessment of construction impacts, consideration has been given to the likely worst-case phases of the works. The assessment concluded that construction of the proposed scheme is predicted to cause temporary adverse noise and vibration impacts for a number of properties. The potential impacts have been subject to a detailed assessment, as described in Chapter 14 (Noise and Vibration), using the construction information available at the time. The construction assessment concludes that mitigation measures will need to be considered in order to minimise noise and vibration impacts on the affected properties, which may include temporary rehousing of residents in nearby properties.

17.4.64 The assessment in Chapter 14 (Noise and Vibration) concluded that with the proposed scheme in place there would be a total of 553 dwellings experiencing perceptible adverse noise impacts and 424 dwellings experiencing perceptible beneficial noise impacts, additionally two other sensitive receptors are expected to experience perceptible adverse noise impacts, whilst none are predicted to experience perceptible beneficial noise impacts.

17.4.65 In terms of long-term daytime and night-time impacts the vast majority of impacts fall within the no change or Negligible change impact categories. This was considered to be predominantly as a result of natural traffic growth on all roads over the 15 year period between the opening and design years considered. This would again result in some properties experiencing perceptible adverse noise impacts as a result of the scheme (including within the Moderate and/or Major adverse impact categories).

17.4.66 There are no specific policies within the ALDP that relate to noise impacts; however, impact on amenity is emphasised throughout the document. The assessment in Chapter 14 (Noise and Vibration) determined that, with implementation of appropriate mitigation measures, the effect of

temporary adverse construction impacts would be reduced. However, given the number of sensitive receptors in the area, there would still be the potential for significant adverse construction noise and vibration impacts for those sensitive receptors in closest proximity to the proposed route. The construction Contractor will undertake a detailed assessment prior to construction.

17.4.67 It is noted in Chapter 14, that there is anticipated to be a substantial growth in traffic on the local road network by 2033 and consequent congestion. It should therefore be recognised that the proposed scheme will provide relief to this anticipated congestion, making the A96 and A90 more desirable and consequently more heavily trafficked (resulting in increased noise levels), meanwhile reducing traffic flows (and noise levels) along the smaller roads off the A96 and A90. In this respect it should be considered that the proposed scheme supports the principles of the ALDP in regards to the minimisation of impact on amenity.

Effects on All Travellers

17.4.68 Relevant policies and advice on the effects on all travellers include the provisions of SPP, PAN 75 (Planning for Transport), PAN 75 (Inclusive Design), Accessibility objectives and targets in the ACSSDP, and ALDP policies D3 (Sustainable and Active Travel) and NE9 (Access and Informal Recreation).

17.4.69 ALDP Policy T1 states that transport infrastructure will be required to make provision for improved walking and cycling facilities. Chapter 15 (Effects on All travellers) states that the proposed scheme will benefit all Non-Motorised Users with the provision of additional footways and cycleways. These will maintain existing access and also provide safer access across the proposed scheme.

17.4.70 ALDP Policies D3 (Sustainable and Active Travel) and NE9 (Access and Informal Recreation) seek to encourage the improvement and preservation of the cycling and walking path networks within Aberdeen. Proposals that would have an adverse impact on these routes and could not be adequately mitigated will not be permitted by ACC. The proposed scheme will create improved access for pedestrians and cyclists through the creation of additional walkways and cycleways and therefore the proposed scheme accords with this policy. Following the implementation of suitable mitigation, there are no significant adverse impacts expected and as such, the proposed scheme accords with policy in this respect. There will also be Slight (beneficial) noise and air quality impacts predicted for a number of NMUs using paths in the immediate vicinity of the proposed scheme.

Materials

17.4.71 The assessment in Chapter 16 (Materials) concluded that the potential for impacts on material resources is considered to be of Slight significance. The assessment highlighted that the construction of the proposed scheme is expected to give rise to small-scale impacts only, however there would be a risk of a slight depletion of natural resources through the extraction of primary aggregates (sands and gravels).

17.4.72 As noted in Chapter 16 (Materials), a Site Waste Management Plan (SWMP) will be developed and regularly updated during construction of the proposed scheme. Supplementary Guidance on Waste Management produced by ACC states that a SWMP will help identify how much waste will be produced, how this can be minimised and what might be done with the waste. The SWMP will identify the types and likely quantities of wastes that may be generated and how these wastes will be reduced, re-used, managed and disposed of. Where materials cannot be used on the proposed scheme, opportunities will be sought to re-use materials on other local projects such as, if appropriate, the Middlefield Regeneration Project as part of ACC's strategic commitment to waste management.

17.5 Summary of Policy Assessment

17.5.1 The proposed scheme has been assessed against national, strategic and local planning policy and strategy documents considered material to the proposed scheme. The assessment has identified areas of policy conflict or compliance with detailed summarised commentary on each provided in Appendix A17.2 (Planning Policy Context for Environmental Assessment).

17.5.2 The proposed scheme is a ministerial commitment to improve connectivity to the local and regional area which will promote opportunities for regeneration and growth and in principle is compliant with policies from national to local level.

17.5.3 It is recognised that some residual significant adverse effects, particularly in terms of landscape and noise impacts, will occur during construction and scheme opening. These have the potential for non-compliance with specific policies however as set out in Chapter 19 (Schedule of Environmental Commitments), extensive mitigation measures have been proposed to ensure the long term impacts will be significantly reduced. In addition, the potential non-compliance should also be balanced against the overaching environmental benefits which will occur as a result of the proposed scheme, such as reducing congestion, enhancing localised quality of openspace, promoting socially-inclusive and healthly transport measures; and complimenting and enabling ACC's aspirational regeneration aims of the Logie/Manor area of Middlefield.

17.6 References

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18 Cumulative Impacts

This chapter presents an assessment of the potential for cumulative impacts of the proposed scheme, and those of the proposed scheme in combination with other major proposed developments.

Potential for cumulative impacts due to the combined effect of a number of different environmental impacts of the proposed scheme on a single receptor/resource was assessed, based on the findings of the topic chapters in this Environmental Statement (ES). Cumulative construction and operation impacts on several residential receptors, in close proximity to the proposed scheme, have been identified as a result of combined significant noise and visual impacts. In addition to cumulative noise and visual impacts, some receptors would also experience significant land-take or severance of vehicular access.

No cumulative construction impacts as a result of the proposed scheme combined with any other developments are expected. This is either due to the timing and/or location/ nature of the developments identified. The combination of the proposed scheme and the Aberdeen Western Peripheral Route (AWPR) road scheme would be beneficial to traffic flows in the Haudagain area overall. The Third Don Crossing road scheme would also contribute beneficially overall to the proposed scheme through provision of re-routing away from the existing Haudagain Roundabout.

18.1 Introduction

18.1.1 The European Commission (EC) guidelines (European Commission, 1999) define 'cumulative impacts' as follows:

> *'Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project'.*

18.1.2 DMRB HA218/08 provides guidance on cumulative impact assessment (Highways Agency et al., 2008a) and expands on the above definition, advising that a cumulative impact may arise as the result of:

- the combined impact of a number of different environmental topic-specific impacts from the proposed scheme on a single receptor/resource; and
- the combined impact of a number of different projects within the vicinity (in combination with the proposed scheme) on a single receptor/resource.

18.1.3 This chapter therefore includes consideration of both the impacts of the proposed scheme on receptors, and the impacts of other 'reasonably foreseeable' projects in line with the EC guidelines.

18.1.4 The assessments as reported in Chapters 7-17 of this ES have, for certain topic areas, already taken into account the potential for cumulative impacts as part of a 'worst-case scenario'.

18.2 Approach and Methods

General Approach

18.2.1 This chapter considers two categories of scenario to identify potential for significant cumulative impacts, based on the DMRB HA218/08 guidance cited in paragraph 18.1.2 above.

18.2.2 In accordance with DMRB HA205/08 (Highways Agency et al., 2008b) 'reasonably foreseeable', in the above definition has been interpreted to include other 'committed' projects, including:

- confirmed trunk road and motorway projects (i.e. gone through the statutory processes); and
- development projects with valid planning permissions as granted by Aberdeen City Council (ACC), and for which formal EIA is a requirement or for which non-statutory EIA has been undertaken.

18.2.3 A review of other major developments beyond those that are committed was also undertaken, to ascertain whether any should also be included in the assessment by virtue of their scale, location, or timing.

Identification of Cumulative Impacts

Combined Impacts of the Proposed Scheme

18.2.4 To consider the potential for a combined impact of different environmental topic-specific impacts on a single receptor/resource (i.e. Bullet Point 1 of paragraph 18.1.2), a review of the topic-area environmental assessments was undertaken as part of the EIA process.

18.2.5 The cumulative impact assessment has paid particular attention to the impacts summarised in Chapter 20 (Residual Impacts), which are those that are expected to remain as significant in the context of the EIA Regulations after application of any proposed mitigation, as these generally have the greatest potential to contribute to a significant cumulative impact. However, it is acknowledged that there is the potential that multiple non-significant impacts in combination could result in a significant cumulative impact, and therefore all residual impacts were reviewed including non-significant residual impacts reported in the individual assessments of this ES.

18.2.6 Residual impacts were considered on a locational and/or receptor basis, for example; the potential for a cumulative impact on a residential receptor to occur due to both traffic noise and land-take, or a cumulative impact on a watercourse affected at various sections and/or by changes to both ecological and hydrological conditions.

Combined Impacts of the Proposed Scheme and Other Developments

18.2.7 To consider the combined impact of a number of different projects on a single receptor/resource in combination with the proposed scheme, allocated development land and identified planning applications or permissions listed in Chapter 7 (Community and Private Assets) were reviewed. There is often little information available regarding these developments or likely timing, so professional judgement was used where necessary to qualitatively ascertain likelihood of significant environmental impacts on receptors that may also be affected by the proposed scheme.

18.2.8 Chapter 7 (Community and Private Assets) considered submitted planning applications and committed development including confirmed land use allocations in the adopted Aberdeen Local Development Plan (ALDP) (2012), where they occurred within the 500m study area for that assessment. This includes development land allocations (Opportunity Sites) associated with ACC's overarching regeneration plans for the Logie/Manor area of Middlefield: OP19 (Haudagain Triangle, Middlefield); OP21 (Manor Walk, Middlefield); and T1 (Land for Transport). This cumulative impact assessment also reviewed a number of additional large-scale developments beyond this study area to identify any that should be added to the assessment:

- **Aberdeen Western Peripheral Route (AWPR):** The AWPR is a major transport infrastructure project which will significantly improve travel in and around Aberdeen and the North East of Scotland. The high-speed dual carriageway will create an alternative route from north to south Aberdeen, bypassing the city. The project, which began pre-start works and surveys in August 2014, is a strategic priority for the Scottish Government and is being developed by Transport Scotland in partnership with Aberdeen City and Aberdeenshire Councils. The planned completion date of the AWPR is late 2017, preceding the construction of the proposed scheme. The AWPR will be located approximately 3km to the west of the proposed scheme at its closest point.
- **A96 Dualling – Inverness to Aberdeen:** The A96 trunk road links the cities of Inverness and Aberdeen, running from Raigmore Interchange (Inverness) to the existing Haudagain Roundabout. The dualling of the A96, led by Transport Scotland, would deliver a number of benefits including improved journey time and reliability, improved connectivity and reduce the rate and severity of accidents. The route option assessment work for the 30km between

Inverness and Nairn is currently underway, with a preferred option expected to be announced in Spring 2015. The Scottish Government has committed to the full dualling of the A96 by 2030.

- **Third Don Crossing:** The proposed crossing would link the Bridge of Don and Tillydrone, improving access in the north of Aberdeen. The route, which is approximately 2.5km long, passes through the Danestone, Grandholm and Tillydrone areas of Aberdeen, and is situated approximately 1.7km east of the proposed scheme. Construction of the Third Don Crossing is currently underway and is planned to open to the public in winter 2015.

Limitations to Assessment

18.2.9 The cumulative assessment has utilised available information on likely other developments, including identified schemes to be progressed to achieve a reduction in traffic congestion in the north-east of Scotland. However, this assessment has only been able to take into account information that is currently available, and the potential for cumulative impacts to occur due to subsequent schemes is therefore identified in this assessment but cannot be quantified.

18.3 Potential Cumulative Impacts

18.3.1 This section qualitatively discusses both the combined environmental impacts of the proposed scheme on single receptors/resources and the combined impacts of the proposed scheme with other developments. Potential cumulative impacts are discussed for the construction and operation phase of the proposed scheme.

Combined Impacts of the Proposed Scheme

Construction

18.3.2 No significant cumulative construction impacts have been identified for ecological receptors. Significant cumulative noise and visual impacts are anticipated for properties in close proximity to the proposed scheme during the construction phase. This includes properties along Manor Drive, Logie Terrace, Manor Avenue, Logie Place and Logie Avenue. No further significant potential cumulative impacts are anticipated during the construction phase.

Operation

18.3.3 Significant cumulative operational impacts are presented in Table 18.1 below. This excludes properties that would be demolished as a result of the proposed scheme. No significant cumulative operation impacts have been identified for ecological receptors.

Table 18.1: Significant Cumulative Impacts on Receptors during Operation

Significant Impact / **Receptors**	**Noise (Moderate and Major Adverse)** *All three scenarios: Do-Minimum (2018) against Do-Something (2018); Do-Minimum 2018 against Do-Something 2033; & Do-Minimum (2033) against Do-Something (2033)*	**Land-take (Moderate or above)** *Garden land-take excluding demolitions*	**Visual (Moderate or above)** *Winter Year of Opening and Summer after 15 years*
10, 16 – 18 and 26 – 32 (all even) Logie Avenue	X	X	X
1 Logie Gardens	X	X	X
21 – 25 (odd) Logie Avenue	X	X	X
8 – 18 (even) Manor Drive	X		X
14 - 16 (even) Logie Place	X		X
26 – 28 (even) Manor Avenue		X	X
20 – 24 (even) Logie Avenue		X	X
1 – 19 (odd) Manor Avenue		X	X

Combined Impacts of the Proposed Scheme and Other Developments

18.3.4 The development of ALDP land allocation OP19 (Haudagain Triangle, Middlefield), may lead to changes to the proposed scheme design and mitigation works. The extent of the proposed scheme to be constructed to access the Haudagain Triangle could be reduced as a result of new development within OP19. Additionally, the proposed mitigation relevant to existing usage of the Triangle could be removed and replaced by the developer for OP19 with mitigation measures appropriate to the re-development of this site.

18.3.5 Details regarding the proposals for OP19 have not been finalised and it is therefore not possible to determine any potential combined impacts of the proposed scheme with the development of OP19 at this stage.

Construction

18.3.6 Additional developments within the study area include four planning applications (Table 7.16 of Chapter 7: Community and Private Assets) and two other development land allocations as shown on Figure 7.3. Due to the type of development proposed and/or location, it is not considered that any of these are likely to result in significant cumulative construction impacts on receptors potentially affected by the proposed scheme. Development land in close proximity to the proposed scheme, which include allocations OP21 and H1[1], are expected to follow the completion of the proposed scheme and therefore cumulative construction impacts are not expected.

18.3.7 Additional larger scale developments including the AWPR, A96 Dualling and the Third Don Crossing were also considered in the assessment. The timescales and/or location of the three schemes, as noted in Section 18.2, are not anticipated to overlap with the proposed scheme. Accordingly, no cumulative construction impacts are expected as a result of the abovementioned road schemes.

Operation

18.3.8 The cumulative assessment utilises the 'Aberdeen Access From the North' (AAFN) paramics traffic model, which takes into account other committed projects, including the AWPR and the Third Don Crossing. The A96 Dualling was not included in the model as the scheme is at an early stage in the design development process, although may result in traffic flow changes. Review of the DMRB Stage 2 Scheme Assessment Report, Part 1: Engineering, Traffic and Economic Assessment, and the A90/A96 Haudagain Improvement STAG Report (SiAS Limited, 2008), was also undertaken to inform the anticipated cumulative traffic impacts. The expected in-combination traffic impacts as a result of the AWPR and the Third Don Crossing are discussed below:

- The operation of the AWPR is expected to initially contribute to the reduction in annual average daily traffic (AADT) at the existing Haudagain Roundabout, as a result of reductions in traffic flows on both A96(T) Auchmill Road and A90(T) North Anderson Drive. As natural traffic growth increases, influenced by economic growth and development in the area, the benefits of the AWPR at the existing Haudagain Roundabout would gradually lessen. The combination of the proposed scheme and the AWPR would however be beneficial to traffic flows in the Haudagain area overall, helping to relieve existing congestion, in comparison to not implementing either of the schemes.
- The Third Don Crossing is expected to be an integral part of the solution at Haudagain, due to the synergy of transport routeing over the River Don between the two proposals (SiAS Limited, 2008). Although the crossing does not have the potential to fully alleviate traffic congestion and traffic movements west of the existing Haudagain Roundabout, it would contribute beneficially overall to the proposed scheme.

[1] Development land allocation T1 (Land for Transport) is also in close proximity but as noted in Chapter 7 (Community and Private Assets) this land has been safeguarded for the Haudagain Roundabout improvements and follows the proposed scheme design very closely.

18.3.9 The aforementioned traffic data has informed the following aspects of EIA reported in this ES, and therefore any potential cumulative environmental impacts of these traffic changes are incorporated within these assessments, and no supplementary assessment for cumulative impacts with other developments is required:

- Chapter 9 (Road Drainage and the Water Environment):
  - water quality of receiving watercourses; and
  - drainage design.
- Chapter 13 (Air Quality);
- Chapter 14 (Noise & Vibration);
- Chapter 15 (Effects on All Travellers):
  - non-motorised users such as pedestrians and cyclists; and
  - driver stress.

18.4 Conclusions

18.4.1 The cumulative impact assessment considered combined impacts of the proposed scheme and also impacts resulting from the combination of the proposed scheme with other developments.

18.4.2 Potential significant construction and operation cumulative impacts have been identified as a result of combined impacts of the proposed scheme. Temporary and permanent cumulative noise and visual impacts have been identified for several receptors surrounding the proposed scheme, as outlined in Section 18.3 (Potential Cumulative Impacts), and additional in-combination impacts as a result of communal garden land-take and/or severance of vehicular access.

18.4.3 No cumulative construction impacts are expected as a result of the proposed scheme combined with any other developments. Potential cumulative traffic impacts have been identified as a result of the proposed scheme combining with the AWPR and the Third Don Crossing schemes. The cumulative impacts associated with these schemes are expected to be beneficial, improving traffic flows and road connectivity in the Aberdeen area.

18.5 References

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19 Schedule of Environmental Commitments

19.1 Introduction

19.1.1 This chapter summarises the mitigation measures identified in the Environmental Statement (ES), which are considered necessary to protect the environment, prior to construction, during construction and/or during operation of the proposed scheme.

19.1.2 The purpose of the Schedule of Environmental Commitments is to collate mitigation measures, both for ease of reference and for use by those overseeing the contract documents. These mitigation measures are those identified as necessary for the proposed scheme as reported in this ES.

19.1.3 As described throughout this ES, the proposed scheme design has been progressed taking account of identified environmental constraints and considerations, enabling avoidance of potential environmental impacts.

19.2 Mitigation Schedules

19.2.1 Tables 19.1 to 19.10 summarise the mitigation measures identified within the ES to avoid, reduce or offset potential impacts.

Table 19.1: Community and Private Assets Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
CP1	Throughout scheme	Construction Post-Construction	Access to/from land, properties and businesses would be maintained throughout construction period via diversions where necessary, and the contractor would be required to notify the local community of the estimated duration and location of diversions ahead of them being put in place.
CP2	Throughout scheme	Construction Post-Construction	Measures would be taken to ensure adequate signage is maintained during construction and any planned diversions would avoid, where possible, affecting Aberdeen city centre.
CP3	Throughout scheme	Construction Post-Construction	Consideration given to the provision of exchange land as part of the proposed scheme.

Table 19.2: Geology, Soils, Contaminated Land and Groundwater Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
G1	Throughout scheme	Construction Operation	Groundwater likely to be intercepted by each of the road cuttings may need to be treated prior to being discharged. The confirmed presence of slightly elevated levels of selenium and mercury in groundwater in the vicinity of cutting 1 and cutting 3 indicate the potential for heavy metals contamination in discharges. This should be taken into account in the preparation of discharge licensing consents in communication with SEPA.
G2	Throughout scheme	Construction Operation	SUDS basins should be lined and direct discharges to the groundwater environment from, for example, soakaways should be avoided unless it can be demonstrated that no water quality impacts will occur.
G3	Throughout Scheme	Construction Operation	Each of the proposed road cutting excavations are considered likely to intercept groundwater and the potential volumes will need to be considered in the context of a potential groundwater abstraction CAR licence prior to works commencing.
G4	Throughout Scheme	Pre-Construction Construction	A detailed geotechnical assessment should be undertaken. Should potential differential settlement risks be confirmed, required mitigation measures may include the need to monitor groundwater level variations during the construction phase and put in place structural reinforcements for affected structures.
G5	Throughout Scheme	Pre-Construction Construction	Consultations with SEPA would be required regarding Scatter Burn should potential impacts be confirmed following receipt of further groundwater monitoring results and confirmation of the nature and condition of the culvert.
G6	Throughout Scheme	Construction	Any residual risks posed by unidentified contamination can be managed through visual inspection during works, safe systems of work and the adoption of personal protective equipment to minimise direct interaction with any potential contaminated soil, contaminated groundwater or asbestos. Waste management procedures shall include but not be limited to: Waste Management Licence Regulations 1994 (as amended by Waste management licensing Amendment (Scotland) Regulations 2003), Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, HSE Guideline Note MS13 Asbestos (2012), SEPA Guidance: Asbestos in Demolition Wastes (2015).
G7	Throughout Scheme	Pre-Construction Construction	To protect the water environment, excavated made ground material would be stored using bunded facilities and re-use criteria, as part of a Material Management Plan. This would be developed so as to mitigate any long term impacts.

Table 19.3: Road Drainage and the Water Environment Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
Generic/Best Practice			
W1	Throughout scheme	Pre-Construction Construction	The Contractor would be required to prepare a Construction Environmental Management Plan (CEMP), or equivalent, which would address and mitigate risks identified in the ES.
W2	Throughout scheme	Pre-Construction Construction	An Environmental Clerk of Works (EnvCoW) would seek to ensure that the mitigation measures identified within the CEMP are fully implemented and activities carried out in such a manner as to prevent or reduce impacts on the surface water environment.
W3	Throughout scheme	Pre-Construction Construction	Measures to avoid, reduce or control pollution of surface water and groundwater would incorporate SEPA requirements and CIRIA guidelines for pollution control, including relevant SEPA Pollution Prevention Guidance notes (PPGs) and the SEPA (2009) Good Practice Guide: Temporary Construction Methods.
W4	Throughout scheme	Pre-construction Construction	The Contractor would be required to prepare construction method statements for any in-stream working for approval by SEPA prior to these specific works.
W5	Throughout scheme	Pre-Construction Construction	During construction of the roadway and associated works, temporary drainage systems would alleviate localised flood risk and help to prevent obstruction of surface runoff pathways.
W6	Throughout scheme	Pre-construction Construction	Temporary SUDS systems or equivalent to reduce the potential for contaminated runoff to the surface water drainage network or watercourses would be used.
W7	Throughout scheme	Pre-construction Construction	Temporary discharge consents are to be obtained from SEPA, where required.
W8	Throughout scheme	Construction	Other runoff and erosion control measures to include as appropriate: • provision of wheel washes more than 10m from watercourses and appropriate disposal of dirty water; • cleaning of roads; • limit exposed bare areas; • covering of stockpiles; • use of silt fences; • provision of peripheral cut-off ditches to intercept runoff from entering working area; and • regular visual inspection and water monitoring of receiving watercourse(s) to be agreed with SEPA.
W9	Throughout scheme	Construction	Appropriate control measures for construction site runoff and sedimentation would be implemented during construction, this includes: • cleaning of roads to reduce mud and dust deposits (away from watercourses, into appropriate drainage sites); • limit exposed bare areas and uncontrolled runoff from newly paved areas; • covering and bunding, if required, of soil stockpiles; • use of silt fences where appropriate; • early covering/seeding/planting of exposed surfaces where practicable; • where appropriate, provision of peripheral cut-off ditches or drainage system to intercept runoff from outside the working area such that it does not encroach on the working area;

Mitigation Item	Approximate location	Timing of Measure	Description
			• lay suitable surfacing materials in site compound and on main access routes; and • regular proactive visual inspection of the sedimentation measures and receiving watercourses.
W10	Throughout scheme	Pre-Construction Construction	If flocculants are considered necessary to aid settlement of fine suspended solids, such as clay particles, the chemicals used must first be approved by SEPA.
W11	Throughout scheme	Pre-Construction Construction	Where required, CAR authorisation would be obtained from SEPA.
W12	Throughout scheme	Construction	The Contractor would comply with the relevant sections of BS6031:2009 Code of Practice for Earthworks with respect to protection of water quality and control of site drainage including washings, dewatering, abstractions and surface water.
W13	Throughout scheme	Pre-Construction Construction	Where the Contractor considers the use of alternative materials to those included in the Stage 3 design stage for use as fill, e.g. in embankments, agreement with SEPA should be sought prior to use of such material, where required.
W14	Throughout scheme	Construction	Best practice measures associated with storage of oils and fuel would be followed in compliance with The Water Environment (Oil Storage) (Scotland) Regulations 2006, SEPA PPG02 and PPG26, and would be included within the Contractor's CEMP.
W15	Throughout scheme	Construction	Effective mitigation for impacts associated with storage, handling and use of chemicals would be based on the following measures: • PPG26 would be followed. Chemicals stored in drums would, as far as practicable, be stored within a secondary containment system. Containers without secondary containment will not be placed within 10m of an open section of watercourse or drainage gulley, which provides a direct pathway to watercourse. • Chemical stores would be located above the 0.5% AEP (1 in 200-year return period) flood level. • Pesticides, including herbicides, would only be used if there are no alternative practicable measures, and would be used in accordance with the manufacturer's instructions and application rates. Choice of pesticides would be those with least harm to the environment (i.e. least toxic and least persistent) suitable for the required purpose. Pesticide use near watercourses would require the prior approval of SEPA.
W16	Throughout scheme	Construction	Effective mitigation for impacts associated with oil/fuel leaks, spillages and refuelling would be based on the following measures: • Bunded areas of sufficient storage capacity (at least 110% of maximum tank capacity) with impervious walls and floor lining for the storage of fuel, oil and chemicals; • Appropriate measures, including site security, to avoid spillages; • Compliance with the Pollution Incident Control Plan and SEPA PPG21 and PPG22; • Stationary plant would be fitted with drip trays and emptied regularly; plant machinery to be properly maintained; and • Suitable spillage kits would be stored at key locations on site.
W17	Throughout scheme	Construction	Concrete mixing and washing areas (Mitigation Item W18) would: • be located more than 10m from open sections of watercourses and waterbodies; • have settlement and re-circulation systems for water reuse; • have a contained area for washing out and cleaning of concrete batching plant or ready mix lorries; and • collect wash-waters and, where necessary, discharge to foul sewer (with the sewerage provider's permission) or contain wash-water for authorised disposal off-site.
W18	Throughout scheme	Pre-Construction	Sewage from site facilities would be disposed of appropriately (Mitigation Item W19) either to:

Mitigation Item	Approximate location	Timing of Measure	Description
		Construction	• foul sewer with the permission of Scottish Water; or • appropriate treatment and discharge agreed with Building Control and SEPA in advance of construction in accordance with PPG04.
W19	Throughout scheme	Construction	Service diversions, protection of utilities and local water supplies, excavations and ground penetration would be carried out according to good practice.
W20	Throughout scheme	Pre-Construction Construction	The permanent SUDS (detention basin and vortex separator) would be scheduled for construction early in the programme, to allow settlement and treatment of any pollutants contained in site runoff and to control the rate of flow before water is discharged into the Scatter Burn. The SUDS would be cleaned of sediments and pollutants (using appropriate licensed disposal off-site) prior to the Contractor leaving the site.
W21	Throughout scheme	Construction	Regular inspections are to be carried out by the Environmental Clerk of Works to identify and recommend appropriate actions for aspects such as unacceptably high pollution risk, or any suspected incidences of pollution.
Drainage			
W22	Throughout scheme	Pre-Construction Construction Operation	Where it has been identified as necessary for road drainage to discharge to receiving watercourses, mitigation would be designed to limit the volume of discharge and the risk to water quality. Where required, authorisation for road drainage discharges under CAR would be obtained from SEPA.
W23	Throughout scheme	Pre-Construction Construction Operation	The detention basin would be designed with an impermeable liner to reduce any identified risk of pollution to groundwater, unless otherwise agreed with SEPA by the Contractor.
W24	Throughout scheme	Pre-Construction Construction Operation	The detention basin would be designed to attenuate the post-development peak flow to a pre-development peak flow associated with the 50% AEP (1 in 2-year return period) rainfall event prior to outflow to the Scatter Burn.
Maintenance of Road Drainage Network			
W25	Throughout scheme	Construction Operation	To avoid failure or sub-optimal operation of the road drainage network, maintenance of its components would be necessary. Regular inspection to inform on maintenance frequency requirements would be required, with the minimum recommended maintenance as follows: • Regular maintenance of SUDS to enable efficient operation and the settlement of solids and removal of pollutants (such as hydrocarbons).

Table 19.4: Ecology Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
Generic Mitigation Measures			
E1	Throughout scheme	Pre-Construction	An Ecological Clerk of Works (ECoW) will be employed by the Contractor to oversee the implementation of the proposed mitigation.
E2	Throughout scheme	Construction	Pre-construction surveys for protected species and invasive non-native species under the footprint of the proposed scheme plus a 50m buffer would be undertaken and their locations communicated to construction staff in strict confidence to ensure no direct mortality of protected species during site clearance, and allow for the development of additional mitigation should it be required.
E3	Throughout scheme	Construction	Works compounds, storage sites, access roads and other any other temporary work areas would be located at least 30m away from any sensitive sites, such as birds' nests, or at an agreed sensitive distance as advised by the ECoW. Any works to be undertaken within this distance must be subject to consultation with SNH, and undertaken under licence where applicable.
E4	Throughout scheme	Construction	Plant and personnel may be constrained to a prescribed working corridor through the use of temporary barriers, thereby minimising damage to habitats and potential direct mortality and disturbance to animals located within and adjacent to the proposed scheme working corridor.
E5	Throughout scheme	Construction	Site management practices to avoid or reduce the risks of secondary impacts on habitat adjacent to the proposed scheme will be adopted.
E6	Throughout scheme	Construction	Habitat loss would be reduced by restricting felling and vegetation clearance activities to the minimum area necessary for the works.
E7	Throughout scheme	Construction	Site clearance of vegetation would be undertaken outside of the main bird breeding season where possible (typically March - August inclusive). Where site clearance works must be undertaken during the main bird breeding season, methods of exclusion and deterrent would be used to prevent birds beginning to nest in suitable areas.
E8	Throughout scheme	Construction	Site clearance works undertaken from September - January inclusive would not be subject to any specific mitigation for breeding birds, however, the ECoW would advise all contractor staff of the residual risk of birds nesting outside of the main bird breeding season and a requirement to stop work should they be encountered.
E9	Throughout scheme	Construction	During the bird breeding season, all cleared material is to be rendered unsuitable for nesting birds.
E10	Throughout scheme	Construction	Tree felling would be carried out by experienced contractors according to agreed felling methods and any licensing conditions to reduce direct mortality of bats through loss of roosts. Such methods may include allowing dispersal times, exclusion of roosts, soft felling techniques, or retention of roost features in newly created areas.
E11	Throughout scheme	Construction	Update surveys would include the internal inspection of buildings to be demolished where appropriate. If surveys confirm the presence of roosts, demolition of properties would be required to be undertaken under licence following consultation with SNH. Conditions would need to be followed to reduce direct mortality of bats through loss of roosts. Such methods may include exclusion of roosts and soft stripping of slates.
E12	Throughout scheme	Construction	Should it be required, the loss of roosts and roosting opportunities would be offset by the provision of replacement roost habitat. This provision would be developed through consultation with SNH.
E13	Throughout scheme	Construction	Night-time working will be avoided where possible.
E14	Throughout scheme	Construction	A lighting plan will be developed for low light conditions and night-time working (that undertaken between sunset and sunrise). The use of construction lighting will be according to BS 5489 requirements and following guidance on lighting (e.g. Bat Conservation Trust (2009, 2014) and Institute of Lighting Engineers, 2007) including the use of directional lighting or preventative measures (e.g. installation of shields, hoods or limiting the height of lighting columns).

Mitigation Item	Approximate location	Timing of Measure	Description
E15	Throughout scheme	Construction	All trenches, holes and pits will be fenced, or kept covered at night or mammal ladders will be provided for escape.
E16	Throughout scheme	Construction	The Contractor will be required to abide by SEPA PPGs (Mitigation Item E16): • Surface and foul water will be appropriately drained and stored. These control measures must be in place before earthworks commence; • Chemicals, oils and fuels will be kept safely stored and away from drainage systems and waste will be appropriately managed; • Plant and machinery must not be fuelled in the vicinity of drainage systems; • Sites will be restored fully on completion of works and contractors will adhere to below, with respect to preventing pollution incidents near drainage systems; • Emergency procedures and spillage kits must be available and construction staff must be familiar with emergency procedures; and • Road run-off will be treated using SUDS techniques including collection in treatment facilities including petrol interceptors, silt traps and balancing ponds according to SEPA PPGs.
E17	Throughout scheme	Construction	Measures to avoid or reduce air pollution impacts will be implemented, so that dust, for instance, does not build up significantly on trees and scrub vegetation. These will include measures These will include measures such as: dampening down construction areas and material stockpiles, especially when weather conditions are dry and windy; use of cutting equipment, e.g. abrasive disc cutters, that utilise water dust suppression; significant material stockpiles to be enclosed as far as practicable; concrete batching to be carried out only in enclosed or shielded areas; setting and enforcing appropriate speed limits on haul roads; implementing regular dampening down of unsurfaced site and access roads using water bowsers, particularly during dry, windy conditions; and provision of wheel washing facilities at site exits.
E18	Throughout scheme	Construction Operation	All areas of habitat loss due to temporary works, site compounds, easements, working areas or access roads would be reinstated following construction on a like for like basis.
E19	Throughout scheme	Construction Operation	Loss of 0.8ha of amenity grassland would be mitigated by the creation of grassed areas along the length of the proposed scheme. An avenue of trees along the length of the proposed road would be created, and hedgerows would be planted.
E20	Throughout scheme	Construction Operation	Landscape planting and newly created habitat would comprise a mixture of species, and would be aimed at enhancing the biodiversity opportunities of the area. Tree species will be small-masted where possible.
E21	Throughout scheme	Construction Operation	Sowing/planting should be undertaken as soon as possible following completion of the works to reduce the likelihood of the areas being colonised by invasive, non-native species which are of lower value to wildlife.

Table 19.5: Landscape and Visual Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
Generic/Best Practice			
LV1	Throughout scheme	Construction	The following mitigation measures are proposed to avoid or reduce landscape and visual impacts during construction: • programming of works to minimise disruption, including keeping the construction programme to the minimum practicable time and clearing areas for construction as close as possible to works commencing; • careful selection of plant and machinery; • avoidance of night-time working where possible. Where necessary, directed lighting would be used to minimise light pollution/glare. In addition to specific approval from the relevant road authority, the Contractor may be required to comply with the specific requirements of the Local Authority, which may include providing advice to potentially affected residents; • sensitive locating of site compounds to minimise their townscape impact. Where possible existing features such as trees should be used to screen from sensitive visual receptors. Where this is not possible, screening can be achieved using bunds or embankments which become part of the permanent works. Alternatively, temporary screens can be erected, designed and painted to be as inconspicuous in their surroundings as possible; • construction sites to be kept tidy (e.g. free of litter and debris); • efficient traffic management and pedestrian diversions; and • protection of vegetation and avoidance of damage to private ground.
LV2	Throughout scheme	Construction Operation	Earthworks proposals aim to minimise the impact of cuttings and embankment slopes and to allow integration of the road with surrounding land, through: • modification or grading out of embankment and cutting slopes where practical to create smooth transitions with surrounding landform; • rounding off top and bottom of cuttings and embankments; • sensitive creation of mounding between the carriageway and the adjacent residential areas, located to assist visual screening, buffering and noise mitigation; and • manipulation of planting and screening elements on the earthworks where possible to ensure cohesive integration.
LV3	Throughout scheme	Operation	Where there is limited space for screen planting, mounding earthworks to comprise of amenity grassland planted with bulbs for seasonal interest. Earthworks to include sculpted mounding to screen views of the road and enhance neighbouring open spaces.
LV4	Throughout scheme	Scheme Design Pre-Construction Construction Operation	Where practicable existing trees and shrubs retained and integrated with new planting proposals including existing parks and open spaces.

Mitigation Item	Approximate location	Timing of Measure	Description
LV5	Throughout scheme	Construction Operation	Planting to: • replace trees lost to the construction of the proposed scheme; • mitigate the impacts of the proposed scheme on the townscape by introducing new 'green infrastructure' and provide new spatial definition; • provide screening to reduce visual impacts of the roads and lighting; • soften the visual impact of existing residential properties; and • create/enhance a strong sense of place and enhance biodiversity through use of a mix of native and non-native species which are robust and can adapt to the anticipated local conditions.
LV6	Throughout scheme	Operation	Planting formal avenue using extra heavy standard trees in grassed verges along new roads backed by parallel formal hedges to create a clear sense of place, strong landscape structure and form a clear boundary between the new link road and the adjacent residential and new open space areas.
LV7	Throughout scheme	Operation	Planting groups of specimen trees in grass areas positioned for visual interest and to screen views from neighbouring residential and new open space areas. Variety of species chosen for their robustness to the anticipated growing conditions, their seasonal interest, form and biodiversity value.
LV8	Throughout scheme	Construction	Formal hedges planting as an element of the core landscape structure to provide low level screening, act as a buffer between the road corridor and the adjacent residential areas and create a soft landscape edge.
LV9	Throughout scheme	Operation	Grass seeding in all soft areas and road verges, different seed mixes will be used, dependent on location and use: • Roadside Verge Mix suited to the road-side location being low maintenance, fast establishing and tolerant of traffic and salt spray; • Amenity Grass Seed Mix in areas of community open space and beneath avenue trees. Ornamental bulb planting is also proposed at key locations within these areas to provide visual interest for road users, pedestrians and cyclists and surrounding residential areas; and • Semi Natural Grass Mix incorporating native wildflowers and suited for use in the SUDS detention basin and areas around culverts that are likely to experience intermittent wet conditions but will be predominantly dry.
LV10	Throughout scheme	Operation	Installation of Light Emitting Diodes (LEDs) and a Central Management Systems (CMS) to allow for dimming and remote control to provide the right amount of light at the right time and in the right place to achieve further energy reduction and reduce environmental impacts.
LV11	Throughout scheme	Construction Operation	If and where temporary lighting is essential during construction or operational maintenance, all reasonable precautions to be undertaken to reduce energy consumption and avoid/reduce the amount of light pollution in the form of glare and/or light trespass/spill where this can be achieved safely and effectively.
Specific Mitigation			
LV12	SUDS Detention Basin	Operation	Earthworks to be seeded with species rich grassland and groups of trees planted for visual interest and to soften associated fencing, outfall and inlet structures, and to promote biodiversity. Hedge planting along the boundary to the detention basin, at a low height to allow visibility of the area from neighbouring footways. Any boundary fencing required for safety purposes, designed to be as unobtrusive as possible, consistent with serving the required safety function, with the fence type and alignment designed to minimise visual impact so far as possible.

Mitigation Item	Approximate location	Timing of Measure	Description
			It would be visual beneficial for the vehicular access to the detention basin to be using surfaced grass with reinforcement e.g. a plastic of concrete cellular system.
LV13	Noise Barriers	Scheme Design Operation	Integration of the noise barriers with the landscape design including their scale and positions. Plant climbing species on both sides the barriers. Grass verges on the southbound side of the link road widened to allow the avenue tree planting to continue adjacent to the noise barriers.
LV14	Community Park off Logie Terrace and Logie Place	Scheme Design Construction Operation	Specimen tree planting and hedge planting to replace boundary trees and hedges lost and severed in the community parks space at Logie Terrace and Logie Place. Redesign of existing parks directly impacted by the proposed scheme, including the grubbing up and topsoiling of the remaining minor local road separating the parks. Existing boundary vegetation retained where possible to assist screening and integration with the park design. Hedgerow planting to link any remaining severed hedges and delineate the boundary to the park whilst providing low level screening. Tree planting along the boundary to provide enclosure and visual interest within the reinstated park area and screening of views to the proposed scheme from surrounding residential properties. Mounding with grass seeding and bulb planting in the eastern part of the park area to create interest and provide additional buffering from the new road alignment. The path linking Logie Place to Manor Avenue retained but on a partially revised alignment. The local community consulted during the detailed design of the park/open space.
LV15	Logie Avenue	Operation	Hard surface the east facing embankment slope with setts or similarly approved material to assist enhancing and retaining its appearance.
LV16	Open Space adjacent to the Link Road to the rear of Manor Drive and Manor Avenue	Operation	A combination of earth mounding and specimen tree planting to provide partial screening of views of the proposed Link Road to residents located along Manor Drive and Manor Avenue.

Table 19.6: Cultural Heritage Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
CH1	Throughout scheme	Pre-Construction	To mitigate potential impacts on the site of Middlefield Buildings (1) site of (Asset 42) and Middlefield Buildings (2) site of (Asset 43) evaluation in the form of trial trenching would be implemented in consultation with Aberdeen City Council. The aims of evaluation works would be to: • Identify any unknown archaeological remains that may be affected by the proposed route option and identify appropriate mitigation.
CH2	Applied throughout scheme at appropriate locations.	Pre-Construction	If archaeological remains associated with Asset 42 or Asset 43 are identified, archaeological excavation is proposed to mitigate the impact on these remains.
CH3	Currently unknown. Applied throughout scheme at appropriate locations.	Construction	Where practicable the archaeological trial trenching, and any resulting archaeological excavation, should be undertaken in advance of the main contract. If this is not feasible, a watching brief during construction may be a suitable alternative. If archaeological remains are identified during the watching brief appropriate archaeological investigation and recording of these remains would need to be undertaken.

Table 19.7: Air Quality Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
Communications			
AQ1	Throughout scheme	Pre-Construction Construction	Communications: • Develop and implement a stakeholder communications plan that includes community engagement before work commences; • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager; • Display the head or regional office contact information; and • Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the local authority. The level of detail will depend on the risk, and should include as a minimum the recommended measures as set out in this appendix. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM10 continuous monitoring and/ or visual inspections.
AQ2	Throughout scheme	Construction	Site Management: • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken; • Make the complaints log available to the local authority when asked; and • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
AQ3	Throughout scheme	Construction	Monitoring: • Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning to be provided in necessary. When activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions increase the frequency of inspections.

Mitigation Item	Approximate location	Timing of Measure	Description
			• Carry out regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary. • Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the local authority. Where possible commence baseline monitoring at least three months before work commences on site, or if it is a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority.
AQ4	Throughout scheme	Pre-Construction Construction	Planning and maintaining the site: • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use intelligent screening where possible – e.g. locating site offices between potentially dusty activities and the receptors; • Erect solid screens or barriers around the site boundary that are at least as high as stockpiles; • Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period; • Avoid site runoff of water or mud; • Keep site fencing, barriers and scaffolding clean; • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and • Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.
AQ5	Throughout scheme	Construction	• Ensure all vehicles switch off engines when stationary – no idling vehicles; • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable; • Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas ; • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and • Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).
AQ6	Throughout scheme	Construction	Operations: • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems; • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible; • Use enclosed chutes, conveyors and covered skips; • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and • Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
AQ7	Throughout scheme	Construction	Waste management: • Only use registered waste carriers to take waste off-site; and • Avoid bonfires and burning of waste materials.
AQ8	Throughout scheme	Construction	Demolition: • Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust); • Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to

Mitigation Item	Approximate location	Timing of Measure	Description
			equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground; • Avoid explosive blasting, using appropriate manual or mechanical alternatives; and • Bag and remove any biological debris or damp down such material before demolition.
AQ9	Throughout scheme	Construction	Measures specific to earthworks: • Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. Only remove the cover in a small area during work and not all at once.
AQ10	Throughout scheme	Construction	Measures specific to construction: • Avoid scabbling (roughening of concrete surfaces) if possible; and • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
AQ11	Throughout scheme	Construction	Measures specific to track-out: • Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site. This may require the sweeper being continuously in use; • Avoid dry sweeping of large areas; • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport; • Record all inspections of haul routes and any subsequent action in a site log book; • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned; • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable; • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site); • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. This can be in the form of a static drive through facility or a manually operated power jet; and • Access gates to be located at least 10m from receptors where possible.

Table 19.8: Noise and Vibration Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
NV1	Throughout scheme	Pre-Construction Construction	All work would be undertaken to the guidance detailed in BS 5228: 2009+A1: 2014. It is anticipated that the following mitigation measures would be employed on site to ensure that noise and vibration levels are attenuated as far as possible: • All construction plant shall be the quietest of its type practical for carrying out the work required and shall be maintained in good condition with regard to minimising noise output; • All construction plant shall be operated and maintained in accordance with the manufacturer's written recommendations, including the use and maintenance of any specific noise reduction measures; • The use of 'best practicable means' during all construction activities; • Switching off plant and equipment when it is not in use for extended periods of time; • Establish agreement with the ACC on appropriate controls for undertaking significantly noisy works or vibration-causing operations close to receptors; • Programming works so that the requirement for working outside normal working hours is minimised (taking into account the highway authority's statutory duties under the Traffic Management Act 2004); • Use of low noise emission plant where possible; • Use of low amplitude running options on vibratory compactors when operating close to sensitive properties; • The use of temporary noise screens around particularly noisy activities; and • Regular plant maintenance.
NV2	Throughout scheme	Pre-Construction Construction	It is anticipated that a scheme of noise and vibration monitoring would be agreed with Aberdeen City Council and noise and vibration limits be contained within any Construction Environmental Management Plan (CEMP) agreed.
NV3	Throughout scheme	Pre-Construction Construction	An updated assessment of potential construction noise and vibration levels should be undertaken once the construction contractor has been appointed and the exact plant, methodology and phasing is known.
NV4	Throughout Scheme		If an updated assessment indicates that sensitive properties may be exposed to construction noise levels that are 5dB, or more, greater than existing pre-construction ambient noise levels and are in excess of those quoted within Table 14.10 of Chapter 14 (Noise and Vibration), for a prolonged period of time, consideration should be given to the provision of noise insulation (NI), typically in the form of secondary window glazing, or temporary or permanent re-housing (TRH), as per paragraph E.5 of BS5228-1+A1:2014.
NV5	Throughout scheme	Construction Operation	Given potential for Major noise impacts at sensitive receptors , the following barriers have been included in the design of the proposed scheme: • 2.0m high and 35m long absorptive barrier between NT 391112, 809113 and 391124, 809081, on the inside of the curve between the proposed link road and Logie Avenue; • 2.0m high and 120m long absorptive barrier between NT 391126, 809075 and 391126, 809075, on the inside of the curve between the proposed link road and Logie Avenue; and • 2.0m high and 112m long absorptive barrier between NT 391229, 808991 and 391323, 808951, on the inside of the curve between the proposed link road and Logie Avenue.

Table 19.9: Effects on All Travellers Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
AT1	In the proximity of current NMU facilities, proposed construction sites and current bus stops throughout the scheme.	Construction	Measures to mitigate potential impacts on NMUs include: • The construction works are to be programmed in such a manner to reduce the length of closures or restrictions of access as far as practicable. Any diversion routes must be safe for NMUs and all inclusive in accordance with the Roads for All: Good Practice Guides for Roads, 2013 (Transport Scotland, 2013). • The construction site is to be fenced and access by non-authorised personnel will generally not be permitted. • Temporary diversion routes are to be provided to maintain access for NMUs throughout the works, and any closure or re-routing of routes used by NMUs will be agreed in advance with the local authorities. • Where necessary, bus stops are to be relocated safely with a safe access route provided for NMUs. • Best Practicable Means are to be employed to avoid the creation of a statutory nuisance associated with noise, dust and air pollution; and • Reasonable precautions to be undertaken to reduce the visual impact of the construction works where practicable.
AT2	NMU facilities	Operation	General principles for maintaining and improving access for NMUs are: • The requirements of the Equality Act 2010 and Transport Scotland's Good Practice Guide for Roads shall be incorporated into the proposed scheme wherever practicable; e.g. any ramps or footpaths should take into account potential barriers to vulnerable users such as the gradient or surfacing (Transport Scotland, 2013). • Surfacing of any new paths including alongside roads should be considered with regard to the type of user and should comply with current standards. • Safety of paths can be improved by the use of pedestrian guardrails to guide NMUs from paths to safe crossing points.
AT3	Throughout scheme	Pre-Construction Construction Operation	Temporary bus stops will be provided during construction where required.
AT4	Throughout scheme	Construction	Measures to mitigate potential impacts on driver stress during construction include the following: • Traffic management during construction should seek to reduce disruption and delays, and be provided in accordance with the Traffic Signs Manual (Department of Transport, 2009). • Seek to avoid or reduce disruption to the road traffic, including consideration of the timing of works, earthworks balance, haul roads to reduce site traffic on the public roads and a well maintained traffic management system with sweeping of roads to reduce construction debris on the carriageway. • Seek to avoid or reduce road closures. • Road diversions should be clearly indicated with road markings and signage as appropriate. Closures to be notified in advance and signage provided. • Appropriate lighting should be provided during any necessary night-time working.

Table 19.10: Materials Mitigation

Mitigation Item	Approximate location	Timing of Measure	Description
M1	Throughout scheme	Scheme Design Construction	Throughout the detailed design and construction stages the principles of the waste hierarchy would be applied to minimise waste generation and maximise re-use of waste arisings on-site, where possible. Where re-use is not possible within the scheme design, alternative options will be sought off-site such as reprocessing into aggregate or the use of inert materials on local farms. For all potential waste arisings, the contractor will consult SEPA for advice where appropriate and will comply with The Waste Management Licensing (Scotland) Regulations 2011 (WML) and the UK Forestry Standard and associated Environmental Guidelines. Consideration will also be given to SEPA guidance on sustainable waste management. If wastes cannot be legitimately re-used on site, these will be removed to a licensed recycling or disposal facility in line with regulation requirements.
M2	Throughout scheme	Scheme Design Pre-Construction Construction	Development and implementation of a CEMP. The CEMP would be developed by the contractor during detailed design (i.e. before the start of construction) and implemented as part of any advance demolition contract and during the construction phase. The CEMP would include the following: • details of the approach to environmental management throughout the construction phase, with the primary aim of mitigating any adverse impacts from construction activity on the identified sensitive receptors; • procurement and waste management protocols / KPIs and targets designed to minimise impacts on the environment and maximise local procurement of materials and waste management options; • good materials management methods, such as co-location of temporary haul routes on permanent capping and recovery and re-use of temporary works materials from haul routes, plant and piling mattresses, etc.; and • risk/impact-specific method statements and strategic details of how relevant environmental impacts will be addressed throughout the proposed scheme, embodying the requirements of the relevant SEPA Pollution Prevention Guidelines.
M3	Throughout scheme	Scheme Design Pre-Construction Construction	A Site Waste Management Plan (SWMP) would be developed and regularly updated during construction of the proposed scheme. The SWMP will identify, prior to the start of construction, the types and likely quantities of wastes that may be generated. It will set out, in an auditable document, how these wastes would be reduced, re-used, managed and disposed of. The SWMP will be developed by the contractor before commencement of the construction phase and, where possible, incorporated within the CEMP. The SWMP would set out how all construction phase materials would be managed and quantities recorded. This may include specific soils management plans developed under the following voluntary and industry regulated Codes of Practice such as: • Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009) provides best practice guidance for the excavation, handling, storage and final placement of soils; and • Land Remediation and Waste Management Guidelines (SEPA, 2009) provides a process whereby contaminated soils can be re-used on the site of origin (i.e. they do not become a waste) if they are proven through appropriate risk assessments to be suitable for use. It also provides for soils with naturally elevated contamination levels to be used directly on another site provided that they are suitable for use at that site. Implementation of the SWMP will minimise waste at source, during detailed design and construction, by facilitating measures to maximise re-use of materials on-site and reduce the need for new construction materials.
M4	Throughout scheme	Construction	Where materials generated during demolition/construction cannot be used for the proposed scheme, opportunities would be sought to re-use the materials on other local projects

Mitigation Item	Approximate location	Timing of Measure	Description
M5	Throughout scheme	Construction	If contaminated soils are encountered during the construction works, further investigation, testing and risk assessment would be undertaken to determine whether the soils could stay on-site, require treatment to make them suitable to remain on-site or would need to be disposed of off-site.
M6	Throughout scheme	Construction	Asbestos surveys would be undertaken of the properties to be demolished prior to any demolition works commencing.

20 Summary of Significant Residual Impacts

20.1 Introduction

20.1.1 Tables 20.1 to 20.3 summarise any residual impacts remaining after implementation of mitigation, as set out in Chapter 19 (Schedule of Environmental Commitments), that would be considered significant in the context of the Environmental Impact (Scotland) Regulations (1999, as amended).

20.1.2 Non-significant residual impacts are not summarised in this chapter. Residual impacts summarised in this chapter are considered adverse, unless otherwise stated (note that significant community benefits are identified in Table 20.1, and significant noise benefits are identified in Table 20.3).

20.1.3 No significant (generally Moderate or greater significance) adverse residual impacts have been identified for the following environmental parameters:

- Geology, Contaminated Land and Groundwater (Chapter 8).
- Road Drainage and the Water Environment (Chapter 9).
- Ecology and Nature Conservation (Chapter 10).
- Cultural Heritage (Chapter 12).
- Air Quality (Chapter 13).
- Effects on all Travellers (Chapter 15)
- Materials (Chapter 16).
- Policies and Plans (Chapter 17).

20.1.4 Cumulative impacts are discussed and considered separately in Chapter 18 (Cumulative Impacts).

Table 20.1: Summary of Significant Residual Impacts – Community and Private Assets

Residual Impact	Mitigation Item (where applicable)	Residual Impact Significance
Residential Land and Property		
124 residential demolitions as highlighted in Appendix A7.1.	n/a	Substantial
10 residential acquisitions (non-demolition) as highlighted in Appendix A7.1.	n/a	Substantial
Communal garden land-take of 24 to 32 (even) Logie Avenue. Approximately 0.2502ha of land-take; 56% of total area.	n/a	Moderate/Substantial
Communal garden land-take of 1 Logie Gardens and 21 – 25 Logie Avenue. Approximately 0.0823ha of land-take; 100% of total area.	n/a	Moderate/Substantial
Communal front garden land-take of 10 Logie Avenue (Flat A to F). Approximately 0.0218ha of land-take; 80% of total area.	n/a	Moderate/Substantial
Communal garden land-take of 26 to 28 (even) Manor Avenue (including three properties associated with two community facilities: Pathways Services Limited and Middlefield Community Project Youth Flat). Approximately 0.1604ha of land-take; 70% of total area.	n/a	Moderate/Substantial
Communal garden land-take of 539 & 541 North Anderson Drive. Approximately 0.0221ha of land-take; 46% of total area.	n/a	Moderate
Communal garden land-take of 535 & 537 North Anderson Drive. Approximately 0.0122ha of land-take; 32% of total area.	n/a	Moderate
Communal garden land-take of 531 & 533 North Anderson Drive. Approximately 0.0107ha of land-take; 33% of total area.	n/a	Moderate
Communal garden land-take of 14 to 22 (even) Logie Avenue. Approximately 0.0640ha of land-take; 19% of total area.	n/a	Moderate
Communal garden land-take of 543 & 545 North Anderson Drive. Approximately 0.0099ha of land-take; 21% of total area.	n/a	Moderate
Communal garden land-take of 12 Logie Avenue (Flat A to F). Approximately 0.0021ha of land-take; 24% of total area.	n/a	Moderate
Communal garden land-take of 17 & 19 Manor Avenue. Approximately 0.0068ha of land-take; 18% of total area.	n/a	Moderate
Communal garden land-take of 9 – 15 (odd) Manor Avenue. Approximately 0.0098ha of land-take; 17% of total area.	n/a	Moderate
Communal garden land-take of 1 – 7 (odd) Manor Avenue. Approximately 0.0087ha of land-take; 15% of total area.	n/a	Moderate
Communal back garden land-take of 10 – 12 (even) Logie Avenue and 551 – 559 North Anderson Drive. Approximately 0.009ha of land-take; 40% of total area.	n/a	Moderate

Residual Impact	Mitigation Item (where applicable)	Residual Impact Significance
Disruption in vehicular access to 438 and 440 Auchmill Road during construction.	CP1, CP2	Moderate / Substantial
Disruption in vehicular access to 73 Manor Avenue during construction	CP1, CP2	Moderate / Substantial
Disruption in vehicular access to 871 Auchmill Road during construction.	CP1, CP2	Moderate / Substantial
Community Land and Property		
Acquisition and demolition of Middlefield Community Project Office and Nursery (8 Logie Place).	n/a	Substantial
Acquisition and demolition of Logie Neighbourhood Services (2A and 2D Logie Place).	n/a	Substantial
Acquisition and demolition of Logie Health Clinic (2B and 4A Logie Place).	n/a	Substantial
Community Severance		
Relief from existing reference at Location Reference 3 (A90(T) North Anderson Drive at Haudagain junction) and Location Reference 4 (A96(T) Auchmill Road at Haudagain junction).	n/a	Moderate (Beneficial)
New severance at Location Reference 8 (Proposed Scheme Link Road at A90(T) North Anderson Drive) and Location Reference 10 (Proposed Scheme Link Road at A90(T) Auchmill Road)	n/a	Moderate (Adverse)

Table 20.2: Summary of Significant Residual Impacts – Landscape and Visual

Residual Impact (Direct Impact unless otherwise stated) *Note: WYO = Winter Year of Opening, SFY = Summer, Fifteen Years after Opening.*	**Mitigation Item (where applicable)**	**Residual Impact Significance**
Landscape		
North Middlefield UCA		
Direct Impacts from: • Disruption to townscape pattern/grain and residential character after demolition of tenement blocks and semi-detached properties. • Introduction of new dual carriageway and associated infrastructure (lighting, signage traffic signals etc.) and traffic. • Open and partial views of new link road and associated infrastructure. • Loss of central communal space and play park at Logie Gardens. • Loss of vegetation and public park space on Manor Terrace and Logie Terrace. • Significant earthworks including embankments and cuttings, particularly cuttings on access road connecting Manor Avenue. • SUDS detention basin with associated earthworks. • Introduction of noise barriers.	LV1, LV2, LV3, LV4,LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV12, LV13, LV14, LV15, LV16	Substantial (WYO) Moderate to Substantial (SFY)
South Middlefield UCA		
Direct Impacts from: • Introduction of a new wider road at Manor Avenue and the A90(T) North Anderson Drive. • Partial loss of private front gardens and boundary vegetation. • Introduction of new access road from Manor Avenue. Indirect Impacts from: • Changes to views due to demolition in adjacent UCA. • Open and partial views of disruption to townscape pattern and disruption to residential character. • Open and partial views along the new route and associated infrastructure. • Open and partial views of significant earthworks including embankments and cuttings particularly cuttings on the access road connecting Manor Avenue. • Open and partial views of noise attenuation in the form of barriers.	LV1, LV2, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV13, LV14	Moderate to Substantial (WYO) Moderate (SFY)
Visual		
Built Receptors with Changes to View		
Receptors 1, 4, 6 and 10	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV12, LV13, LV14, LV16	Moderate (WYO)
Receptors 3, 8, 16, 26 and 29	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV12, LV13,	Moderate to Substantial (WYO)

	LV14, LV15, LV16	Moderate (SFY)
Receptors 12, 13, 17, 25, 27, 30, 34 and 35	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV12, LV13, LV14, LV15, LV16	Substantial (WYO) Moderate to Substantial (SFY)
Receptors 18 and 32	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV13, LV16	Substantial (WYO) & (SFY)
Outdoor Receptors with Changes to View		
O1 (Park)	LV1, LV2, LV3, LV4, LV5, LV7, LV8, LV9, LV10, LV11, LV14	Substantial (WYO) Moderate (SFY)
O2 (Road & Footpath)	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV13	Moderate to Substantial (WYO) Moderate (SFY)
O3 (Road & Footpath)	LV1, LV2, LV3, LV4, LV5, LV7, LV8, LV9, LV10, LV11, LV14	Moderate to Substantial (WYO)
O4 (Road & Footpath)	LV1, LV2, LV3, LV4, LV5, LV6, LV7, LV8, LV9, LV10, LV11, LV12, LV13, LV14, LV16	Moderate (WYO)

Table 20.3: Summary of Significant Residual Impacts – Noise and Vibration

Residual Impact	**Mitigation Item (where applicable)**	**Residual Impact Significance**
During the daytime (short-term) with the proposed scheme with mitigation in place 115 dwellings will experience Moderate adverse noise impacts, and 115 dwellings and one other sensitive receptor will experience Major adverse noise impacts in 2018.	NV4	Moderate to Major Adverse
During the daytime (short-term) with the proposed mitigation in place 26 dwellings will experience Moderate beneficial noise impacts, and 10 dwellings will experience Major beneficial noise impacts in 2018.	NV4	Moderate to Major Beneficial
During the daytime (long-term) with the proposed mitigation in place 158 dwellings and one other sensitive receptor will experience Moderate adverse noise impacts, and 40 dwellings will experience Major adverse noise impacts in 2033.	NV4	Moderate to Major Adverse
During the daytime (long-term) with the proposed mitigation in place six dwellings will experience Moderate beneficial noise impacts in 2033.	NV4	Moderate Beneficial
During the night-time (long-term) with the proposed mitigation in place four dwellings will experience Major adverse noise impacts in 2033.	NV4	Major Adverse