

19 Disruption Due to Construction

This chapter considers the potential disruption impacts of the construction works for the proposed scheme. The operation of equipment and/or the movement of heavy construction traffic can create nuisance including noise, vibration, dust and loss of amenity. Construction activities can potentially impact upon different receptors including local communities and businesses, pedestrian, cyclists and equestrians, and the natural environment.

The main impacts during construction are those relating to temporary traffic disruption, noise, dust, landscape and visual impacts, particularly for receptors in close proximity to the Main Crossing and also the construction compounds situated at Ferrytoll, Queensferry and M9 Junction 1A.

Subject to the implementation of the necessary mitigation measures, it is considered that construction impacts on people and the environment can be suitably reduced or avoided. A key tool for enabling this will be the Code of Construction Practice, which all contractors will be required to adhere to in order to ensure that disruption due to construction is kept to a minimum. Mitigation measures include the use of appropriate screening to reduce noise and visual impacts in the vicinity of the construction compounds as well as best practice measures to reduce disruption such as the layout of the construction compounds and materials storage.

19.1 Introduction

- 19.1.1 This chapter presents the assessment of potential disruptive impacts during construction of the proposed scheme. The chapter is supported by the following appendices, which are cross-referenced in the text where relevant:
- Appendix A19.1: Code of Construction Practice; and
 - Appendix A19.2: Construction Noise Results.
- 19.1.2 As defined by DMRB Volume 11, Section 3, Part 3, (Highways Agency et al., 1994), 'disruption due to construction' is a term which includes the effects on people, properties and the natural environment. Impacts can include nuisance arising from noise, vibration, dust, and loss of amenity, particularly for residents. Such impacts can also affect the setting and amenity of listed buildings in close proximity to the works. Construction activities can impact on routes utilised by different users including vehicles, pedestrians, cyclists and equestrians. The natural environment can also be affected through impacts such as disturbance to wildlife, pollution of watercourses or the storage of materials on ecologically sensitive land.
- 19.1.3 The assessment focuses on the temporary impacts (disruption) during construction. As explained in paragraph 19.2.2, those impacts which would occur during construction but result in long-term or permanent changes that would remain once the proposed scheme is operational, are considered separately in the relevant chapters of this ES.
- 19.1.4 Given the scale of the construction works, and the vital importance of the Forth Road Bridge as part of Scotland's transport network, it is essential to avoid or minimise any activities that may give rise to significant effects. This chapter therefore considers the types of activities that might give rise to significant effects and sets out the appropriate mitigation measures. These measures will form part of a Code of Construction Practice (CoCP) which all contractors will be required to implement as part of the Employers Requirements. The CoCP is provided as Appendix A19.1.
- 19.1.5 The indicative construction programme, including the construction of the Main Crossing and approach roads, is predicted to be over five years. Construction is scheduled to commence in July 2011 at the earliest. Further details of the works required are provided in Chapter 4 (The Proposed Scheme).
- 19.1.6 Land will be acquired through the Bill process for construction compounds in the locations highlighted on Figure 19.1. It is envisaged that the main construction compound would be located to the west of South Queensferry, with smaller compound areas to the west of the M9 Spur at M9 Junction 1A and at Ferrytoll Junction.

- 19.1.7 The location envisaged for the main compound is within Echline Field, west of South Queensferry. However, ongoing community liaison over the course of the design development and assessment revealed local concerns regarding this site. To address these, a potential alternative location for the main compound, further to the west, has been identified; this alternative site is assessed in Section 19.11 of this chapter.
- 19.1.8 Details of the compound areas are provided in Chapter 4 (The Proposed Scheme). However, it should be noted that the Contractor may wish to create site compounds outwith the areas shown on Figure 19.1 and would need to obtain necessary permissions to do this.

19.2 Approach and Methods

- 19.2.1 The assessment has been undertaken in accordance with the guidelines outlined in DMRB Volume 11, Section 3, Part 3 (Highways Agency et al., 1994). The assessment methodologies are provided in the chapter for the relevant environmental topic area, with the exception of methods specific to construction which are described in this chapter.

Scope of Assessment

- 19.2.2 This chapter assesses those impacts that are generally temporary in nature and include activities that occur either prior to construction, e.g. diversion of services, or during construction. Potential temporary impacts and mitigation measures are considered for the following environmental topics:
- Land Use;
 - Landscape and Visual;
 - Air Quality;
 - Noise and Vibration;
 - Pedestrians, Cyclists, Equestrians and Community Effects; and
 - Vehicle Travellers.
- 19.2.3 As noted in paragraph 19.1.3, impacts which would occur during construction works, but result in long-term or permanent changes that remain once the proposed scheme is operational, are considered separately in the relevant chapters of this ES, with a summary provided in Section 19.9. This applies to the majority of impacts on Geology, Contaminated Land and Groundwater (Chapter 8), Water Environment (Chapter 9), Terrestrial and Freshwater Ecology (Chapter 10), Estuarine Ecology (Chapter 11) and Cultural Heritage (Chapter 14). These chapters provide a detailed technical analysis of the specific issues arising from the proposed scheme. Land Use (Chapter 7) also considers construction impacts where issues such as land-take or disruption may affect the viability of the businesses, therefore resulting in long-term changes.
- 19.2.4 Other issues relevant to disruption due to construction such as safety and security issues are provided in Section 19.10.
- 19.2.5 All reported impacts are considered adverse unless otherwise stated.

Limitations of Assessment

- 19.2.6 As the precise details of the construction programme and approach will be defined by the Contractor, the assessment undertaken in this chapter is based on a set of reasonable, stated assumptions and takes a qualitative approach except where reliable quantitative data are available. Refer to Chapter 4 (The Proposed Scheme) and Appendix A4.1 for an outline of the anticipated construction methods.
- 19.2.7 With regard to construction traffic, the air quality assessment is based on the estimated lorry loads provided in Appendix A4.1. These estimates relate to materials required or disposed of from a

construction site, including estimates of both Heavy Goods Vehicle (HGV) movements and construction worker movements. As the construction period is scheduled to take approximately five years, there is a high level of uncertainty in construction traffic volume data and also routing of traffic.

- 19.2.8 As there are necessarily various uncertainties associated with the construction-related traffic, and reasonable worst-case assumptions have been made with regard to traffic numbers and routing when calculating the contribution of construction traffic-related pollutant concentrations at specific receptor locations, the assessment of significance of air quality impacts is indicative only.

19.3 Land Use

Introduction

- 19.3.1 Land use impacts involve temporary changes in the use of land as a consequence of construction activities.

- 19.3.2 During construction, land-take would be required to allow for:

- the provision of a working corridor for the construction of the proposed scheme including Main Crossing, structures approach roads, drainage and associated earthworks;
- construction compounds including the storage of materials and equipment, temporary site offices, parking, and the possible inclusion of a visitor centre (refer to Figure 19.1 and Chapter 4: The Proposed Scheme for a description of the compounds and visitor centre);
- temporary road diversions and construction access;
- footpath diversions (refer to Section 19.7); and
- the implementation of essential mitigation measures for construction e.g. noise barriers where required for the construction compounds.

- 19.3.3 The land necessary to construct and operate the proposed scheme will be acquired as part of the Parliamentary Bill process. Any land-take required only for the operation of the proposed scheme as well as any resulting changes to the viability of farms or businesses are assumed to be permanent impacts and are assessed in Chapter 7 (Land Use).

Potential Impacts

- 19.3.4 There are a number of local communities, including residential properties, businesses and agricultural land holdings located within close proximity to the proposed scheme. Key land uses potentially affected by disruption due to the construction works are as follows:

- residential properties, particularly those near the construction compounds and Main Crossing works e.g. residents to the west of North Queensferry, South Queensferry and Kirkliston;
- agricultural uses, which includes high quality (prime) agricultural land to the north and south of the Firth of Forth;
- businesses, which include premises located adjacent to construction works along the B981, A8000 and Society Road;
- fields and woodland used for amenity, including areas at St. Margaret's Marsh, land to the west of South Queensferry and also playing fields at Kirkliston Leisure Centre adjacent to the M9 Spur;
- marine uses (commercial and recreational), particularly activities associated with Port Edgar Marina and also creel fishery areas around Beamer Rock and the Forth Rail Bridge); and
- educational facilities, including Dalmeny Primary School which is located approximately 200m of major works.

- 19.3.5 The key potential temporary disruption impacts on land use are those related to:
- changes in access and journey length, including disruption to properties along Society Road (refer to Section 19.8);
 - loss of overspill parking facility for one commercial premises (Deep Sea World) (refer to Figure 7.2);
 - temporary loss of agricultural land (and also amenity areas at South Queensferry) for the construction compounds and works associated with the proposed scheme;
 - temporary loss of some garden areas, including gardens of properties located off Standingstone Road to provide access for the A90 works, land to the east of the Fisheries to provide access for the Main Crossing works, land from Inchgarvie Lodge and Inchgarvie House, and garden ground at numbers 2 and 4 Clufflat to provide access to the construction compound;
 - disruption to cultivation and land management practices, including restrictions to the movement of livestock or machinery and also changes to existing drainage;
 - dust and emission impacts (refer to Section 19.5) which may affect arable crop productions;
 - disruption due to temporary noise, vibration and visual impacts (refer to Sections 19.4 and 19.6);
 - disruption to marine activities during construction of the Main Crossing; and
 - short-term disruption of utility supplies during switchover to new infrastructure, particularly for local businesses.

Mitigation

- 19.3.6 The following measures are proposed to mitigate construction impacts on land use:
- appropriate measures to be undertaken to reduce damage or disturbance to field and forestry drainage systems and to the agricultural capability of soils (refer to Chapter 7: Land Use) (mitigation item DC1);
 - the contractor will seek appropriate consent with the Forth Ports Authority regarding marine traffic and any construction activities that require use of the shipping lanes in the Firth of Forth (mitigation item DC2);
 - maintenance of existing access or provision of alternative access for all properties during construction in accordance with the requirements of the Bill (mitigation item DC3);
 - provision of suitable signage to businesses and local amenities (mitigation item DC4);
 - landowners to be notified in advance of construction works (mitigation item DC5);
 - adherence to best construction practice to control dust generation and disposal (mitigation item DC6);
 - screening to be used to reduce the visual intrusion of construction compounds (mitigation item DC7); and
 - implementation of a Marine Traffic Management Plan specifying procedures and measures to manage operations within the Firth of Forth and reduce the impact of marine works on navigation (mitigation item DC8).
- 19.3.7 Further details of the mitigation measures are provided in the CoCP (Appendix A19.1).

Residual Impacts

- 19.3.8 In line with DMRB guidance, the section outlines key land use impacts arising from construction operations. However given the uncertainties present, it was not considered appropriate to assign a level of significance to individual impacts.

19.3.9 Due to the scale of works necessary, there will inevitably be disruption to local residents and businesses during construction. Construction activities that are likely to be most disruptive to land use include works at the foreshore of the Firth of Forth and associated with the Main Crossing abutments, as well as movement between these areas and the construction compounds. Key uses that are likely to be particularly sensitive to these works include the Queensferry Hotel situated off the B981 north of the Firth of Forth and residential properties (flats) in Inchgarvie House located immediately west of the proposed Main Crossing. To the south of the Firth of Forth, key sensitivities include recreational activities based at Port Edgar, properties located adjacent to the South Queensferry construction compound and also residents and businesses affected by the construction access via Society Road. Within the Firth of Forth, the creel fishing area Beamer Rock would be temporarily lost during construction. Impacts on the viability of businesses or agricultural land interests are detailed separately in Chapter 7 (Land Use).

19.3.10 Claims for reasonable financial compensation can be made for areas of land required as a result of the proposed scheme, severance, injurious affection and disturbance, and will be considered by the District Valuer.

19.4 Landscape and Visual

Introduction

19.4.1 This section considers the temporary changes in the landscape and visual amenity during construction. Landscape and visual impacts reflect the scale of construction required for the proposed scheme, and the sensitivity of the area to changes in views.

19.4.2 The Firth of Forth is a sensitive, open landscape enjoyed by residents and visitors for its extensive views and dramatic setting for the iconic Forth Road Bridge and Forth Rail Bridge. Settlements in Fife, South Queensferry and the estates around South Queensferry would be sensitive to impacts from construction activities.

Potential Impacts

19.4.3 The construction activities associated with the proposed scheme are expected to cause temporary adverse landscape and visual impacts, typically resulting from:

- machinery including drilling rigs, cranes, excavating equipment, dumper trucks, bulldozers;
- transfer of machinery and materials to and from the construction compounds for road works, and to the Firth of Forth for construction of the Main Crossing (including the use of barges and cranes);
- exposed bare earth over the extent of the proposed road construction works;
- highways and structures construction operations;
- site compounds (refer to Figure 19.1) and associated access, parking and office accommodation;
- soil storage mounds and construction materials stockpiles;
- lighting associated with night-time working and construction compounds;
- signs and safety barriers;
- traffic congestion and queuing traffic at road works; and
- temporary works associated with bridge construction operations.

19.4.4 The significance of impacts depends on the scale and duration of construction activities and their location in relation to sensitive receptors. The most significant impacts would therefore be likely to occur in proximity to construction compounds or where major earthworks or structural works are

being carried out. These impacts could directly affect landscape elements or indirectly affect the tranquillity of an area. Visual intrusion from construction activities can impact on views and also reduce the enjoyment of the landscape. The locations where the most significant potential landscape and visual impacts would be likely to occur (from north to south), are shown in Table 19.1 below. Local Landscape Character Areas (LLCAs) are described further in Chapter 12 (Landscape) and temporary impacts during construction on those surrounding the proposed scheme described below.

Table 19.1: Key Potential Landscape and Visual Impacts

LLCA	Potential Landscape Impacts	Potential Visual Impacts
Rosyth, Inverkeithing, Castlandhill, and South Inverkeithing Bay	None.	<ul style="list-style-type: none"> Views of major road and roundabout construction works at Ferrytoll Junction. Views of Main Crossing construction.
Rosyth Industrial Area	<ul style="list-style-type: none"> Temporary construction compound to east of LLCA area. 	<ul style="list-style-type: none"> Views of new rock cuttings. Views of the construction compounds at Ferrytoll Junction.
St. Margaret's Marsh	<ul style="list-style-type: none"> Temporary construction compound to north of LLCA area Major construction works for the main crossing northern approach viaduct. Major construction works for the B981 realignment and new access road to the west of the Dunfermline WWTW. 	<ul style="list-style-type: none"> Views of major construction works for the northern viaduct and Main Crossing. View of any grouting works that may be required adjacent to the northern route between Ferrytoll Junction and Ferry Hill, and adjacent to the southern route between the A8000 and M9 spur (refer to Chapter 8: Geology, Contaminated Land and Groundwater).
Ferry Hills	<ul style="list-style-type: none"> Major construction works for the northern viaduct and Main Crossing. New rock cuttings. Major construction works for construction access roads. 	
North Queensferry	None.	<ul style="list-style-type: none"> Views of major construction works for the Main Crossing.
Firth of Forth	<ul style="list-style-type: none"> Disturbance to calm and tranquil character from barges, cranes and major construction works for the Main Crossing and viaducts at the north and south shores. 	<ul style="list-style-type: none"> Views of major construction works for the Main Crossing and viaducts at the north and south shores.
South Queensferry	<ul style="list-style-type: none"> Major construction works for the southern viaduct and Main Crossing. 	<ul style="list-style-type: none"> Views of major road, roundabout and bridge construction at the Queensferry Junction Views of construction compound and access road to the south abutment. Views of major construction works for the southern viaduct and Main Crossing.
Duddingston (north facing slopes)	<ul style="list-style-type: none"> Temporary construction compound to northeast of LLCA area. Major construction works for the Main Crossing, roads and roundabout at the Queensferry Junction. Major construction works for the southern viaduct and Main Crossing. 	
Hopetoun	None.	<ul style="list-style-type: none"> Distant views of major construction works for the Main Crossing.
Dundas	<ul style="list-style-type: none"> Major construction works at the Queensferry Junction. 	<ul style="list-style-type: none"> Views of the Main Crossing construction and also major road and roundabout works at the Queensferry Junction.
Kirkliston	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> Views of major road, junction and bridge construction at M9 Junction 1A.
Overton	<ul style="list-style-type: none"> Major construction works at Junction 1A. 	
Duddingston (southern slopes)	<ul style="list-style-type: none"> Temporary construction compound at Junction 1A. Major construction works for road. Major construction works for Swine Burn realignment. 	
Newliston	<ul style="list-style-type: none"> Construction works for detention ponds and access road at M9 Junction 1A. 	

Mitigation

- 19.4.5 Mitigation measures proposed to avoid or reduce the potentially adverse landscape and visual impacts on the aforementioned receptors are detailed in the CoCP (Appendix A19.1) and include:
- the layout of construction compounds and storage of materials to reduce disruption through lighting or construction traffic. Where practicable, existing trees to be retained and screening in the form of bunds and barriers provided (mitigation item DC9);
 - works to be programmed to minimise disruption period (mitigation item DC10);
 - night-time working is to be restricted to essential activities to minimise light pollution (mitigation item DC11); and
 - dust and noise to be kept to a minimum by providing mitigation measures (mitigation item DC12).

Residual Impacts

- 19.4.6 The key landscape and visual impacts, as identified above, are temporary in nature. The proposed mitigation measures will help to reduce the landscape and visual impacts during construction. However, due to the extensive construction works necessary, these can not be completely mitigated.

19.5 Air Quality

Introduction

- 19.5.1 Construction of the proposed scheme would contribute to local emissions of air pollutants. The impact of construction activities depends on the potential for emissions (type of activities) and also the effectiveness of control measures. There are two main sources of emissions that will need to be controlled:
- exhaust emissions from site plant, equipment and vehicles (including the pollutants NO_x, PM₁₀, PM_{2.5} volatile organic compounds (VOCs), and carbon monoxide (CO)); and
 - fugitive dust emissions from site activities.
- 19.5.2 Emissions from the operation of site equipment, vehicles and machinery are unlikely to be significant, particularly in comparison to levels of similar emissions from road traffic. These emissions have therefore not been considered further in this assessment. The following sections focus on construction traffic emissions (offsite effects) and dust nuisance potential.
- 19.5.3 Impacts are discussed in relation to the following three separate, discrete construction areas:
- Ferrytoll: including construction works for the Main Crossing northern approach, Ferrytoll Junction and associated construction compound activities;
 - South Queensferry: including construction works for the Main Crossing southern approach, Queensferry Junction and associated construction compound activities; and
 - M9 Junction 1A: works and construction compound activities associated with this junction.

Construction Traffic Emissions – Approach to Assessment

- 19.5.4 The assessment of construction traffic emissions is based on the likely construction routes identified for the majority of construction vehicles and also estimates of construction traffic (refer to Chapter 4: The Proposed Scheme and Appendix A4.1: Construction Information).
- 19.5.5 The DMRB screening tool (model version 1.03c, Highways Agency, July 2007) has been used to calculate the contribution of these construction vehicles to pollutant concentrations at discrete

receptor locations. The DMRB method is a relatively crude way of calculating pollutant concentrations at defined receptor locations generated by road traffic. DMRB defines the following thresholds above which traffic flows could influence local air quality significantly:

- road alignment will change by 5m or more;
- annual average daily traffic flows (AADT) will change by 1,000 or more;
- Heavy Goods Vehicle (HGV) flows will change by 200 AADT or more;
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20 km/hr or more.

19.5.6 Receptors, such as residential properties, schools or hospitals, which are closest to affected road links and where the greatest change in local air quality would be expected as a result of the construction activities were identified and chosen as DMRB receptor locations.

19.5.7 In order to establish total pollutant concentrations, the construction traffic contribution was added to a background concentration generated by other vehicles travelling on the affected roads, and a road increment. Due to the level of uncertainty associated with construction traffic and a lack of traffic information for the year of construction assessment (2012), it was considered appropriate to assume a range of NO₂ concentrations (total concentrations). Based on the results of the air quality monitoring and modelling presented in Chapter 15 (Air Quality), NO₂ concentrations of between 15µg/m³ and 35µg/m³ and a range of PM₁₀ concentrations between 8µg/m³ and 16µg/m³ have been assumed. The significance criteria, described in Chapter 15 have also been used to assess the construction traffic related impact significance and are based on percentage change. The use of a range in NO₂ and PM₁₀ concentrations provides for consideration of the sensitivity of the significance criteria to non construction traffic contributions.

Dust Nuisance – Approach to Assessment

19.5.8 Dust is the generic term used to describe particulate matter in the size range 1-75 µm (micrometers) in diameter (British Standards Institution, 1987). Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition and is defined as a statutory nuisance by the Environmental Protection Act (1990). There are no relevant standards or guidelines in the UK however, an informal criterion of 200-250 mg/m²/day (as a 30 day average) is often applied as an indicator of potential nuisance.

19.5.9 Monitoring and assessment of construction sites in the UK indicates that any elevation in dust deposition rates (which can lead to dust nuisance) or ambient concentrations of particulates (PM₁₀) is limited to well within 200m of the construction works boundary. Within this distance, there is significant potential for air quality impacts on sensitive receptors such as residential units, schools, hospitals and care homes, without careful site management. The assessment therefore considered impacts on sensitive receptors within 200m of the construction works boundary instead of the 100m suggested by DMRB.

19.5.10 Fugitive dust emissions from construction activities are likely to be variable depending on the type and extent of the activity, soil conditions (soil type and moisture), road surface condition and weather conditions. Soils are inevitably drier during the summer period and periods of dry weather combined with higher than average winds have the potential to generate the most dust. Activities that are the most significant sources of fugitive emissions comprise:

- demolition activities, due to the breaking up and size reduction of concrete, stone and compacted aggregates;
- earth moving, due to the excavation, handling, storage and disposal of soil and subsoil materials;
- construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement powder and sand), and on site treatment to re-use materials;

- movement of heavy site vehicles on dry untreated or hard surfaced surfaces; and
- movement of vehicles over surfaces contaminated by muddy materials brought off the site, for example over public roads.

19.5.11 Construction dust impacts have been assessed following a risk-related approach adapted from the Greater London Authority (GLA) and London Councils' Best Practice Guidance. Whilst the guidance has been produced by the GLA and London Councils, it can equally be applied to construction sites outside London.

19.5.12 The assessment involved a review of the proposed demolition and construction works to determine the potential for dust nuisance and hence, additional mitigation required. This included the following steps:

- 1) Assign a preliminary risk category in accordance with Table 19.2, taking into account the number of dust sensitive receptors and the distance from the assessed construction activity.
- 2) Identify the scale of potential of the construction works to cause dust. Construction activities are categorised into different dust raising potential classes (high e.g. earthmoving, excavation, grading, stockpiling and crushing; medium e.g. concrete batching, loading and unloading of vehicles, demolition, grinding, grit blasting and transport; and low e.g. land filling, cutting, burning of material and traffic of dirty vehicles).
- 3) Identify the anticipated duration of the dust raising activities.
- 4) Apply the outcome of steps 2) and 3) above to the matrix in Table 19.3 to identify any adjustments to the categorisation of High, Medium, or Low risk in Table 19.2.

Table 19.2: Potential Dust Nuisance

Distance from Site Boundary	Number of Sensitive Properties		
	0-10	11-100	101-1000
0-25 m	High	High	High
25-50 m	Medium	High	High
50-100 m	Low	Medium	Medium
100-200 m	Negligible	Low	Low

Table 19.3: Scale of Dust Nuisance Potential

Duration of Dust Raising Activities	Dust Raising Potential		
	Low	Medium	High
0-3 months	No adjustment	No adjustment	No adjustment
3-6 months	No adjustment	No adjustment	Increase by one step
6-12 months	No adjustment	Increase by one step	Increase by two steps
>12 months	Increase by one step	Increase by two steps	Increase by two steps
One step – from 'negligible' to 'low', 'low' to 'medium', 'medium' to 'high'			
Two steps – from 'negligible' to 'medium', 'low' to 'high' or 'medium' to 'high'			

Potential Impacts

Main Crossing

19.5.13 Traffic movements assumed for the purposes of assessment have been developed on the basis of the construction activities required for the Main Crossing, and taking into account that some materials and components will be transported up the Firth of Forth and not by road.

Typical Traffic Movements

- 19.5.14 Assumed HGV delivery traffic movements associated with the construction of the Main Crossing have been converted into AADT values. These are broken down into deliveries for the north and south.
- 19.5.15 The following average HGV traffic flows can be expected:
- 8 AADT to the north over a five year period assuming a six day working week; and
 - 31 AADT to the south over a period of five years, assuming a six day working week.

Peak Traffic Movements

- 19.5.16 It is acknowledged that there are periods of elevated traffic numbers and periods of time when there is less than average construction traffic.
- 19.5.17 For the Main Crossing deliveries to the north, peak traffic movements have been identified as a five month period in the middle of 2012 and a six month period in the middle of 2015, when the planned establishment (2012) and reinstatement (2015) of the access takes place. The resulting increased HGV movements for these periods are as follows:
- 2012: 12 HGV/day for a five month period, which averages to 10 HGV AADT; and
 - 2015: 10 HGV/day for a six month period, which averages to 10 HGV AADT.
- 19.5.18 For the Main Crossing deliveries to the south, peak traffic movements have been identified as a four month period in the beginning of 2012 and a three month period in the beginning of 2016, when it is anticipated that placement (2012) and removal (2016) of the earth bund take place. The resulting increased HGV movements for these periods are as follows:
- 2012: 90 HGV/day for four months averages to 51 HGV AADT; and
 - 2016: 107 HGV/day for three months averages to 50 HGV AADT.
- 19.5.19 To account for uncertainties in HGV numbers and duration of peak periods, the calculated HGV AADT is rounded up to the nearest 50. The resulting peak HGV movements are therefore 50 AADT for the north and 100 AADT for the south.

Network Connections (proposed scheme north and south of the Firth of Forth)

- 19.5.20 Estimated deliveries for the proposed scheme in the vicinity of Ferrytoll, South Queensferry and M9 Junction 1A (see paragraph 9.5.3) are summarised in Table 19.4 below.

Table 19.4: Estimated Construction Movements for Network Connections

Compound	Average Trips per Week		HGV AADT
	Earthworks	Pavement Construction	
Ferrytoll	96	65	46
South Queensferry	164	100	75
M9 Junction 1A	224	50	78

- 19.5.21 In addition, the numbers of workers and visitors travelling to the construction compounds have been estimated based on available car parking spaces. Assuming 100% occupancy, the traffic flows for construction workers and visitors are shown in Table 19.5.

Table 19.5: Additional Construction Related Traffic – Workers and Visitors

Compound	Number of Car Parking Spaces	AADT
Ferrytoll	60	120
Queensferry	365	730
M9 Junction 1A	60	120

19.5.22 A number of routes in the vicinity of the construction sites have been identified as unsuitable for construction traffic due to their proximity to sensitive receptors. Traffic routing would be discussed with the local authorities. For the purposes of this assessment, the following routing assumptions have been made with regard to access to the construction compound locations:

- Ferrytoll Junction: assumed that routes through Inverkeithing and Castlandhill would be restricted i.e. B981 and B980.
- Queensferry Junction: assumed that routes through South Queensferry would be restricted i.e. B924, B907.
- M9 Junction 1A: assumed that routes through Winchburgh and Broxburn would be restricted i.e. B8046, B8020 and sections of the B9080. It is assumed that the A8000 would also be restricted.

19.5.23 Based on the above restrictions, receptors have been selected on the remaining permitted routes to assess the impact of construction traffic. It has been assumed that all construction traffic travels along the route adjacent to or closest to the chosen receptor, representing the worst-case scenario. Tables 19.6-19.8 set out the modelled receptors, their distance to the road and the contribution of construction traffic to annual mean NO₂ and PM₁₀ concentrations for receptors affected by the three construction areas defined in paragraph 19.5.3. As the detailed design of the haul roads is unknown at this stage, potential diversions or widening works could reduce the distance to the modelled receptors. An arbitrary receptor at 10m from the road is therefore included to provide a worse-case.

19.5.24 As stated in paragraph 19.5.7, a range has been assumed for the annual mean NO₂ and PM₁₀ concentrations hence, the magnitude of change and significance are also presented as a range.

Table 19.6: Construction Traffic Contribution to Emissions - Ferrytoll

Receptor	Distance to Road	Road	Construction Traffic Contribution (mg/m ³)		Key Assumptions
			NO ₂	PM ₁₀	
50 Admiralty Road, Rosyth	14m	Admiralty Road A985	0.76	0.13	All construction traffic (Main Crossing north and Ferrytoll compound) uses the A985.
	94m	Slip Road northbound M90			
	149m	Slip Road southbound M90			
25 Craig Street, Rosyth	45m	M90 northbound	0.22	0.03	All construction traffic uses the M90.
	58m	M90 southbound			
18 Whinnyhill Crescent, Inverkeithing	85m	M90 southbound	0.09	0.01	All construction traffic uses the M90.
	100m	M90 northbound			
Receptor at 10m Distance (arbitrary receptor)	10m	A Road	0.77	0.13	All construction traffic uses the A Road.

Table 19.7: Construction Traffic Contribution to Emissions – South Queensferry

Receptor	Distance to Road	Road	Construction Traffic Contribution (mg/m ³)		Key Assumptions
			NO ₂	PM ₁₀	
21 Echline, South Queensferry	10m	Builyeon Road, A904	1.19	0.23	All traffic for the South Queensferry compound and Main Crossing south travels along A904 Builyeon Road.
1a Dundas Home Farm, South Queensferry	108m	A90 eastbound	0.12	0.02	All traffic for the South Queensferry compound and Main Crossing south travels along the A90.
	122m	A90 westbound			
8 Main Street, Newton	8m	Main Street, A904	1.25	0.24	All traffic for the South Queensferry compound and Main Crossing south travels along the A904 Main Street.

Table 19.8: Construction Traffic Contribution to Emissions - M9 Junction 1A

Receptor	Distance to Road	Road	Construction Traffic Contribution (mg/m ³)		Key Assumptions
			NO ₂	PM ₁₀	
28 Buie Rigg, Kirkliston	11m	Main Street B9080	0.83	0.14	All construction traffic for the M9 Junction 1A compound uses the B9080 and all construction traffic for the Queensferry Compound and Main Crossing south use the M9 Spur.
	42m	M9 Spur southbound			
	59m	M9 Spur northbound			
95 King Edwards Way, Kirkliston	31m	M9 eastbound	0.83	0.15	All construction traffic for the M9 Junction 1A compound and all traffic for the South Queensferry compound and Main Crossing south use the M9.
	49m	M9 westbound			
93 Ratho Station, Newbridge	14m	Glasgow Road eastbound	1.25	0.24	All construction traffic for the M9 Junction 1A compound and all traffic for the South Queensferry compound and Main Crossing south use Glasgow Road.
	28m	Glasgow Road westbound			
6 Queen's Avenue, Broxburn	18m	A89	1.32	0.25	All construction traffic for the M9 Junction 1A compound and all traffic for the Queensferry compound and Main Crossing south use the A89.
Receptor in 10m Distance (arbitrary receptor)	10m	A Road	1.59	0.32	All construction traffic for the M9 Junction 1A compound and all traffic for the Queensferry compound and Main Crossing south use the A Road.

- 19.5.25 For the construction areas at Ferrytoll and South Queensferry, the magnitude of change for receptors listed in Tables 19.7 and 19.8 with regards to annual mean NO₂ concentrations varies from extremely small to small. The associated significance is Negligible to Slight. The magnitude of change for PM₁₀ concentrations ranges from extremely small to very small and the associated impact significance is Negligible to Slight.
- 19.5.26 For the construction area at M9 Junction 1A, the magnitude of change for receptors listed in Table 19.8 with regards to annual mean NO₂ concentrations varies from very small to medium. The significance is Negligible to Slight Adverse. The magnitude of change for PM₁₀ ranges from extremely small to very small and the significance is Negligible to Slight.

Dust Nuisance

- 19.5.27 Key construction activities with the potential to create dust include top soil stripping, bulk excavation, drilling, grouting and import of materials, handling of soils, spoils and aggregates. In addition at Ferrytoll, potential dust raising activities include blasting which may be required for particular rock cuttings at Ferrytoll. Construction works at South Queensferry include demolition of the existing A8000 bridge and at the M9 Junction 1A, the partial demolition of the existing bridge over the B9080. The counts of sensitive properties within 200m of these construction areas are provided in Table 19.9.
- 19.5.28 Areas potentially affected by construction works at Ferrytoll include North Queensferry, Rosyth and Inverkeithing. Topographical features that might act as a dust barrier for receptors in Inverkeithing have not been considered in this assessment. There are 428 sensitive receptors within 200m of the construction area at Ferrytoll. All of the affected receptors are residential units.
- 19.5.29 Different residential areas within South Queensferry and also part of Dalmeny would be potentially affected by the construction activities. There are 862 sensitive receptors within 200m of the South Queensferry construction area. There is one school (Dalmeny Primary School) (as shown on Figure 17.2) within 50m of the construction area while the remaining receptors are residential properties. Although Dalmeny Primary School is situated close to the edge of the works area, it is approximately 200m from any major works with few disruptive activities to be undertaken within 50m.
- 19.5.30 Residential properties in Kirkliston would be potentially affected by the construction activities at the M9 Junction 1A. There are 237 sensitive receptors (all of them residential properties) located within 200m of this construction area.

Table 19.9: Number of sensitive receptors

Distance from site boundary	Number of sensitive receptors		
	Ferrytoll	South Queensferry	M9 Junction 1A
0-25m	2	66	35
25-50m	19	86	27
50m-100m	110	190	48
100m-200m	297	520	127
Total	428	862	237

- 19.5.31 According to the criteria specified in Table 19.2, the risk of dust nuisance experienced by all receptors within 50m is considered High, whilst the dust nuisance potential for receptors within 100m and within 200m is considered to be of Medium and Low risk, respectively. Due to the high dust nuisance potential at 21 receptors at Ferrytoll, 152 receptors at South Queensferry and 62 receptors at M9 Junction 1A, the potential for dust is considered to be significant for all construction areas. Best practice mitigation measures, as identified below, would be therefore be required independent of the length of construction period or methods applied.
- 19.5.32 The GLA Best Practice Guidance notes that the implementation of the suggested mitigation measures will help reduce the impact of construction activities to a Medium or Low risk. However, it is likely that for receptors in very close proximity to construction activities (specifically Inchgarvie House where the construction site boundary for the Main Crossing is within 3m of the property), even the effective employment of all proposed mitigation measures may not be completely effective and the risk at these receptors would therefore remain higher during certain activities.

Mitigation

- 19.5.33 During the construction period it will be necessary to apply best practice mitigation measures which are detailed in the CoCP (refer to Appendix A19.1). Specific requirements for contractors include:

- the Contractor will employ Best Practicable Means to control dust and air quality pollution (mitigation item DC13);
- the Contractor will implement a Dust and Air Quality Management Plan to limit dust and air pollution from the transportation and storage of materials and to limit emissions from construction plant and vehicles (mitigation item DC14);
- traffic routing, site access points and hours of operations will be discussed with Fife Council, West Lothian Council and City of Edinburgh Council to reduce potential impacts on local receptors (mitigation item DC15);
- a dust and air quality monitoring programme for construction activities will be agreed with the local authorities (mitigation item DC16); and
- blasting works will be avoided where reasonably practicable (mitigation item DC17).

Residual Impacts

- 19.5.34 Dust nuisance is considered to have a residual impact of medium to low risk after mitigation and would occur on a short to medium term basis only, although it is considered that there may be a higher risk of dust impact during certain construction activities occurring close to Inchgarvie House. The residual effects of construction related vehicle emissions are Negligible to Slight and would occur on a medium term basis only. No long-term residual impacts on air quality are anticipated in relation to the construction works for the proposed scheme.

19.6 Noise and Vibration

Introduction

- 19.6.1 Noise and vibration are key issues associated with the construction works and can impact on various different receptors. This assessment focuses on noise and vibration impacts on human receptors. Impacts on ecological and cultural heritage are considered separately in Chapter 10 (Terrestrial and Freshwater Ecology), Chapter 11 (Estuarine Ecology) and Chapter 14 (Cultural Heritage). The assessment has been carried out following DMRB Volume 11, Section 3, Part 3 (Highways Agency et al., 1994). Consistent with this guidance, the approach has been refined and augmented using professional judgement taking into account the nature of this project and its context. The results of the construction noise appendix are provided in Appendix A19.2 (Construction Noise Results).

Study Area

- 19.6.2 Consistent with the requirements of BS5228-1 Code of practice for noise and vibration control on construction and open sites: Part 1 Noise (British Standards Institution, 2009) and good practice, the study area includes all receptors that are potentially sensitive to noise and vibration and which are within 300m of the proposed scheme.
- 19.6.3 The number of receptors within study area: 2,301 residential, 36 commercial and one school (Dalmeny Primary School).
- 19.6.4 However there are few properties close to the project with only 238 residential receptors within 100m of the proposed construction works.

Policy and Legislative Context

Control of Pollution Act (HMSO, 1974)

- 19.6.5 The Control of Pollution Act (CoPA) gives local authorities powers to control noise or vibration pollution from construction site, using primarily two mechanisms:

- Section 60 enables a Local Authority to serve a notice specifying its noise or vibration control requirements with respect to steps to minimise noise and vibration that may include plant or machinery that may or may not be used, limits on hours of working, and emission or reception limits on noise or vibration generated by the works.
- Section 61 relates to prior consent, and provides a local authority and those responsible for construction works a means to agree in advance, the construction methods and the associated steps to minimise noise and vibration. A 'Section 61 consent' is in essence a Section 60 notice agreed between those responsible for the works and the local authority in advance of the works being undertaken.

19.6.6 In respect of both Section 60 and Section 61, it is acceptable that Best Practicable Means have been used to minimise noise (including vibration). Section 72 of CoPA presents the definition of Best Practicable Means, which is a mechanism for balancing noise and vibration levels with reasonably practicable mitigation (the definition is provided in the ES glossary).

Environmental Protection Act 1990 (EPA)

19.6.7 The EPA 1990 requires councils to investigate noise disturbance and serve an abatement notice, under Section 80 of the Act, if the noise (including vibration) is considered to constitute a statutory nuisance. Section 82 of the Act also enables individuals to apply to a sheriff court and seek that an abatement notice is served. Defence against abatement action includes that Best Practicable Means is employed to minimise noise and, with respect to abatement action under Section 80 of the Act, that the works are being undertaken in accordance with the conditions imposed on a prior consent granted under the CoPA.

BS 5228: Parts 1 and 2: Code of Practice for Noise and Vibration Control on Construction and Open Sites, 2009

19.6.8 BS 5228 provides guidance on the assessment and mitigation to control noise and vibration from construction operations. The standard also provides a calculation methodology and source noise level database for construction equipment to support the quantitative assessment of construction noise. The standard also provides a reference to the calculation methodology presented in the Transport Research Laboratory (TRL) report 429 for predicting construction vibration from specific activities.

Department of Environment (DoE) Advisory Leaflet (AL)72 (1976)

19.6.9 Advisory Leaflet (AL) 72 recommends that daytime construction noise levels at the facades of noise sensitive receivers should not exceed:

- 75 dB LAeq, 12h in urban areas near to main roads or in heavy industrial areas; or
- 70 dB LAeq, 12h in rural, suburban and urban areas away from road traffic and industrial noise.

19.6.10 AL72 also advises that noise limits should be 10dB(A) lower for the evening period, if any such works are agreed, to take account of increased noise sensitivity outside the working day and reduced background noise levels. Noise criteria for major infrastructure projects over the last 30 years have been generally set on the basis of AL72.

Local Consultation and Policies

19.6.11 There are three local authorities within the study area: City of Edinburgh Council, Fife Council and West Lothian Council. Discussions have been held with all three authorities to determine their approach to the control of construction noise and vibration:

- City of Edinburgh Council has a code for construction noise that includes stated limits of 75dB LAeq, 07:00-19:00 Monday to Saturday with no working on Sundays or outside 07:00 – 19:00.

- West Lothian Council has confirmed that it applies an equivalent code to the City of Edinburgh Council.
- Fife Council has no standard code or policy with respect to construction. However, the officers of Fife Council have advised that certain construction works e.g. works on the A90, should be undertaken during the evening in order to minimise potential traffic disruption.

19.6.12 For large and long-term construction projects it is good practice for project promoters to identify the need for extended working hours and the mitigation frameworks that will be employed to minimise the adverse effects potentially caused by the construction noise and vibration, in a Code of Construction Practice.

Construction Noise and Vibration Assessment Methodology

Construction Noise

19.6.13 Airborne noise from construction activities has been calculated using the methodology specified in BS5228: Part 1: 2009 and taking account of mitigation as described in paragraph 19.6.31. The quantitative noise assessment has considered the main construction activities as set out in Appendix 4.1 (Sections 4 and 5) that could give rise to appreciable levels of environmental noise at receptors within the study area. The construction programme is also set out in Appendix A4.1 (Section 3) and this has also formed the basis for the assessment.

19.6.14 The construction noise assessment categories for the proposed scheme are presented in Table 19.10. These are based upon the local authority daytime noise limits, guidance in AL72 and BS5228: Part 1: 2009 and are widely used for major infrastructure projects across the UK. The criteria are guided by the prevailing baseline ambient noise levels in the locale of the receptor/receptors.

Table 19.10: Construction Noise Impact Criteria

Period	Assessment Category, dBL _{Aeq}		
	A	B	C
Night	45	50	55
Evening	55	60	65
Day	65	70	75

- Category A: are threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are less than these values;
- Category B: are values to use when ambient noise levels (rounded to the nearest 5 dB) are the same as category A values; and
- Category C: are values to use when ambient noise levels (rounded to the nearest 5 dB) are higher than category A values.

19.6.15 An impact is defined as where the predicted construction noise level is equal or greater than the relevant assessment category. Where an impact is predicted on the above basis for residential receptors then the potential for the resulting noise to cause an adverse effect is evaluated for an area taking account of matters such as:

- number of receptors subject to the noise impact;
- the proportion of the community subject to the impact; and
- existing absolute noise levels (particularly very noisy and quiet / tranquil areas).

19.6.16 Where an impact is predicted on the above basis for a non-residential noise sensitive receptor then the potential for the resulting noise to cause an adverse effect is evaluated on a receptor-by-receptor basis taking account of matters such as:

- the receptor's use (e.g. educational, healthcare, religious or community);
- the times of use;
- the existing internal noise levels compared to relevant guidance on noise for the particular use; and
- the design of the receptor (e.g. whether the building envelope – i.e. sound insulation provided by windows, doors and ventilation systems - are sufficient to protect the internal environment from any noise impact on the environment outside the receptor).

19.6.17 Further discussion on noise significance criteria is presented in Chapter 16 (Noise and Vibration).

Construction Vibration

19.6.18 A construction vibration assessment has been undertaken for specific activities which have the potential to generate significant levels of vibration.

19.6.19 Few construction activities give rise to appreciable groundborne vibration. The quantitative groundborne vibration assessment has therefore been undertaken for the currently foreseen construction activities outlined in Appendix A4.1 that could give rise to appreciable vibration at receptors within the study area. In decreasing order of potential vibration impact these are:

- removal of rock to create the access road to the north abutment;
- compaction / vibro rolling of new road sub-grade and road surfacing;
- impact driven piles (steel columns for temporary access trestle / jetty and sheet piles for coffer dams for main cross piers S5 and S6); and
- blasting (Beamer Rock and North of the Firth of Forth, at pinch point between one of the new slip roads and the railway corridor).

19.6.20 Vibration predictions have been made based upon the information presented in:

- Transport Research Laboratories (TRL) Report 429, Ground Vibration caused by Mechanised Construction Works, 2000;
- BS5228: Part 2: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites: Vibration, British Standards Institute; and
- BS6472: Part 1: 2008 Guide to evaluation of human exposure to vibration in buildings (1Hz to 80Hz), specifies guidance regarding human response to vibration (refer to Table 19.11).

19.6.21 The TRL methodology predicts the Peak Particle Velocity (PPV). To assess the effect on people, the predicted PPV have then need to be scaled to estimate Vibration Dose Values (VDV) used to assess human response to vibration as discussed later in this section. PPV have been scaled to VDV using the following relationship: $eVDV$ (estimated VDV) = $50.3 \times PPV \times t^{0.25}$, where, t is total 'on time' over which the PPV is predicted to occur during the course of the day or night-time assessment periods. This method will over-estimate VDV and therefore represents a conservative approach.

Construction Vibration – Assessment Criteria

19.6.22 Criteria and procedures for vibration control are specified for three purposes and assessed using three different sets of parameters:

- to protect the occupants and users of buildings from disturbance, for which the VDV's are assessed (VDV's are defined and their application to occupants of buildings is discussed in BS6472);

- to protect buildings from risk of physical damage, for which peak component particle velocities are assessed in accordance with BS 7385; and
- to protect particularly vibration-sensitive equipment and processes from damage or disruption, for which peak component acceleration, velocity or displacement are assessed as appropriate to each process or item of equipment.

19.6.23 In some buildings, two or three of the above sets of criteria may apply, and in those cases the contractor will evaluate the criteria separately. In establishing criteria, controls and working methods, the contractor shall take account of guidance in BS6472, BS5228 and BS7385.

19.6.24 To assess the impact of construction vibration on the occupants and users of buildings, it is standard practice to use the following VDV's defined in BS 6472: 2008 as the basis for assessment criteria.

Table 19.11: Human response to vibration dose value ranges in BS6472

Place and time	Low probability of adverse comment (ms ^{-1.75})	Adverse comment possible (ms ^{-1.75})	Adverse comment probable (ms ^{-1.75})
Residential buildings (16h day)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings (8h night)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

19.6.25 To evaluate the magnitude of any vibration impact, assessment categories defined in Table 19.12 have been defined.

Table 19.12: Vibration Impact Magnitude Criteria: Human Response

Impact Classification	VDV (ms ^{-1.75}) Daytime (07:00-23:00)	VDV (ms ^{-1.75}) Night time (23:00 – 07:00)
Negligible	<0.2	<0.1
Minor	> 0.2 and ≤0.4	>0.1 and ≤0.2
Moderate	> 0.4 and ≤0.8	> 0.2 and ≤0.4
Major	> 0.8	> 0.4

Notes: Measured on a normally-loaded floor of any bedroom or living room

19.6.26 Guidance to protect against building damage is provided within BS7385: Part 2: 1993 Evaluation and measurement of vibration in buildings: Guide to damage levels from ground borne vibration. The Standard notes that the risk of damage (even cosmetic damage) to modern robust buildings from transient vibration tends to zero below a peak particle velocity of 12.5mm/s. For convenience and to err on the side of caution, this value is often rounded down to 10mm/s PPV and this forms the basis of DMRB (HA 213/08).

19.6.27 When considering continuous vibration it is generally accepted that the guide values should be reduced by up to 50%. The criteria in Table 19.3 have therefore been adopted to identify potential significant adverse effects on buildings arising from the proposed scheme construction vibration.

Table 19.13: Construction Vibration Significance Criteria: Building Damage

Category of Building	Threshold of Significant Effect (Peak Particle velocity at building foundation)
Continuous vibration	5 mm/s
Intermittent vibration	10 mm/s

Potential Impacts

19.6.28 A review of the construction activities for the proposed scheme indicates that the following may give rise to potentially significant noise impacts:

- removal of the 'cap' of Beamer Rock to form the foundations for the central tower of the Main Crossing (a series of very short noise events rather than a contributor to the ambient noise levels);
- top driven steel tubular piles to support the temporary jetties used to provide access to the pier locations for the north and south approach structures for the Main Crossing;
- marine (bored) piling off the north and south shore of the Firth of Forth;
- mechanical rock breaking on the northern shore of the Firth of Forth for the construction of the north abutment;
- sheet piling for the temporary bund off the south shore of the Firth of Forth;
- construction of the south abutment; and
- construction of main highway works (a series of activities including drainage, earthworks, sub-grade, pavement laying, installation of highway furniture that can be noisy in the immediate vicinity of the activity but which do not occur at the same time in any one location and each of which is generally of a short duration at any one location).

19.6.29 It should be noted that many marine works will have to be undertaken at night-time or weekends to work around tidal constraints and to allow works to progress at a reasonable rate.

19.6.30 A review of the construction activities for the proposed scheme indicates that the following may give rise to potentially significant vibration impacts:

- removal of rock to create the access road to the north abutment;
- compaction / vibro rolling of new road sub-grade and road surfacing;
- impact driven piles (steel columns for temporary access trestle / jetty and sheet piles for coffer dams for main crossing piers S5 and S6); and
- blasting (e.g. Beamer Rock and North of the Firth of Forth near Ferrytoll). The potential impact of the Beamer Rock activities on ecological receptors is considered in Chapter 10 (Terrestrial and Freshwater Ecology) and Chapter 11 (Estuarine Ecology).

Mitigation

19.6.31 The following mitigation measures to control noise and vibration are included within this assessment:

- the Contractor will implement the CoCP (refer to Appendix A19.1) (mitigation item DC18);
- the Contractor will be required to develop and implement a Noise and Vibration Management Plan which will include noise and vibration monitoring (mitigation item DC19);
- use of Best Practicable Means as defined in Section 72 of the Control of Pollution Act to minimise noise (including vibration) during construction (mitigation item DC20);
- use of Best Practicable Means will be employed to minimise construction activities undertaken outside of 07:00 to 19:00 Monday to Saturday (mitigation item DC21);
- defining of noise thresholds. Should the contractor identify that it will need to work outside the threshold levels then it will need to seek prior approval from the local authority under Section 61 of the Control of Pollution Act and will need to carry out, or provide a grant in respect of, noise insulation to the affected properties (the noise insulation work would be provided in accordance with the Noise (Insulation) Scotland Regulations 1975) (mitigation item DC22);
- no impact piling shall be undertaken at night (mitigation item DC23);
- a bund/barrier, to a height of approximately 5m, shall be constructed on the eastern-side of the main construction compound to screen adjacent receptors on the west side of South Queensferry (mitigation item DC24);

- solid site hoardings will be provided where necessary and reasonably practicable between worksites and noise sensitive receptors to a height sufficient to break line of sight from the windows of habitable rooms to significant construction noise sources (mitigation item DC25); and
- where identified, any mitigation (permanent or temporary) will be installed early to afford the receptor the maximum benefit (mitigation item DC26).

Residual Impacts

19.6.32 The results of the construction noise assessment are presented in Appendix A19.2 and Figures 19.2 and 19.3. A summary of these results is presented in Table 19.14.

Table 19.14: Summary of Construction Noise Impacts

Receptor Address	No. of receptors	Day	Evening	Night	Duration
St Margaret's Hope (also known as Admiralty House)	1	✓	-	-	4 months
Tigh-na-grian	2		-	✓	5 months
Inchgarvie House	1 (10 flats)	✓	-	-	6 months
St. Margaret's Hope Lodge	1	✓	-	-	2 months

19.6.33 The adverse construction noise impact of the project is low because there are few receptors close to the major works and because of the mitigation provided by the measures set out in the CoCP.

19.6.34 Whilst a small number of individual residential receptors are predicted to be subject to a noise impact, they are isolated properties and hence in the context of this national scheme are not considered to constitute significant adverse effects requiring additional mitigation (over and above that set out in the CoCP).

19.6.35 Consultation is being undertaken with the owners and operators of Queensferry Hotel. The impact is predicted as consequence of daytime construction noise whereas the hotel is most sensitive to noise at night.

19.6.36 Only three properties, St Margaret's Hope/Admiralty House (owned by Transport Scotland); St Margaret's Hope Lodge (owned by Transport Scotland); and Inchgarvie House, are very close to the main construction works (Main Crossing and/or network connections). The assessment has identified the periods over which these receptors are likely to experience significant noise impacts from construction activities. The mitigation to be provided and the varying nature (and noise) of the works means that these receptors are likely to be subject to significant noise impacts for only a few months of the five year construction programme. However, given the close proximity of these receptors it is inevitable that construction noise will become a feature of the ambient noise at these receptors during much of the construction period.

19.6.37 The assessment of construction vibration indicates that impacts will occur at the following receptors:

- Inchgarvie House (disturbance of occupants due to vibro-compaction of highway works and during the construction of the haul route); and
- St Margaret's Hope Lodge (disturbance of occupants due to vibro-compaction of highway works).

19.6.38 No other vibration impacts are forecast as the activities that are likely to generate appreciable levels of vibration are expected to be located a substantial distance from vibration sensitive receptors.

19.6.39 The construction noise assessment indicates that, consistent with the approach set out in the CoCP, the following properties are likely to qualify for noise insulation as a consequence of night-time marine construction activities:

- 'Tigh-na-grian' (2 properties comprising Tigh-na-grian and Ferrycraig House).

19.6.40 In conclusion, although adverse noise and vibration impacts have been identified at a number of receptors, as a consequence of the small number of receptors located close to the works and because of the mitigation provided by the CoCP, no residual significant construction effects are predicted.

19.7 Pedestrians, Cyclists, Equestrians and Community Effects

Introduction

19.7.1 Existing access for non-motorised users (NMUs) within the study area is provided along key paths and cycleways including National Cycle Routes (NCR) 1 and 76, the adopted and proposed core path network, rights of way and local paths. The Forth Road Bridge connects Fife with the Lothians and provides a key pedestrian and cycle link along this route, also designated as NCR 1.

19.7.2 The existing path and cycleway network links key communities including Rosyth, North Queensferry and Inverkeithing in the north and South Queensferry, Kirkliston and Winchburgh in the south. Paths are used to access community facilities such as schools, parks and leisure centres.

19.7.3 Figures 17.1 and 17.2 illustrate the existing path and cycleway network and links to community facilities.

Potential Impacts

19.7.4 During the construction period, pedestrians and other NMUs have the potential to be disrupted by:

- temporary diversions of paths and cycleways e.g. along the B9080 where M9 Spur bridge widening may require diversion of the core path (refer to Figure 17.3);
- creation of new paths and cycleways e.g. at Ferrytoll and along the B981 existing paths including a core path, NCR1, NCR76 would need to be temporarily diverted to maintain access;
- construction traffic on local roads which may create busier crossing points e.g. for the core path and NCR 76 along Society Road, safe provision for pedestrians and cyclists would be required;
- location of site compound on recreation areas which would reduce accessibility e.g. at Echline fields;
- temporary community severance experienced by residents at Inchgarvie House resulting from the disruption to the access road to Society Road, and consequently potential for a reduction in access to community facilities in South Queensferry; and
- effects on the amenity value of the path and cycleway network due to noise, dust, and also visual intrusion of the works.

19.7.5 The above potential impacts cannot be quantified as they will depend on the detail and timing of activities undertaken by the Contractor. However, the effects on the communities due to construction may include:

- disruption of local bus services, for example, changes in journey times;
- temporary diversions of paths, cycleways and minor roads which may increase journey time to community facilities; and

- temporary severance where construction works disrupt or deter residents from accessing local facilities.

Mitigation

19.7.6 Measures to mitigate effects on NMUs are detailed in the CoCP (Appendix A19.1) and 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 Disability Discrimination Act, Good Practice Guide 2009 (mitigation item DC27);
- the construction site is to be fenced and access by non-authorised personnel will generally not be permitted (mitigation item DC28);
- 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 pedestrians and others will be agreed in advance with the local authorities and in consultation with Sustrans where applicable (i.e. for NCR 1 and 76) (mitigation item DC29);
- where necessary, bus stops are to be relocated safely with a safe access route provided for NMUs (mitigation item DC30);
- Best Practicable Means are to be employed to avoid the creation of a statutory nuisance associated with noise, dust and air pollution (mitigation item DC31); and
- reasonable precautions to be undertaken to reduce the visual impact of the construction works where practicable (mitigation item DC32).

Residual Impacts

19.7.7 The above mitigation measures will reduce impacts on pedestrians and others, although disruption to journeys is still likely to be experienced during the construction period.

19.8 Vehicle Travellers

Introduction

19.8.1 Construction impacts on vehicle travellers were considered in terms of driver stress, such as distraction or uncertainty over diversions, and view from the road.

Potential Impacts

19.8.2 Conditions on the existing road network are described in Chapter 18 (Vehicle Travellers), which indicates that current driver stress is Moderate for the existing A90/M90 road corridor during peak hours. Driver stress is assessed as High between the Forth Road Bridge and Masterton for the dominant direction of travel during peak periods.

19.8.3 It is anticipated that driver stress is likely to be increased during construction, particularly during peak time and for works that directly affect existing roads (primarily sections of the A90/M90, B981, M9, M9 Spur, A8000, A904 and B924). This would be caused as a result of, for example, increases in journey times and delays due to temporary traffic lights, diversions and queuing traffic.

19.8.4 For Ferrytoll Junction, a number of temporary traffic management measures would be required to allow traffic movements to be maintained during construction. Traffic management measures would include diversion of the B981, A90 northbound and southbound traffic as well as some contraflow arrangements. The majority of construction near South Queensferry and at M9 Junction 1A is expected to be completed without impacting on traffic flows. The exception to this is for the

carriageway tie-ins where some temporary carriageway and traffic diversions would be required. This may include some contraflow arrangements and where necessary, restricting roads to one lane overnight. Occasional overnight closures would be necessary for the installation of new beams for the widening of the B9080 bridge (on M9 spur) and the replacement A8000 bridge and also demolition works at these locations.

- 19.8.5 The proposed access routes from the construction compounds to the shore of the Firth of Forth are shown on Figure 19.1. The proposed access to the south of the Firth of Forth includes a new link from the B924 to Society Road. This would allow direct access to the Main Crossing works on the southern shore of the Firth of Forth from the construction compound. Whilst the proposed access would avoid the need for construction traffic to travel through South Queensferry, some local disruption is anticipated along Society Road.
- 19.8.6 Negative impacts on drivers' view from the road are predicted due to the visual impact of construction works, including the works themselves and the associated temporary signage.

Mitigation

- 19.8.7 Measures to minimise impacts on vehicle travellers are detailed in the CoCP (Appendix A19.1) and include the following:
- reasonable precautions to be undertaken to avoid/reduce disruption to the road traffic, including consideration of the timing of works vehicles using public roads and delivery/removal of site materials (mitigation item DC33);
 - reasonable precautions to be undertaken to reduce the amount of imported/exported material required (mitigation item DC34);
 - reasonable precautions to be undertaken to avoid/reduce road closures. No lane closures of the A90/M90 or M9 are to be permitted during peak hours except in exceptional circumstances that are approved by Transport Scotland (mitigation item DC35);
 - temporary traffic management arrangements are to take reasonable precautions to reduce disruption and delays (mitigation item DC36);
 - road diversions are to be clearly indicated with road markings and signage as appropriate. Closures to be notified in advance and signage provided (mitigation item DC37); and
 - appropriate lighting will be provided during any necessary night-time working (mitigation item DC38).

Residual Impacts

- 19.8.8 Provided that the above measures are implemented, it is considered that driver stress and drivers' view from the road can be managed to the extent that they do not cause significant impact. Traffic flows will be maintained in all but occasional circumstances, and these will be scheduled to occur when they will have least impact (e.g. night-time).

19.9 Summary of Construction Impacts on Other Environmental Parameters

- 19.9.1 The following section provides a summary of construction impacts on the environmental parameters as listed in paragraph 19.2.3.

Geology, Contaminated Land and Groundwater

- 19.9.2 The proposed scheme has potentially significant impacts on geology, contaminated land and groundwater, through construction activities such as blasting, dredging of the Firth of Forth, and required earthworks. The majority of construction impacts (such as the loss of material at Beamer Rock) would extend through the operational phase. Refer to Section 19.10 in relation to safety issues associate with flyrock and also Chapter 11 (Estuarine Ecology) for ecology mitigation

requirements in relation to blasting. Dredging of the Firth of Forth, required in the construction of the southern approach viaduct to the Main Crossing, would potentially affect drift geology. However impacts are assessed as being Negligible.

- 19.9.3 The proposed earthworks in the southern study area have been identified as having potential contamination issues. These risks are considered Moderate to Low. In the northern study area, the risks are assessed to range from Very Low to Very High. However, appropriate mitigation would be undertaken to avoid or manage these risks.
- 19.9.4 A full assessment of potential impacts on Geology, Contaminated Land and Groundwater is provided in Chapter 8 (Geology, Contaminated Land and Groundwater).

Water Environment

- 19.9.5 The construction of the proposed scheme has potentially significant impacts on the water environment. These could include soil compaction from works traffic, alteration of run-off pathways, erosion and sedimentation of watercourses, dewatering of watercourses and increased flood risk.
- 19.9.6 A full assessment of potential impacts on the water environment, including suitable mitigation measures to avoid or reduce these impacts, is provided in Chapter 9 (Water Environment).

Ecology and Nature Conservation

- 19.9.7 The construction phase has potential to impact on ecology and nature conservation interests. Key ecological sensitivities include a number of statutorily protected sites including the Firth of Forth SPA, Ramsar site and SSSI, Forth Islands SPA, as well as the Ferry Hills and St. Margaret's Marsh SSSIs.
- 19.9.8 Potential impacts include the displacement of species due to noise or ground disturbance, severance of migratory or foraging routes, pollution and habitat loss. Appropriate mitigation will be required to avoid long-term or permanent ecological changes.
- 19.9.9 Construction impacts on Ecology and Nature Conservation are assessed in Chapter 10 (Terrestrial and Freshwater Ecology) and Chapter 11 (Estuarine Ecology). Reports to inform an Appropriate Assessment have been produced for Forth Islands SPA and Leith Docks SPA, Firth of Forth SPA and River Teith SAC. These reports include detailed consideration of construction phase impacts.

Cultural Heritage

- 19.9.10 Potential impacts on cultural heritage include changes to the setting of listed buildings, changes in access and also noise and vibration during construction of the proposed scheme. Some impacts, such as the removal and storage of the beacon light on Beamer Rock, occur during construction but would result in permanent changes to cultural heritage. A full assessment of these impacts is provided in Chapter 14 (Cultural Heritage).

19.10 Other Issues of Relevance to Construction Works

Site Safety and Security

- 19.10.1 Safety and security issues associated with the construction of the proposed scheme include potential noise and visual distractions to road traffic from construction activities, particularly for vehicles travelling over the Forth Road Bridge. Heavy vehicle movements, possible contaminated soils excavation and transport, and construction site activity also create potential safety concerns. Potential disruption to flight paths from Edinburgh Airport is also a consideration.
- 19.10.2 Best construction management practices will be in place to ensure the safety of construction workers, residents and other members of the public during construction of the proposed scheme.

Measures such as the use of fencing, lighting and screening of construction works, together with recognised safety practices for the utilisation of heavy equipment, the movement of construction materials and control of flyrock from blasting operations will be implemented to avoid accidents. During construction, the Contractor will be responsible for job-site safety and security. Diversions, lane closures, and vehicle entrance locations will be well signed and managed appropriately to minimise disruption. Consultation has also been undertaken with BAA to prevent any potential disruption to the flight paths.

- 19.10.3 The Contractor will be required to liaise with police, fire, and other emergency response agencies of construction activities, diversions and road closures on a regular basis throughout the construction process. The public will also be alerted about diversions, lane and road closures, and site vehicle entrances.

Materials Balance

- 19.10.4 Details with regard to balancing cut and fill material, where possible, to reduce the requirement for material transportation, are contained in Chapter 4 (The Proposed Scheme). The estimated earthworks reported in Table 4.6 indicate an import requirement for each junction. It is anticipated that some material could be sourced locally from borrow pits, however the suitability of sources has not been confirmed at the time of this assessment. The location of any material sourced would be determined by the Contractor.
- 19.10.5 Details of the associated land-take and routing of vehicle movements associated with any borrow pit locations proposed by the Contractor would be discussed with the relevant local planning authority, and appropriate consents/planning permission obtained.

19.11 Alternative Construction Compound

- 19.11.1 The assessment of construction impacts presented in this chapter up to this point assumes the main construction compound will be located in Echline Field to the east of the proposed scheme alignment. As described in Section 19.1.6 and 19.1.7 of this chapter and Section 4.7.10 of Chapter 4 (the Proposed Scheme), a potential alternative location for the main construction compound has been identified. The alternative location for the compound is identified on Figure 19.1 and for the purposes of this assessment is referred to as the Echline Field West compound. An access track would be provided from the Echline Field West compound to the works at the Firth of Forth. This track would follow the same route as the access track for the main compound in its original location (refer to Figure 19.1) with the exception of a small additional section where the track crosses the mainline near the south abutment of the main crossing. An assessment of the Echline Field West compound and access track is provided below.
- 19.11.2 The visitor centre element would be located in the vicinity of this compound, either within the compound itself or in the fields to the west of the mainline within land already identified for the proposed scheme. With the exception of landscape and visual issues (refer to Section 19.11.9 below), the location of the visitor centre would not result in any changes to the impacts assessed in previous sections of this chapter.

Land Use

- 19.11.3 The land required for the Echline Field West compound is prime agricultural land of MLURI land capability for agriculture (LCA) class 2 and 3.1. This area is currently occupied by the Dundas Estate. It is estimated that 4.1ha of LCA class 3.1 and 3.1ha of LCA class 2 would be temporarily lost by the location of the construction compound, although may be able to be returned to agriculture post-construction. No additional areas of severance have been identified. Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of the potential or residual impacts reported in Chapter 7 (Land Use). Both compound locations require a similar size and affect a similar quality of agricultural land and it is assumed that impacts would be mitigated by returning the land to agricultural use following construction.

Geology

- 19.11.4 The geology of the Echline Field West compound area comprises glacial till (boulder clay) over igneous (dolerite or basalt) bedrock which is assessed as being of low sensitivity. The area is not covered by the FRC GI works however, historical maps indicate the presence of a small former whinstone quarry approximately 50m west of the Echline Field West compound therefore there may be issues associated with ground gas. Further consultation with relevant consultees, and current and former land owners/ users would be required to supplement the knowledge obtained from historical maps.
- 19.11.5 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Chapter 8 (Geology, Contaminated Land and Groundwater) as potential ground gas issues have already been identified for other areas of the proposed scheme and there is a commitment for the contractor to undertake an assessment of ground gas prior to construction.

Water Environment

- 19.11.6 The Echline Field West compound and associated access track would be located within the catchment of Linn Mill Burn, however it would not directly impact on any watercourses. Linn Mill Burn would be potentially affected by a temporary increase in the runoff rate and also potential sediment and accidental spillages.
- 19.11.7 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Chapter 9 (Water Environment) as both compound locations affect the Linn Mill Burn catchment. Although the Echline Field West compound would be closer to Linn Mill Burn, sufficient mitigation measures to control any impacts are described Chapter 9 (Water Environment).

Ecology

- 19.11.8 The Echline Field West compound would result in the potential loss of the following areas of Phase 1 habitats during construction:
- approximately 9.6ha of arable land; and
 - approximately 0.9ha poor semi-improved grassland.
- 19.11.9 No designated sites would be significantly affected although the access track would cross the Linn Mill Burn SINC near Society Road. The compound would sever a bat commuting route. The access track from the compound to the Firth of Forth would also potentially impact on two additional bat commuting routes. Badgers from within the territories of Social Group A are potentially active in the area of the Echline Field West compound and access track. No active badger setts would be affected. No other protected species would be affected by the Echline Field West compound.
- 19.11.10 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Chapter 10 (Terrestrial Ecology) as both compound areas are of low ecological interest and both would affect badger foraging areas and bat commuting routes. The generic mitigation measures that apply to all ecological receptors across the proposed scheme (as outlined in Chapter 10: Terrestrial Ecology) would be applied.

Landscape and Visual

- 19.11.11 The Echline Field West compound would be visible from the A904 and would have an adverse impact on views from this receptor immediately west of South Queensferry. It would be likely to have an adverse impact on the landscape character of the area by introducing a new built element (albeit a temporary one) to open fields in a location which is relatively remote from the other urban

and industrial development in the area. Views from informal footpaths across Echline fields would be affected, although access to these paths would be prevented during construction. No landscape and visual impacts would be anticipated from the access track connecting the Echline Field West compound to the Firth of Forth.

- 19.11.12 The visitor centre would be a temporary structure located in the vicinity of this compound, either within the compound itself or within the fields to the west of the proposed scheme. The visitor centre would not affect the future implementation of any proposed screen planting / bunds required to mitigate for the long term landscape and visual impacts of Queensferry junction (refer to Figure 12.4).
- 19.11.13 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Section 19.1 (Landscape and Visual). The Echline Field West compound would be located further from properties at the edge of South Queensferry than the main compound and would therefore be less visually intrusive. For both compound locations, mitigation measures for temporary screening, described in section 19.1, would be implemented as necessary.

Cultural Heritage

- 19.11.14 The location of Echline Field West compound partially overlies two known cultural heritage sites of local importance: an earthwork (Site 706), the precise location and type of which is unknown, and a linear cropmark (Site 1118) site aligned east-west. The access track from the compound to the Firth of Forth would be constructed through the suggested location of a long cist cemetery identified in the 19th Century (Site 543). It would also be close to the site of a possible clearance cairn (Site 516) and a possible burial (Site 868). The proximity of the Echline Field West compound and access track to these and other known sites suggests that the archaeological potential of the site is high. A summary of the potential impacts is provided in Table 19.15.

Table 19.15: Summary of Potential Direct Impacts of the Echline Field West compound and access track

Site	Site Name	Designation	Sensitivity	Potential Impact (unmitigated)	
				Magnitude	Significance
1118	South Queensferry Linear Cropmark.	None	Medium	Moderate	Moderate
706	Earthwork.	None	Negligible	Negligible	Neutral
543	Inchgarvie House, Springfield House, graves.	None	Low	Major	Moderate

- 19.11.15 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Chapter 14 (Cultural Heritage) as both areas have a high archaeological potential and a detailed programme of archaeological evaluation would be undertaken to ensure that any archaeological remains would be identified, excavated and fully recorded.

Air Quality

- 19.11.16 The operation of equipment, vehicles and machinery associated with the Echline Field West construction compound are expected to contribute to local emissions of air pollutants. The number of sensitive receptors within 200m of the Echline Field West construction compound is provided in Table 19.15.

Table 19.15: Number of sensitive receptors

Distance from site boundary	Number of sensitive receptors	
	Original Location of Main Compound (east of mainline)	Echline Field West
0-25m	66	46
25-50m	86	63
50m-100m	190	141
100m-200m	520	525
Total	862	775

19.11.17 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Section 19.5 (Air Quality). The Echline Field West compound would be located further away from properties at South Queensferry although the access track would be located close to the rear of properties at Linn Mill. Mitigation measures to control air quality impacts are set out in Section 19.5. In relation to construction traffic emissions, the emissions reported in Section 19.5 are independent of the compound /visitor centre location as the number of car parking spaces would remain the same.

Noise and Vibration

19.11.18 There are no particular noise or vibration concerns with the location of the Echline Field West compound. However, the properties at Linn Mill, Inchgarvie Lodge and Clufflat Brae would be affected by noise from vehicles using the access track.

19.11.19 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Section 19.6 (Noise and Vibration). There are fewer noise sensitive receptors in the vicinity of the Echline Field West compound. Although some additional properties at Linn Mill would be potentially be affected by the access track, noise barriers, i.e. close boarded fences, would be used to mitigate noise arising from vehicle movements. An earth bund, high enough to break the line of sight, would also be provided along the northern edge of the Echline Field West compound, and would provide some noise mitigation. Other mitigation measures described in section 19.6 would also be implemented.

Pedestrians

19.11.20 The Echline Field area is used for informal recreation by the communities of Linn Mill and South Queensferry. The Echline Field West compound and associated access tracks to the Firth of Forth would result in the temporary loss of a small network of informal local paths. The value of the paths in this area would already be reduced by the construction of the mainline restricting movement from east to west.

19.11.21 Siting the construction compound to the west as opposed to east of the mainline would not affect the significance of potential or residual impacts described in Section 19.7 of this chapter as both locations would affect an area of informal local paths. It should be noted that for the Echline Field West location, the area to the east of the mainline construction would potentially still be a usable area for local recreation.

Policies and Plans

19.11.22 The Echline Field West compound is located within an area designated as countryside (policies E5 and E6). The access track would also cut through housing allocations (HSG2 and HSG7) and Linn Mill Burn SINC. Siting the construction compound to the west as opposed to east of the mainline would not affect the compliance with policies reported in Chapter 20 (Policies and Plans) as

although the main compound location would require additional land-take from housing allocation HSG2, all impacts would be temporary and would not affect the long term use of the site.

19.12 Summary of Residual Impacts

- 19.12.1 The main residual impacts relate to the disruption caused in relation to temporary air quality, noise and vibration, landscape and visual impacts, particularly for residents and businesses located in close proximity of the construction compounds.
- 19.12.2 Due to the extensive construction works required the landscape and visual impacts, although temporary in nature, cannot be completely mitigated.
- 19.12.3 Dust nuisance is considered to have a residual impact of Medium to Low risk and would occur on a short to medium term basis only, although it is considered that there may be a higher risk of dust impact during certain construction activities occurring close to Inchgarvie House. The residual effects of construction related vehicle emissions are Negligible to Slight and would occur on a medium term basis only. No long-term residual impacts on air quality are anticipated in relation to the construction of the proposed scheme.
- 19.12.4 Noise and vibration impacts have been identified at a number of receptors however, no significant residual effects are anticipated.
- 19.12.5 Impacts on pedestrian access are also anticipated during the works and will require careful management in order to avoid or reduce disruption.
- 19.12.6 Best Practicable Means will be implemented to reduce potentially significant impacts. Detailed mitigation measures are provided in the CoCP. A liaison officer will be responsible for community engagement and will seek to inform and consult with affected communities about the programme of construction works and how the effects will be mitigated.

19.13 References

British Standards Institution (1987). BS 6069 Part 2 Characterisation of Air Quality.

British Standards Institution (2009). BS 5228 Noise and Vibration Control on Construction and Open Sites, British Standards Institution.

British Standards Institution (1993). BS 7385 Part 2 Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Groundborne Vibration

British Standards Institution (2008). BS 6472-2, Guide to Evaluation of Human Exposure to Vibration in Buildings. Blast-induced Vibration.

British Standards Institution (2008). BS 6472-1, Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources other than Blasting.

Department of Environment (1976). Advisory Leaflet (AL) 72 (1976), Noise control on Building Sites, HMSO.

Forth Estuary Transport Authority (FETA) (2008). Traffic Statistics 2008 – Forth Road Bridge http://www.feta.gov.uk/index.php?option=com_content&task=view&id=36&Itemid=57

GLA and London Councils (2006). The control of dust and emissions from construction and demolition. Best Practice Guidance, November 2006.

Highways Agency et al. (1994). Design Manual for Roads and Bridges (DRMB) Vol.11 Section 3 Part 3. 'Disruption Due to Construction'.

Highways Agency et al. (2007). DMRB Volume 11 screening method spreadsheet tool model, version 1.03c.

Hiller, D.M., Crabb, G.I. (2000). Ground-borne Vibration Caused by Mechanised Construction Works, Transport Research Laboratory (TRL) Report 429.

HMSO (1974). Control Of Pollution Act, HMSO.

HMSO (1975). Noise Insulation (Scotland) Regulations (1975 SSI No.0460 (s.60)), HMSO.

OPSI (1990). The Environmental Protection Act 1990.

Scottish Executive (1998). 'Cost Effective Landscapes: Learning from Nature' (CEL:LfN).

Transport Scotland (2009). Disability Discrimination Act, Good Practice Guide.