13. Air Quality

The changes to the A720 Sheriffhall Roundabout, near Edinburgh, have been assessed as part of this EIA to determine the impact the Proposed Scheme will have on air quality. A construction phase assessment of dust emissions, and local and regional operational phase assessments have been undertaken, based on Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)' (Highways Agency et al. 2007).

Mitigation controls have been identified to minimise the effect of dust so the overall significance of the construction phase assessment will be negligible and not significant.

The operational phase impacts have been predicted to be small to imperceptible for NO_2, PM_{10} and $PM_{2.5}$. In line with the method used, the effect has been found to be 'not significant'. This is because no exceedances of the air quality objective values for the pollutants considered are predicted to occur anywhere where there is sensitive exposure within the study area, with and without the Proposed Scheme.

13.1 Introduction

13.1.1 This chapter of the Environmental Statement (ES) reports the findings of an assessment of the likely significant effects on air quality as a result of the changes to the A720 Sheriffhall Roundabout (hereafter referred to as 'the Proposed Scheme'), located to the southeast of Edinburgh. For more details about the Proposed Scheme, refer to Chapter 5 - The Proposed Scheme. The combined cumulative air quality effects with other relevant Developments are discussed later in the chapter and summarised in Chapter 19 - Cumulative Assessment of this ES.

13.1.2 The Proposed Scheme is located within the administrative areas of both City of Edinburgh Council (CEC) and Midlothian Council (MLC).

13.1.3 This chapter of the ES has been prepared by competent experts with relevant and appropriate experience. The technical lead for the Air Quality assessment has 15 years of relevant work experience and is a member of the Institute of Environmental Sciences (MIEnv) and a member of the institute of Air Quality Management (IAQM). Further details are provided in Appendix 1.2 – Table of Expert Competencies.

13.2 Approach and Methodology

13.2.1 The A720 Sheriffhall Roundabout, hereby referred to as the 'Proposed Scheme', has the potential to impact upon air quality during both construction and operational phases.

13.2.2 Local air quality impacts during the construction phase will be mainly associated with on-site vehicle and plant emissions, and dust generation.

13.2.3 Local and regional impacts during the operational phase will be associated with the change in vehicle emissions as a result of the operation of the Proposed Scheme.

13.2.4 The methodology of the air quality assessment for the Proposed Scheme is based on the guidance of the Design Manual for Roads and Bridges (DMRB) and associated relevant Interim Advice Notes (IAN) and is discussed below. The assessment includes the following elements:

- Construction phase dust assessment;
- Local operational air quality assessment for public exposure and European and nationally designated habitat sites; and
- Regional assessment of pollutant emissions.

13.2.5 Key methodology documents of relevance to the air quality impact assessment are as follows:

- DMRB, Volume 11, Section 3, Part 1 'Air Quality' (HA207/07) (Highways Agency et.al, 2007);
- IAN 174/13: Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07) (Highways Agency, 2013);
- Guidance on the assessment of dust from demolition and construction (Institute of Air Quality Management (IAQM), 2016); and
- Department for Environment, Food and Rural Affairs (DEFRA) Air Quality Management Technical Guidance LAQM.TG (16) (DEFRA, 2018).

13.2.6 A revision to the air quality section of the DMRB is due to be issued later in 2019, though fundamental changes to the methodology are not anticipated. The assessment reported herein has been completed based on the 2007 version, which was current at the time of the assessment.

13.2.7 Detailed methodologies applied within this assessment are outlined in the following sections relating to the consideration of key environmental receptors and pollutants.

13.2.8 Throughout this assessment, reference is made to sensitive receptors. These are locations where members of the public may be exposed to and affected by air quality impacts. In relation to the Proposed Scheme, sensitive receptors are predominantly residential properties, but can also include, for example, schools, internationally and nationally designated ecosystems and allotment gardens (construction dust only). Where sensitive receptors are anticipated to be in a location for only a short period of time, these locations are considered against relevant short-term air quality objectives.

Study Area

13.2.9 The study area within this assessment includes the roads that are part of the ARN, as defined by DMRB guidance, as well as all other roads within 200m of a receptor located within 200m of the ARN. The extent of this network is shown in Figure 13.1 ‘Location of Modelled Network, Receptors and Diffusion Tubes’.

13.2.10 The study area is located within three local authorities: CEC, MLC and East Lothian Council (ELC). These Councils undertakes a variety of air quality monitoring, the details of which can be found within Section 13.5 ‘Baseline Conditions’.

13.2.11 Affected routes within the study area do not pass through any Air Quality Management Areas (AQMAs) and nor are there any AQMAs close to the air quality study area. The nearest AQMA is 5km north-east of the Proposed Scheme: High Street, Musselburgh in East Lothian. This AQMA was declared in relation to NO_2. In addition to this, there are a further 4 AQMAs within 12km of the site, which include: Edinburgh AQMA No.2 (St John’s Road), Edinburgh AQMA No.1 (City Centre), Air Quality Management Area (Inverleith Row) 2013 and Great Junction Street AQMA, all of which are within the City of Edinburgh and were declared for NO_2. These AQMA locations are shown in Figure 13.2 ‘Locations of AQMAs and Ecological Sites of Significance in Relation to the Proposed Development’.

Construction Phase

13.2.12 The impacts associated with the construction phase of the Proposed Scheme have been qualitatively assessed with reference to the IAQM published ‘Guidance on the assessment of dust from demolition and construction’ (IAQM, 2016). This guidance is consistent with the requirements of DMRB (HA207/07) (i.e. identifying sensitive locations around works) and also enables appropriate levels of mitigation to be identified.

13.2.13 According to the IAQM, the main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM_{10} concentrations, as a result of dust generating activities on site; and
- An increase in concentration of airborne particles and NO_2 due to exhaust emissions from diesel powered vehicles and equipment on site and vehicles accessing the site.

13.2.14 Potential site vehicle and equipment emissions impacts have been screened out of this assessment. Current Institute of Air Quality Management (IAQM) guidance (IAQM, 2016) states that *"experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed"*. The construction works will be phased so that there will be a limit to the number of site vehicles and equipment in operation at any one time and the emissions from the vehicles will also be managed. On this basis quantitative assessment of plant emissions is not required and significant air quality effects would not be anticipated to be associated with this emission source.

13.2.15 Construction traffic emissions impacts have also been screened out of the assessment on the basis that the existing operational capacity of the junction will be maintained throughout the full construction period, with all traffic continuing to pass through the existing signalised at-grade roundabout. The existing lane capacity, including queuing capacity at traffic signals, will be maintained at the same extent as currently exists. At the same time, it is recognised that construction activities could potentially affect overall capacity. To mitigate the effect of this on traffic flows and speeds, it is proposed that certain aspects of the construction, including construction vehicle movements, will be restricted to periods outside of peak hours.

13.2.16 As a result, traffic conditions should be no worse than currently exist, thereby removing the need for traffic to re-route on to alternative unsuitable roads. Reasonable worse case construction traffic volumes are estimated at up to a maximum of 200 heavy goods vehicle (HGV) movements per day (HGVs being construction vehicles that weigh more than 3.5 tonnes) and 100 light goods vehicle (LGV) movements per day (LGVs being construction vehicles that weigh less than 3.5 tonnes), accessing the site using the A720 Edinburgh City Bypass ('the A720'). Daily annual average flow increases are likely to be less than this and so changes in traffic are anticipated to be lower than the DMRB local air quality screening criteria. When changes in traffic are lower than these criteria further air quality consideration is not required and potentially significant air quality impacts in the area are not expected.

13.2.17 Activities on construction sites are classified into four types to reflect their different potential impacts:

- Demolition;
- Earthworks;
- Construction; and,
- Track-out.

13.2.18 The following steps, as defined by the IAQM, were followed;

- Step 1: Screen the requirement for a detailed assessment. Human and ecological receptors were identified and distance to the Scheme and construction routes were determined;
- Step 2: Assess the risk of dust impacts. The potential risk of dust impacts occurring for each activity was determined, based on the magnitude of the potential dust emissions and the sensitivity of the area;
- Step 3: Identify the need for site-specific mitigation. Based on the risk of impacts occurring, site specific mitigation measures were determined; and

- Step 4: Define impacts and their significance. The significance of the potential residual dust impacts (taking mitigation into account) for each activity was determined.

13.2.19 Further details of the construction assessment method are provided in Section 13.6.

Operational Phase

13.2.20 A detailed level local air quality assessment has been undertaken with reference to the DMRB guidance (HA207/07) (Highways Agency, et al., 2007).

Local Air Quality Assessment

13.2.21 The DMRB (HA207/07) (Highways Agency et al., 2007) sets out the following criteria for defining an affected road which should be considered further as part of an air quality assessment, along with the route of a Scheme:

- Road alignment change by 5 m or more; or
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or,
- Peak hour speed will change by 20 km/hr or more.

Assessment Methodology

13.2.22 The local air quality assessment has been undertaken using ADMS-Roads, detailed dispersion modelling software, to determine traffic derived pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) at several sensitive receptors located within 200 m of the Affected Road Network (ARN) immediately around the Proposed Scheme. The assessment has been undertaken for the following scenarios:

- 2017 Baseline Scenario (2017 traffic data, 2017 meteorological data, 2017 traffic emissions factors and 2017 background concentrations);
- 2024DM (Do-minimum, without the Proposed Scheme) (2024 traffic data, 2017 meteorological data, 2020 traffic emissions factors and 2020 background concentrations); and,
- 2024DS (Do-Something, with the Proposed Scheme) (2024 traffic data, 2017 meteorological data, 2020 traffic emissions factors and 2020 background concentrations).

Dispersion Modelling

13.2.23 This assessment has used the latest version of dispersion model software ADMS-Roads (v4.1.1) to quantify baseline (2017) and future (2024) pollution levels at selected receptors with and without the Proposed Scheme. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies.

13.2.24 Details of general ADMS-Roads model conditions are provided in Table 13-1 'General ADMS-Roads Model Conditions'.

Table 13-1 General ADMS-Roads Model Conditions

Variables	ADMS Roads Model Input
Surface roughness at source at dispersion site	0.5 metres(m) across the entirety of the study area
Surface roughness at source at meteorological station site	0.2 m

Variables	ADMS Roads Model Input
Minimum Monin-Obukhov length for stable conditions	30 m
Terrain types	Flat
Receptor location	X, Y and Z coordinates determined by GIS
Emissions	NO_X, PM_{10} and $PM_{2.5}$, based on the traffic data supplied
Emission factors	Emissions Factors Toolkit (Version 9.0) (DEFRA (2019b)
Meteorological data	Hourly sequential data from Edinburgh Airport in 2017
Emission profiles	24-hour annual average daily traffic flow data used, with no time varying emissions used
Receptors	Selected receptors
Model output	Long-term annual mean road contributions for NO_X, PM_{10} and $PM_{2.5}$

Traffic Data

13.2.25 Traffic data in the form of Annual Average Daily Traffic (AADT) flows, number of HGVs (vehicles greater than 3.5 tonnes gross weight) and average vehicle speeds (km/h) for all major roads within the Sheriffhall Roundabout area were provided by the project transport consultants (AECOM) (see the DMRB Stage 3 Engineering, Traffic and Economic Assessment, AECOM 2020). The traffic data used to inform the air quality assessment described in this chapter can be provided upon request.

13.2.26 The AECOM transport consultants provided two traffic models, one on a regional scale and one Paramics Microsimulation local-scale model. The Microsimulation data covers an area of up to 3 km around the scheme and enables the main changes in traffic and associated changes in air quality to be established. Where there is overlap between the microsimulation data and the regional scale information, the microsimulation data has been utilised. Additionally, at the boundary of the micro simulation area, where receptors are close to this boundary, additional regional traffic data has been utilised in the local air quality modelling to ensure that total pollutant concentrations are appropriately characterised. The regional scale model has been used to check that there are no wider areas away from the Proposed Scheme that could be subject to significant air quality effects. A qualitative review of the predicted areas of affected road network in the regional model that are located beyond the extent of the Paramics Microsimulation local-scale model is presented in the following Paragraphs (13.2.27 and 13.2.28). The regional scale traffic data has also been used to support the calculation of regional emissions.

13.2.27 The regional traffic model affected road links which have been excluded from quantitative air quality assessment include the following:

- Straiton Road, south of the A720;
- Gilmerton Station Road, north of the A720
- The Wisp, north of the A7
- A6106 north of Millerhill
- B702, north of Loanhead;
- Old Craighall Road at Millerhill.

13.2.28 A review of anticipated air quality along these routes and the expected changes in air quality that may result from the implementation of the Proposed Scheme indicates that the exclusion of any quantitative predictions from these wider affected road links would not change any of the conclusions presented in this assessment. This has been determined based on the absence of any AQMAs along these routes, existing monitoring data gathered in the study area showing

NO_2 concentrations ranging between 18 µg/m^3 and 34 µg/m^3, which is well below the relevant air quality objective, and predicted Do-minimum and Do-something pollutant concentrations in the area quantitatively modelled. Modelling undertaken where the maximum changes are anticipated to occur demonstrates that pollutant concentrations in this wider area are very likely to be below the air quality objective values, and therefore any changes in air quality in this wider area are not expected to be significant.

13.2.29 The traffic data provided by the transport consultants were for an existing baseline scenario (2017), from the Paramics model only, and for the year of opening (2024), with and without the Proposed Scheme, from both the Paramics and regional traffic model. Due to the absence of base year traffic data output from the regional model, the regional traffic data could not be verified as part of the air quality model verification procedure. Therefore, the study area for the quantitative local air quality assessment was constrained by the extent of the Paramics model. The opening year of the Scheme has been the focus of the local air quality assessment as improvements in air quality are anticipated over time, meaning that the opening year is typically the worst-case assessment year. Traffic data for future year scenarios also includes flows associated with the reasonably foreseeable developments listed in Chapter 19 – Cumulative Assessment.

13.2.30 It should also be noted that all roads for which traffic data was provided, that are located within 200 m of the modelled sensitive receptors, were included in the local air quality assessment modelling exercise. All road links included in the modelling exercise are shown on Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes'.

Vehicle Emissions

13.2.31 Vehicle emissions rates have been sourced from the Emissions Factors Toolkit (EFT) (DEFRA, 2019b). Due to current uncertainty in the rate of projected improvements in vehicle emissions technology over future years, the assumption has been made in this assessment that projected vehicle emission rates for 2020 are representative of conditions in 2024. This approach assumes three years of improvements in emissions of NO_X, PM_{10} and $PM_{2.5}$ and is considered to be a suitably cautious approach in that it does not assume the full rate of seven year improvements suggested in the EFT between the existing base year and year of opening have taken place.

Background Pollutant Concentration Data

13.2.32 A large number of sources of air pollutants exist which individually may not be significant, but collectively, over a large area, need to be considered. The concentrations calculated by the model due to vehicle emissions can then be added to these background concentrations to give the total concentration.

13.2.33 Background pollutant concentration data was sourced from DEFRA background maps (DEFRA, 2019a). DEFRA backgrounds were used in preference to Scottish background maps because the Scottish maps do not contain a background dataset for $PM_{2.5}$. In order to maintain consistency of the data used, the DEFRA background maps have been utilised for all three pollutants considered in this assessment.

13.2.34 For the existing baseline year and model verification, background total NO_2, PM_{10} and $PM_{2.5}$ data was sourced for the year 2017. For the future year scenarios (DM and DS 2024), background total NO_2, PM_{10} and $PM_{2.5}$ data was sourced for the year 2020, to represent conditions in 2024. The use of 2020 data to represent 2024 is considered to be a suitably cautious approach in that it does not assume the full rate of future improvement suggested in the DEFRA background maps between the existing base year and year of opening has taken place. The total background concentration data used in the assessment does not include for sector removal in any of the modelled scenarios or model verification.

13.2.35 A full list of all the background values used for NO_2, PM_{10} and $PM_{2.5}$ can be found in Appendix 13.1 - Background Concentrations.

Conversion of NO_x to NO_2

13.2.36 The proportion of NO_2 in NO_X varies greatly with location and time according to a number of factors including the amount of oxidant available and the distance from the emission source. NO_X concentrations are expected to decline in future years due to falling emissions, therefore NO_2 concentration will not be limited as much by ozone and consequently it is likely that the NO_2/NO_X ratio may in the future increase.

13.2.37 In this study modelled NO_X values were converted to NO_2 using the 'NO_X to NO_2' calculator (v7.1) (DEFRA, 2019c), released in April 2019, and available at the Air Quality Archive (https://laqm.DEFRA.gov.uk/review-and-assessment/tools/tools.html). The year and region for which the modelling has been undertaken are specified and local factors, such as an appropriate factor of NO_X emitted as NO_2, are used in the calculation.

Meteorological Data

13.2.38 The meteorological dataset used in the assessment was recorded at the station at Edinburgh Airport, Edinburgh, in 2017, located approximately 18 km to the north west of the Proposed Scheme.

13.2.39 The recording site is considered to be representative of regional meteorological conditions and sufficient to satisfy the requirements of this assessment. The wind rose for this site and further details are provided in Appendix 13.2 – Meteorological Data.

Model Verification

13.2.40 It is standard practice to verify dispersion models of road traffic emissions to account for model bias. The verification exercise undertaken in this assessment is described in Appendix 13.3 – Model Verification. Model verification made use of NO_2 survey data gathered in the study area. The comparison of modelled and measured concentrations at the locations of survey led to the calculation of model bias-adjustment factors that were then applied to all receptor results reported in this chapter.

Receptors

13.2.41 Air quality receptors sensitive to changes in air quality typically include residential properties, schools, care homes, hospitals and designated ecological sites.

13.2.42 Twenty-one (21) sensitive receptors were selected, all of which are residential properties (See Table 13-2 'Modelled Sensitive Receptors'). The receptors were selected based on the changes in traffic expected and their proximity to the affected roads to ensure that the greatest impacts of the Proposed Scheme were modelled. In line with DMRB guidance, all 21 receptors are located with 200m of the ARN.

13.2.43 In line with DMRB guidance, consideration of air quality impacts was given to ecological habitats with a national or international designation that are located within 200m of the ARN. The closest such ecological site is the Site of Special Scientific Interest (SSSI) Dalkeith Oakwood and is located to the northeast of the Proposed Scheme (approximately 1.5km). However, as this site is more than 300m away from the Affect Road Network (ARN), it was screened out from this assessment.

13.2.44 The air quality sensitive receptors considered in this assessment are shown in Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes'.

Table 13-2 Modelled Sensitive Receptors

Receptor ID	Location	Height (m)	X	Y
R1	Cockrill Farm	1.5	331556	668284
R2	Home Farm	1.5	331524	668323
R3	Back of Summerside	1.5	331612	668028
R4	Summerside	1.5	331636	668100
R5	Sheriffhall Farm Cottage	1.5	332006	667986
R6	Sheriffhall Farm	1.5	332030	667904
R7	Sheriffhall Mains	1.5	332091	668665
R8	19 Newton Village	1.5	331696	669504
R9	Haulsford Cottage	1.5	330696	669183
R10	Drum Farm	1.5	331000	668789
R11	Parkburn	1.5	329285	667175
R12	Burnside	1.5	330841	667804
R13	Melville Grange	1.5	330485	667636
R14	South Melville Farm	1.5	331657	666641
R15	Lasswade Road	1.5	331851	666706
R16	Melville Grange Cottage	1.5	330553	667916
R17	Smithy Green Avenue	1.5	330533	669414
R18	11 Smithy Green Avenue	1.5	330663	669267
R19	11 Newton Village	1.5	331734	669482
R20	Burdiehouse Village	1.5	327446	667296
R21	Clippens Drive	1.5	327511	667147

Impact Assessment

EIA Assessment Criteria

13.2.45 The EIA Regulations require consideration of the 'likely significant effects' but do not provide a definition of what constitutes a significant effect, as this is determined according to the environmental parameter under consideration. The determination of significance for air quality is consistent with the overall approach set out in the ES, but terminology and approach utilised for air quality is based on the specific requirements of IAN 174/13 'Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07)' (Highways Agency, et al., 2013).

13.2.46 The approach to the determination of significance for air quality is set out below.

Highways Assessment Criteria

Magnitude of Change

13.2.47 With regard to road traffic, the change in pollutant concentrations in the DS compared to DM concentrations has been quantified at selected sensitive receptors. The total concentration of pollutant concentrations in the baseline, DM and DS scenarios have also been quantified and these have been used to consider the risk of the air quality objective values being exceeded in each scenario.

13.2.48 For a change of a given magnitude (increase or decrease) in pollutant concentrations, IAN 174/13 (Highways Agency, et al., 2013) contains descriptors of the magnitude of change at individual sensitive receptors, based on the proportion of that change to the air quality objective value. For example, a change in predicted annual average concentrations of NO_2 of less than 0.4µg/m^3 (or 0.18µg/m^3 for PM_{10}) is considered to be so small as to be imperceptible. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

13.2.49 The magnitude of change is divided into four classes as defined in Table 13-3 'Magnitude of Change in Ambient Pollutant Concentrations (IAN 174/13)', and the corresponding terminology used in Table 13-3 is identified so it is consistent with DMRB IAN 174/13. This deviates from the terminology used in the other chapters within the ES.

Table 13-3 Magnitude of Change in Ambient Pollutant Concentrations (IAN 174/13)

Magnitude of Change in NO_2 (µg/m^3)	Value of Change in Annual Average NO_2 and PM_{10}	Magnitude of Change in PM_{10} (µg/m^3)
Large (>4)	Greater than full measure of uncertainty (MoU) value of 10% of the air quality objective (4 µg/m^3)	Large (>1.8)
Medium (>2 to 4)	Greater than half of the MoU (2 µg/m^3), but less than the full MoU (4 µg/m^3) of 10% of the air quality objective	Medium (>0.9 to 1.8)
Small (>0.4 to 2)	More than 1% of objective (0.4 µg/m^3) and less than half of the MoU i.e. 5% (2 µg/m^3). The full MoU is 10% of the air quality objective (4 µg/m^3)	Small (>0.18 to 0.9)
Imperceptible (≤0.4)	Less than or equal to 1% of the objective (0.4 µg/m^3)	Imperceptible (≤0.18)

13.2.50 The magnitude of the change in the predicted number of exceedances of the 24-hour objective is directly derived from the predicted annual average value using the relationship defined in LAQM.TG (16) (DEFRA, 2018).

13.2.51 Research projects completed on behalf of DEFRA and the Devolved Administrations (AEAT, 2008; Laxen & Marner, 2003) have concluded that the hourly average NO_2 objective is unlikely to be exceeded if annual average concentrations are predicted to be less than 60 µg/m^3. Therefore, this assessment evaluates the likelihood of exceeding the hourly average NO_2 objective by comparing predicted annual average NO_2 concentrations at all receptors to an annual average equivalent threshold of 60 µg/m^3 NO_2. Where predicted concentrations are below this value, it can be concluded that the hourly average NO_2 objective (200 µg/m^3 NO_2 not more than 18 times per year) is likely to be achieved.

13.2.52 IAN 174/13 refers to both NO_2 and PM_{10}, but not $PM_{2.5}$. The assessment reported in this chapter does also provide predictions of annual mean $PM_{2.5}$ concentrations in the baseline, DM and DS scenarios, at the selected air quality sensitive receptors. The method described in IAN 174/13 has been adapted to also apply to $PM_{2.5}$.

Description of Effect at Individual Receptors

13.2.53 All relevant receptors that have been selected to represent locations where people are likely to be present are based on potential impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such, the sensitivity of receptors was considered in the definition of the air quality objective values. Therefore, no additional subdivision of human health receptors on the basis of building or location type is necessary because the receptor sensitivity already takes account of a worst case for effects on human receptors.

13.2.54 The significance of local operational air quality effects for the Proposed Scheme is based on the guidance presented in the IAN 174/13 (Highways Agency, 2013), which recommends that key criteria for air quality are considered including:

- Is there a risk that environmental standards will be breached?
- Is there a probability of the effect occurring?
- Will there be a large change in environmental conditions?
- Will the effect continue for a long time?
- Will many people be affected?
- Is there a risk that protected sites, areas or features will be affected?
- Will it be difficult to avoid, or reduce or repair or compensate for the effect?

13.2.55 Following the collation of information to address the above questions, an informed professional judgement on the significance of local air quality effects for public exposure and European or nationally designated ecosystems has been established.

13.2.56 The scope of IAN 174/13 includes the assessment of significant local air quality effects for public exposure and European or nationally designated ecosystems only. Changes in regional emissions are presented as a reporting requirement of DMRB HA207/07.

Overall Assessment of Significance

13.2.57 The questions set out in Paragraph 13.2.54 form the basis for determining likely significant local operational air quality effects for sensitive receptors. The question of how many people would be affected has been addressed by reference to the number of receptors predicted to experience small, medium and large changes in air quality above an air quality objective. Table 13-4 'Guideline for Number of Properties Constituting a Significant Effect (IAN 174/13)' provides a basis for assessment as set out in IAN 174/13 (Highways Agency, et al., 2013a). Where numbers of affected receptors are above the upper thresholds listed in Table 13-4 for locations above the air quality objective, this may suggest significant air quality effects are more likely.

Table 13-4 Guideline for Number of Properties Constituting a Significant Effect (IAN 174/13)

Magnitude of Change in NO_2 ($\mu g/m^3$)	Number of Receptors with:		Magnitude of Change in PM_{10} ($\mu g/m^3$)
	Worsening of air quality already above objective or creation of a new exceedance	Improvement of air quality already above objective or the removal of an existing exceedance	
Large (>4)	1 to 10	1 to 10	Large (>1.8)
Medium (>2 to 4)	10 to 30	10 to 30	Medium (>0.9 to 1.8)
Small (>0.4 to 2)	30 to 60	30 to 60	Small (>0.18 to 0.9)

13.2.58 The overall significance of predicted effects on local air quality is also evaluated in the context of relevant national (e.g. NPF3), regional and local air quality planning policy.

Regional Assessment

13.2.59 The regional assessment provides the change in the quantity of total pollutant emissions as a result of the operation of the Proposed Scheme in each assessment year.

13.2.60 The regional assessment considers changes in annual road transport emissions of NO_x, PM_{10} and CO_2 that may be brought about by the Proposed Scheme in the opening year (2024) and the design year (i.e. 15 years after opening, 2039) at a regional level. The Emission Factor Toolkit (EFT v9.0) spreadsheet has been used in the estimation of these emissions. No restrictions on vehicle emissions rates have been assumed in the regional assessment, other than the use of 2030 vehicle emissions rates to represent conditions in 2039, as the latest year available year in the EFT is 2030.

13.2.61 The regional air quality assessment study area has been determined using the DMRB HA207/07 regional screening criteria, as given below, which has been applied to the traffic data supplied for both the assessment year and design year:

- A change of more than 10% AADT; or
- A change of more than 10% to the number of HDV AADT; or
- A change in daily average speed of more than 20 km/h.

13.2.62 The regional assessment has used traffic data from both the local microsimulation model, which has been provided by the AECOM traffic consultants to be representative of conditions with and without the Proposed Scheme in place for the assessment years (see the DMRB Stage 3 Engineering, Traffic and Economic Assessment, AECOM).and the regional traffic model. Where there was overlap between the two, data from the local microsimulation model was used.

Limitations of the Assessment

13.2.63 It is likely that the Proposed Scheme will be procured by means of a Design and Build (D&B) type contract. Under the terms of this contract type, the Contractor will undertake both the detailed design and construction of the Proposed Scheme

13.2.64 It is expected that the construction work would take place within the Scheme Extents as shown on Figure 1.2 'The Proposed Scheme'. The Scheme Extents have informed the land take calculations undertaken for assessment purposes in this ES. The land within the Scheme Extents will be purchased under a Compulsory Purchase Order (CPO).

13.2.65 It is possible that the Contractor may require construction compounds to be located out with land identified in the CPO. Should construction compounds be located out with the Scheme Extents it will be the responsibility of the Contractor to assess the environmental impacts of the construction compounds and seek to mitigate these where possible.

13.2.66 The construction assessment is based on the construction information that is currently available, with advice being provided by the Highway Design Team. As with all construction assessments, the exact details of construction activities would not be fully known before a specific contractor is appointed to complete the works who would determine their exact construction methods and programme during the detailed design stage.

13.2.67 As the Proposed Scheme is developed at detailed design any refinements to the design should be subject to environmental review to ensure that the residual effects would not be greater (or significantly different) than those

reported in this ES. The findings of any such review should be subject to approval by Transport Scotland (TS) and where necessary opinions should be sought from the statutory bodies.

13.3 Legislative and Policy Framework

European Legislation

13.3.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC (European Parliament, 2008), which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC (European Parliament, 1999) - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_X), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10});
- Directive 2000/69/EC (European Parliament, 2000) - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- Directive 2002/3/EC (European Parliament, 2002) - the Third Air Quality "Daughter" Directive - seeks to establish long term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

13.3.2 Directive 2008/50/EC (Council of European Communities, 2008) is currently transposed into United Kingdom (UK) legislation by the Air Quality Standards Regulations 2010 (Scottish Government, 2010) which came into force on 11 June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment.

National Legislation

13.3.3 The objectives adopted in Scotland are laid out in the Air Quality (Scotland) Regulations 2000 (Scottish Government, 2000), Air Quality (Scotland) Amendment Regulations 2002 (Scottish Government, 2002) and the Air Quality (Scotland) Amendment Regulations 2016 (draft) (Scottish Government, 2016). Table 13-5 'Current Air Quality Objectives in Scotland' provides a summary table for current Air Quality Objectives in Scotland concerning pollutants considered within this study.

Table 13-5 Current Air Quality Objectives in Scotland

Pollutant	Concentration (µg/m^3)	Measured as	To be achieved by
Nitrogen Dioxide, NO_2	200	1-hour mean	31 Dec 2005
	40	Annual mean	31 Dec 2005
Particulates, PM_{10}	50	24-hour mean 7 exceedances permitted per year	31 Dec 2010
	18	Annual mean	31 Dec 2010
Particulates, $PM_{2.5}$	10	Annual mean	2020

13.3.4 The air quality objective values have been set down in regulation solely for the purposes of local air quality management (LAQM). Under the LAQM regime, local authorities have a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the governing local authority to define

the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. Consequently, it is possible for the boundary of an AQMA to include within it, relevant locations where air quality is not at risk of exceeding an air quality objective.

National Policy

National Planning Framework 3 (Scottish Government, 2014a)

13.3.5 The National Planning Framework (NPF3) was published in 2014 by the Scottish Government and outlines the key principles that guide the wider planning system in Scotland. NPF 3 guides Scotland's spatial development for the next 20 to 30 years, setting out strategic development priorities to support the Scottish Governments central purpose of promoting sustainable economic growth. Plans that are beneath the NPF 3 in the planning policy hierarchy are directly influenced by the goals and themes in the document.

13.3.6 NPF 3 directly influences the content of Scottish Planning Policy (SPP), Circulars, Planning Advice Notes (PANs) and Development Plans produced by Local Authorities.

13.3.7 With regards to air quality, the NPF 3 is hoped by 'reducing the impact of the car on city and town centres' to improve air pollution and provide health benefits.

Planning Advice Note 51 – Environmental Protection (PAN51) (Scottish Government, 2006)

13.3.8 The central purpose of this Planning Advice Note (PAN) is to support the existing policy on the role of the planning system in relation to the environmental protection regimes, including air quality.

Scottish Planning Policy (Scottish Government, 2014b)

13.3.9 The Scottish Planning Policy (SPP) document is a statement of the Scottish Government's policy on nationally important land use matters.

13.3.10 SPP (Scottish Government, 2014) facilitates development while at the same time *"protecting and enhancing the natural and built environment"* and is considered to be central to the Scottish Government's central purpose of achieving sustainable economic growth (Paragraph 4).

13.3.11 The SPP relates to air quality in the following contexts:

- Policies and decisions should be guided by *"avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality"*
- Local development plans *"should set out the factors that specific proposals will need to address, including disturbance, disruption and noise, blasting and vibration, and potential pollution of land, air and water"*
- Town centre strategies should *"identify how green infrastructure can enhance air quality, open space, landscape/settings, reduce urban heat island effects, increase capacity of drainage systems, and attenuate noise"*

Cleaner Air for Scotland (CAFS) (Scottish Government, 2015)

13.3.12 CAFS is a document set out in conjunction with TS, Scottish Environment Protection Agency (SEPA), Health Protection Scotland and health boards as well as local authorities to provide a national framework to help improve air pollution and fulfil legal responsibilities. This document also provides a large amount of detail on air pollution in general and ways to reduce the impact of air quality.

13.3.13 The CAFS's main links to the Proposed Scheme include:

- The Proposed Scheme links to transport by providing better pedestrian and cycle access around the Sheriffhall Roundabout, allowing more people to use these forms of travel rather than driving. The Proposed Scheme also provides a more intelligent traffic system management.
- In terms of place making, the Proposed Scheme integrates different transport modes and provides safe and convenient opportunities for walking and cycling.

Regional Policy

Strategic Development Plan: SESplan (June 2013)

13.3.14 The adopted Strategic Development Plan (SDP) makes no specific references to air quality. It does identify Sheriffhall Roundabout as a key strategic improvement.

Proposed South East Scotland Strategic Development Plan (SDP2) (SESplan, 2016)

13.3.15 The Proposed Plan sets out the vision for the city region over 20 years from 2018. Once consultation is over and the Plan adopted, it will replace the current Strategic Development Plan and will inform the next set of Local Development Plans. Work is underway on the next SESplan (SDP2) which is anticipated to be approved by the summer of 2018.

13.3.16 The plan highlights A720 Improvements, including Sheriffhall Roundabout as 'Potential Strategic Cross-Boundary Projects' to improve connectivity for the region. The SDP2 Proposed Strategic Development Plan published in October 2016 highlights improvements to the A720 including the Sheriffhall Roundabout upgrade as a potential strategic cross-boundary project supporting the vision for the plan of a *"better connected place".*

13.3.17 In relation to air quality, the document discusses:

"Public spaces should be free from excessive traffic noise and air pollution and the needs of people should be considered before the movement of motor vehicles."

13.3.18 As discussed in Chapter 2 - Need for the Scheme, the Proposed SDP was rejected by the Scottish Ministers on 16 May 2019; however, the proposed plan has still been considered within this ES as a draft plan.

Local Policy

Edinburgh Local Development Plan (City of Edinburgh Council, 2016)

13.3.19 The ELDP (City of Edinburgh Council, 2016) contains a number of environmental policies, of which Policy Env 22 (Pollution and Air, Water and Soil Quality) relates to air quality:

"a) there will be no significant adverse effects for health, the environment and amenity and either

b) there will be no significant adverse effects on: air, and soil quality; the quality of the water environment; or on ground stability

c) appropriate mitigation to minimise any adverse effects can be provided.

Pollution can arise from many sources and activities including traffic and transport, domestic heating, industrial processes, agriculture, waste disposal and landfill. Air, soil and water quality can all be affected and harmed by some forms of development and land can present a potential pollution or safety threat if it has been contaminated or destabilised by previous activities. Air, noise and light pollution can also be a source of harm to health and amenity.

The potential risk and significance of pollution will be considered when assessing planning applications, in consultation where necessary with relevant agencies, such as Scottish Environment Protection Agency and the Health and Safety Executive. Proposals will be assessed to ensure development does not adversely affect air quality

in identified Air Quality Management Areas (AQMAs) or, by cumulative impacts, lead to the creation of further AQMAs in the city."

13.3.20 This document includes reference to AQMA locations within the Edinburgh area. These AQMA's have been declared in the city centre, St John's Road, Corstorphine, Great Junction Street in Leith, Glasgow Road (A8) at Ratho Station and Inverleith Row/Ferry Road junction, with traffic congestion being the main cause of these areas within Edinburgh. The LDP contains various strategies to promote sustainable modes of travel to improve congestion and air quality.

Midlothian Local Development Plan (Midlothian Council, 2017)

13.3.21 The MLDP (Midlothian Council, 2017) contains a number of environmental policies, of which Policy Env 17 is related specifically to air quality:

"The Council may require further assessment (either as part of Environmental Impact Assessment or separately) to identify air quality impacts where the Council's Environmental Health service and the Scottish Environment Protection Agency (SEPA) considers it requisite. It will refuse planning permission, or seek effective mitigation, where development proposals cause unacceptable air quality or dust impacts, or would result in sensitive uses, which give rise to air pollution concerns, being located within or close to uses with potential to generate such pollution."

13.3.22 With regards to air quality, the introduction of electric vehicles into the county is seen as a viable option in reducing air quality within the county. Although the Council undertakes various air quality monitoring, there are no outstanding AQMAs, however in the event that one was declared, the Council would consider various management techniques to improve the situation.

East Lothian Local Development Plan (East Lothian Council, 2016)

13.3.23 The East Lothian Local Development Plan (ELLDP) has various aims and policies. Aims relating to air quality include:

"Protect and enhance the area's high quality environment and its special identity [SOA: 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10]: To ensure that the area's significant international, national and local cultural and natural heritage assets, including green network assets, are protected and conserved, and where appropriate enhanced, including biodiversity, flora and fauna as well as soil, water and air quality".

13.3.24 Policies include:

"Policy NH12: Air Quality Impacts on air quality will be taken into account in assessing development proposals, particularly within and close to any Air Quality Management Area (AQMA). An Air Quality Assessment may be required for developments that are within an AQMA or where the proposed development may cause or exacerbate a breach of National Air Quality Standards. Development proposals that would result in either a breach of National Air Quality Standards or a significant increase in concentrations of air pollution within an existing AQMA will not be supported unless appropriate mitigation measures can be put in place. Financial contributions to strategic air quality mitigation measures will be necessary in these circumstances."

13.3.25 With regards to local air quality, vehicle emissions are seen as a key factor to the AQMA at Musselburgh High Street, and other areas in the district with elevated concentrations, including Tranent High Street. These issues are linked to strategic transport issues. As part of the AQMA relating to Musselburgh High Street, an air quality management plan for Musselburgh town centre will be prepared to 'mitigate existing issues and development impacts. Allocated sites will make use of existing infrastructure, or are in locations and are of a scale that will justify new facilities or infrastructure provision'. This will also need to include mitigation for transport, which includes improvements to bus stop locations and the existing bus fleet. This management strategy is outlined in Action 'Prop T20 and Policy T19.

To manage the cumulative impact of new developments in the local area, further traffic management measures will be required. The Council also is supporting the provision of electric vehicle charging points.

13.4 Consultations

13.4.1 With regards to air quality, only City of Edinburgh Council had specific consultation comments with regards to air quality at the scoping stage. These are outlined and responded to in Table 13-6 'Consultation Comments and Response'.

Table 13-6 Consultation Comments and Response

City of Edinburgh Council Response	AECOM response to comments
The scoping report does not make reference to Cleaner Air for Scotland (CAFS) which challenges local authorities to optimise the operation of road space within urban areas (e.g. minimise the stop-start vehicle movements; make active travel routes a more attractive option).	Although CAFS isn't referred to within the scoping report, the Proposed Scheme is anticipated to reduce stop-start vehicle movements and the cycle ways and footpaths being embedded within the Proposed Scheme. A reference to CAFS has been included within this Chapter in Section: 13.3 – National Policy.
CEC asks if there will be emission limits set on the contractors' vehicles servicing the Scheme site.	The CEMP considers emission standards on road mobile machinery that is consistent with national guidance.
CEC also raise recent question marks over the integrity of diesel emission data which raises concerns (CEC don't specify these) over air quality modelling.	Modelling has been conducted using the most recent emission factors published by DEFRA. The model outputs were also adjusted using local air quality monitoring data to account for uncertainties. Additionally, the assumption has also been made that vehicle emission rates projected for 2020 are representative of vehicle emission rates in 2024 and that background concentrations don't improve from 2020 and so we have not assumed that all projected improvements in air quality are realised by 2024.

13.5 Baseline Conditions

13.5.1 Baseline conditions are considered with reference to local air quality management review and assessment responsibilities within the area encompassing the Proposed Scheme and study area, DEFRA background pollutant concentration data and Pollution Climate Mapping (PCM) link data, project specific measurement data and modelled baseline pollutant concentrations.

Local Air Quality Management Monitoring

13.5.2 No AQMAs have been declared within or close to the air quality study area. CEC and ELC operate an extensive network of NO_2 passive and automatic air quality monitoring equipment; however, the nearest site is located roughly 1km away from the air quality study area. MLC operates an extensive network of NO_2 passive air quality monitoring equipment, the nearest of which is 150m away from the study area. A selection of the nearest monitoring locations to the site is presented in Table 13-7 'Council Air Quality NO_2 Monitoring'. Note that all of the sites listed are designated as roadside. No background concentration measurement data is gathered within or near to the study area.

Table 13-7: Council Air Quality NO_2 Monitoring

ID	Council	Location	Type	X	Y	NO_2 mean Concentrations (µg/m^3)					
						2013	2014	2015	2016	2017[1]	2018[1,2]
BR1	Midlothian	Bonnyrigg	Roadside	330895	665229	23.2	21.5	20.5	21.4	17.5	16.5
BR2	Midlothian	Bonnyrigg	Roadside	330973	665219	21.2	20.1	20.9	20.1	18.2	21.3
J2	Midlothian	Dalkeith	Roadside	333178	667290	25.3	23.6	23.1	25.3	17.8	20.9

ID	Council	Location	Type	X	Y	NO_2 mean Concentrations (µg/m^3)					
						2013	2014	2015	2016	2017[1]	2018[1,2]
BD1	Midlothian	Dalkeith	Roadside	333055	667183	29.0	29.3	23.1	26.4	22.5	26.6
ED1	Midlothian	Dalkeith	Roadside	333206	667372	30.1	29.1	27.8	32.5	25.0	32.4
ED2	Midlothian	Dalkeith	Roadside	332996	667122	24.2	23.1	19.1	19.9	17.7	22.2
X1	Midlothian	Dalkeith	Roadside	332959	667392`	16.5	14.7	14.8	15.1	-	-
HD1	Midlothian	Dalkeith	Roadside	333326	667514	14.7	13.0	14.5	14.7	13.6	16.4
ND1	Midlothian	Dalkeith	Roadside	333410	667059	27.2	37.3	23.7	25.4	24.8	26.2
DL1	Midlothian	Dalkeith	Roadside	333247	667073	29.4	28.2	26.9	26.2	25.4	27.4
LH1	Midlothian	Loanhead	Roadside	328242	665585	21.2	18.7	18.2	21.1	17.3	23.8
SN1	Midlothian	Loanhead	Roadside	327142	666337	23.6	21.6	20.0	21.7	17.5	26.1
SN2	Midlothian	Loanhead	Roadside	327262	666588	25.0	22.3	21.8	24.5	22.8	28.6
149a	Edinburgh	Howden Hall Road 79	Roadside	327383	668079	-	-	30.0	33.0	29.0	-
150	Edinburgh	Drum Street	Roadside	329281	668615	-	-	27.0	29.0	25.0	-

[1]Missing data from the Midlothian Council 2019 ASR. [2]City of Edinburgh Council have not published the 2019 ASR online at the time of publication of the ES.

13.5.3 The annual mean NO_2 data presented in Table 13-7 'Council Air Quality NO_2 Monitoring' demonstrates that even at roadside locations in the wider area surrounding the study area, concentrations are well below the air quality objective value.

13.5.4 No monitoring of PM_{10} or $PM_{2.5}$ is undertaken near to the Proposed Scheme. The nearest PM_{10} monitoring is located approximately 3 km away and is beyond the extent of the study area.

DEFRA Background Concentrations

13.5.5 Background pollutant concentration maps for the years 2017 and 2020 are provided in Appendix 13.2 – Meteorological Data, for the centre point of the 1km by 1km grid square within which the air quality sensitive receptors are located. Table A13.1of Appendix 13.1 – Background Concentrations shows that background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are all well below the respective air quality objective values.

Pollution Climate Mapping (PCM) Model Links

13.5.6 Within the study area, two PCM links have been identified. Of these two links, Old Dalkeith Road has the highest NO_2 concentration, which is 23.5 µg/m^3 in 2017 (DEFRA (2017a)). Therefore, there are no PCM link exceedances in the existing baseline or future baseline scenarios.

AECOM Monitoring

13.5.7 To ascertain pollutant concentrations within the study area, AECOM undertook a baseline nitrogen dioxide diffusion tube survey between 2 April 2015 and 2 October 2015. Monitoring was undertaken at nine locations shown in Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes'. These data was annualised to a projected annual mean concentration for 2017, in line with the standard approach, which is summarised in Appendix 13.4 - Seasonal and Bias Adjustment.

13.5.8 As well as helping to understand baseline NO_2 conditions in the study area, some of the diffusion tube monitoring data was used to inform model verification. Not all of the monitoring sites were suitable for model verification. Sites G and I were located more than 200m from the ARN, and Site B had limited data capture. More details of the verification process used within this assessment are outlined in Appendix 13.3 - Model Verification.

13.5.9 The nine diffusion tube monitoring locations are identified in Table 13-8 'AECOM NO_2 Monitoring Data'. The monitoring sites (except for the Background site (I)) consisted of triplicate diffusion tube sampling. These diffusion tubes results have annualised following the appropriate method and then averaged to provide the results given for each site.

13.5.10 The annual mean NO_2 dataset demonstrates that concentrations are well below the national air quality objective value for that pollutant at the locations considered, but are more elevated at roadside locations where traffic is sometimes congested (A and F). Away from roadside locations (G and I), concentrations are lower still, where conditions are nearer to background.

Table 13-8 AECOM NO_2 Monitoring Data

ID	Location	X	Y	Type	Bias-Adjusted Annualised 2017 Mean (µg/m^3)
A	Gilmerton Road (west)	330544	667918	Roadside	34.4
B	Gilmerton Road	331211	667630	Roadside	12.7[1]
C	Gilmerton Road (Kings Acre Golf Course)	330884	667805	Roadside	18.1
D	Melville Inn	331567	667468	Roadside	26.7
E	Campend	331522	668324	Roadside	31.4
F	A7 Sheriffhall Roundabout	331659	668100	Roadside	34.1
G	Sheriffhall Farm	331979	667936	Background	18.6
H	West End of Dalkeith	332509	667615	Roadside	24.6
I	Kindsacre Golf Course	330487	667063	Background	12.1

Predicted Baseline

13.5.11 Predicted conditions at the selected sensitive receptors for the baseline scenario (2017) are provided in Table 13-9 'Predicted Baseline Concentrations (2017)'. The locations of the sensitive receptors are illustrated in Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes'.

Table 13-9 Predicted Baseline Concentrations (2017)

Receptor ID	NO_2 (µg/m^3)	PM_{10} (µg/m^3)[2]	$PM_{2.5}$ (µg/m^3)
R1	32.5	16.3 (0)	9.3
R2	36.9	17.2 (1)	9.8
R3	27.9	14.6 (0)	8.4
R4	26.2	14.7 (0)	8.3
R5	22.7	11.6 (1)	7.3
R6	17.4	11.2 (2)	7.0
R7	15.8	12.5 (1)	7.3

[1] The annual mean concentrations at diffusion tube Site B should be treated with caution, due to poor data capture.
[2] Values in parenthesis denote the number of PM_{10} daily exceedances.

Receptor ID	NO_2 (µg/m^3)	PM_{10} (µg/m^3)[2]	$PM_{2.5}$ (µg/m^3)
R8	16.3	13.7 (0)	7.6
R9	28.0	14.3 (0)	8.5
R10	15.4	13.6 (0)	7.6
R11	27.2	14.4 (0)	8.5
R12	16.8	13.1 (0)	7.6
R13	16.5	13.0 (1)	7.5
R14	16.8	11.7 (1)	7.2
R15	15.2	11.6 (2)	7.1
R16	33.8	15.4 (0)	9.0
R17	15.8	12.7 (1)	7.5
R18	16.6	12.7 (1)	7.6
R19	14.0	13.3 (0)	7.4
R20	18.9	13.7 (0)	7.9
R21	23.7	14.4 (0)	8.3

13.5.12 Table 13-9 indicates that for NO_2, all predicted concentrations were below the objective. The highest NO_2 concentrations at the residential receptors considered was predicted at R2 (36.9 µg/m^3) and R16 (33.8 µg/m^3). R2 is located adjacent to and predominantly downwind of the A7, on the often congested approach to the Sheriffhall Roundabout, and R16 is located in close proximity to the A720, which would contribute to the relatively higher concentrations at these locations.

13.5.13 For PM_{10}, Table 13-9 shows that annual mean concentrations at all receptors considered were well below the respective air quality objective values, as were the number of daily exceedances. Annual mean concentrations of $PM_{2.5}$ are all below the national air quality objective. Three receptors are within 10% of the national air quality objective for that pollutant at receptors R1, R2 and R16, on the approach to the Sheriffhall Roundabout and near to the A720 respectively.

13.6 Potential Impacts

Construction Phase Assessment

13.6.1 A four-step process was followed to determine the risk of potential effects during the construction phase, as described in Section 13.2. Further details are provided in Appendix 13.5 – Construction Phase Air Quality and Dust Risk Assessment'.

Step 1: Screen the Requirement for a Detailed Assessment

13.6.2 The nearest dust sensitive receptors to the Proposed Scheme are the residential properties on the A7, Sheriffhall Farm, and a collection of properties nearby, on Millerhall Road, called Sheriffhall Mains. The nearest of these located on the A7 and at Sheriffhall Farm, approximately 10m and 26m from the Proposed Scheme construction site boundary respectively. Non-residential receptors include a Café on the A7, called Sheriffhall Café, approximately 350m from the Proposed Scheme construction boundary.

13.6.3 There are no nationally designated ecological sites within 50m of the Proposed Scheme, or within 50m of public road that is within 500m of a construction site entrance.

13.6.4 Due to the presence of dust sensitive receptors within 350m of the construction site boundary, a detailed construction phase assessment was undertaken, in line with IAQM guidance (2016).

Step 2: Assess the Risk of Dust Impacts

Step 2A: Define the Potential Dust Emission Magnitude

13.6.5 Demolition - As the Proposed Scheme is essentially updating the existing road network, there are no existing structures to be demolished. Therefore, the potential dust effects during the demolition works are considered insignificant and not considered further in this assessment.

13.6.6 Earthworks and Construction - With respect to road schemes, earthworks and construction works will be undertaken simultaneously. With reference to the IAQM guidance and using professional judgement, a single 'potential dust emission' magnitude has been determined for both activities. Taking into consideration potentially dusty soil and construction material, and a site area being larger than 10,000m^2, the potential dust emission class is considered to be '**Large**'.

13.6.7 Track-Out - With regard to the criteria for the dust-generating potential of the surface material and the length of unpaved road, it is considered appropriate to classify the potential dust effects as '**Small**'.

Step 2B: Define the Sensitivity of the Area

13.6.8 The following were taken into consideration when determining the sensitivity of the area to dust soiling and health impacts of PM_{10}:

- The Proposed Scheme is located in fairly rural area, however as there is at least one property within 20m of the Scheme extent, the receptor sensitivity is considered to be '**Medium**'.
- No local background monitoring of PM_{10} is undertaken in the study area; however the modelled background PM_{10} concentration provided by DEFRA was 11.7 µg/m^3 as an average across the study area in 2017 (DEFRA, 2019a).

13.6.9 Taking the above into consideration the sensitivity of the area to dust soiling effects and human health effects is '**Low**'.

Step 2C: Define the Risk of Impacts

13.6.10 Taking into consideration the conclusion from Steps 2A and 2B, the risk of dust impacts for each activity are provided in Table 13-10 'Risk of Unmitigated Dust Impacts'. The greatest risk of impact associated with the unmitigated construction works are from dust soiling during earthworks and construction activities.

Table 13-10 Risk of Unmitigated Dust Impacts

Source	Dust Soiling	Human Health
Earthworks & Construction	Medium	Low
Track-out	Negligible	Negligible

13.6.11 Step 3 and Step 4 of the construction dust assessment are considered later within Section 13.7 'Mitigation' and 13.8 'Residual Impacts' respectively.

Operational Phase Assessment

Nitrogen Dioxide (NO_2)

13.6.12 Predicted NO_2 conditions at the selected sensitive receptors for the DM and DS scenarios (2024) are provided in Table 13-11 'Predicted Do-Minimum and Do-Something NO_2 Concentrations (2024)', as well as the change in

concentration between the two scenarios. The locations of the sensitive receptors are illustrated in Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes'.

Table 13-11 Predicted Do-Minimum and Do-Something NO_2 Concentrations (2024)

Receptor ID	Do-minimum (DM) (2024) ($\mu g/m^3$)	Do-something (DS) (2024) ($\mu g/m^3$)	DS-DM ($\mu g/m^3$)
R1	26.8	27.2	+0.4
R2	30.1	30.7	+0.6
R3	24.8	24.0	-0.8
R4	22.7	21.4	-1.3
R5	20.2	18.5	-1.7
R6	15.3	14.8	-0.5
R7	14.0	14.0	<+0.1
R8	14.4	15.0	+0.6
R9	22.9	24.2	+1.3
R10	13.0	13.4	+0.4
R11	24.5	24.7	+0.2
R12	15.0	15.0	<+0.1
R13	14.4	14.5	+0.1
R14	14.4	14.6	+0.2
R15	13.3	13.3	<+0.1
R16	30.9	30.5	-0.4
R17	13.5	13.8	+0.3
R18	14.1	14.4	+0.3
R19	12.5	12.8	+0.3
R20	16.4	16.3	-0.1
R21	20.8	20.2	-0.6

13.6.13 With or without the Proposed Scheme in place, NO_2 concentrations are well below the air quality objective at all receptors. The highest concentrations were predicted at receptors R2 (DM: 30.1 $\mu g/m^3$, DS: 30.7 $\mu g/m^3$) and R16 (DM: 30.9 $\mu g/m^3$, DS: 30.5 $\mu g/m^3$).

13.6.14 The orientation and magnitude of change in NO_2 concentrations between the Do-Minimum and Do-Something (2024) scenarios is summarised as follows:

- Imperceptible change (<0.4$\mu g/m^3$) in NO_2 concentrations at 10 of the 21 receptors considered;
- Small improvement in NO_2 concentrations (-0.4$\mu g/m^3$ to -2$\mu g/m^3$) at six receptors; and
- Small worsening in NO_2 concentrations (+0.4$\mu g/m^3$ to +2$\mu g/m^3$) at five receptors.

13.6.15 As shown in Figure 13.3 'Impacts of the Proposed Scheme on NO_2 Concentrations', the receptors that experience a small improvement in NO_2 concentrations include R3 and R4 which are located adjacent to the A7 immediately to the north west of the Sheriffhall Roundabout and R5 and R6 which are located adjacent to Old Dalkeith Road, immediately to the south east of the Sheriffhall Roundabout The reduction at R4 is due to both the realignment of the A7 immediately north of the roundabout and the overall increases in speeds along both the main A720 carriage way, and slip roads, causing engines to operate more efficiently with reduced emission rates. R16 and R21 also experience a

small improvement in NO_2 concentrations which is due to decreased flows on the A772 near R16 and on Burdiehouse Road near R21.

13.6.16 The receptors that experience a small worsening in NO_2 concentrations are located on the roads that lead directly to and from the Sheriffhall Roundabout. Notably the receptors that experience the greatest worsening are also located adjacent to the A7, north of the roundabout, where there is no change in alignment, an increase in vehicle flows and less benefit in changes to average vehicle speed.

13.6.17 For annual mean NO_2 the operation of the Proposed Scheme will not cause an exceedance of air quality objective or a worsening in concentrations where there is already an exceedance. In line with the criteria used in this assessment, this does not constitute a significant effect.

PM_{10} and $PM_{2.5}$

13.6.18 Predicted PM_{10} and $PM_{2.5}$ conditions at the selected sensitive receptors for the DM and DS scenarios (2024) are provided in Table 13-12 'Predicted Do-Minimum and Do-Something PM_{10} Concentrations (2024)' and Table 13-13 'Predicted Do-Minimum and Do-Something $PM_{2.5}$ Concentrations (2024)', as well as the change in concentration between the two scenarios. The locations of the sensitive receptors are illustrated in Figure 13.1 'Location of Modelled Network, Receptors and Diffusion Tubes' and Figure 13.4 'Impacts of the Proposed Scheme on PM_{10} Concentration' and Figure 13.5 'Impacts of the Proposed Scheme on $PM_{2.5}$ Concentration' show these results.

Table 13-12 Predicted Do-Minimum and Do-Something PM_{10} Concentrations (2024)

Receptor ID	Do-minimum (DM) (2024) (µg/m^3)[1]	Do-something (DS) (2024) (µg/m^3)[1]	DS-DM (µg/m^3)
R1	15.7 (0)	16.0 (0)	+0.3
R2	16.6 (1)	17.0 (1)	+0.4
R3	14.2 (0)	14.3 (0)	+0.1
R4	14.2 (0)	14.1 (0)	-0.1
R5	11.2 (0)	11.3 (0)	<+0.1
R6	10.8 (0)	10.8 (0)	<+0.1
R7	12.1 (0)	12.2 (0)	+0.1
R8	13.4 (0)	13.5 (0)	+0.1
R9	13.8 (0)	14.0 (0)	+0.2
R10	13.1 (0)	13.2 (0)	+0.1
R11	14.0 (0)	14.0 (0)	<+0.1
R12	12.7 (0)	12.7 (0)	<+0.1
R13	12.6 (0)	12.6 (0)	<+0.1
R14	11.3 (0)	11.3 (0)	<+0.1
R15	11.2 (0)	11.2 (0)	<+0.1
R16	15.0 (0)	15.0 (0)	<+0.1
R17	12.2 (0)	12.3 (0)	+0.1
R18	12.3 (0)	12.4 (0)	+0.1
R19	13.0 (0)	13.0 (0)	+0.1
R20	13.3 (0)	13.3 (0)	<+0.1
R21	14.0 (0)	14.0 (0)	<+0.1

[1] Numbers in brackets for PM_{10} results are show the number of PM_{10} daily exceedances.

Table 13-13 Predicted Do-Minimum and Do-Something $PM_{2.5}$ Concentrations (2024)

Receptor ID	Do-minimum (DM) (2024) ($\mu g/m^3$)	Do-something (DS) (2024) ($\mu g/m^3$)	DS-DM ($\mu g/m^3$)
R1	8.7	8.9	+0.2
R2	9.2	9.4	+0.2
R3	8.0	8.0	<+0.1
R4	7.9	7.9	<+0.1
R5	6.9	6.9	<+0.1
R6	6.6	6.6	<+0.1
R7	7.0	7.0	<+0.1
R8	7.3	7.4	+0.1
R9	8.1	8.2	+0.1
R10	7.2	7.2	<+0.1
R11	8.1	8.1	<+0.1
R12	7.2	7.2	<+0.1
R13	7.1	7.1	<+0.1
R14	6.8	6.8	<+0.1
R15	6.7	6.7	<+0.1
R16	8.6	8.6	<+0.1
R17	7.2	7.2	<+0.1
R18	7.2	7.2	<+0.1
R19	7.1	7.1	<+0.1
R20	7.5	7.5	<+0.1
R21	7.9	7.9	<+0.1

13.6.19 Both with and without the Proposed Scheme in place, there are no exceedances of the National objective with regards to PM_{10} or $PM_{2.5}$.

13.6.20 The orientation and magnitude of change between PM_{10} and $PM_{2.5}$ concentrations between the Do-Minimum and Do-Something (2024) scenarios is summarised as follows:

- Imperceptible change (<0.18 $\mu g/m^3$) in PM_{10} concentrations at 18 of the 21 receptors considered;
- Small worsening in PM_{10} concentrations (>0.18 $\mu g/m^3$ to +0.9 $\mu g/m^3$) at three receptors (R1, R2 and R9);
- No change in the number of exceedances of the 24 hour PM_{10} objective between the DM and DS scenarios are predicted at any receptors; and
- Imperceptible change (<0.1 $\mu g/m^3$) in $PM_{2.5}$ concentrations at 18 of the 21 receptors considered;
- Small change in $PM_{2.5}$ concentrations (>0.1 $\mu g/m^3$ to +0.5 $\mu g/m^3$) at three receptors (R1, R2, R8 and R9).

13.6.21 Annual mean concentrations of PM_{10} and $PM_{2.5}$ remain below the air quality objective value for those pollutants in both DM and DS scenarios, with a maximum increase of +0.4 and +0.2$\mu g/m^3$ respectively, at R2. It should be noted that total concentrations at this location are within 10% of the air quality objective values for for PM_{10} and $PM_{2.5}$ in both Do-Minimum and Do-Something scenarios.

13.6.22 For annual mean PM_{10} and $PM_{2.5}$, the operation of scheme is not predicted to cause an exceedance of air quality objective or worsening where there is already an exceedance. In line with the significance criteria used in this assessment, this does not constitute a significant effect.

Regional Assessment

13.6.23 This section outlines the results of the regional air quality assessment for the Proposed Scheme in the opening year (2024) and design year (2039) for CO_2, NO_X and PM_{10}. Table 13-14' Opening Year and Design Year Regional Assessment for the Proposed Scheme (tonnes)' below presents these regional assessment results. For context, the below table also provides the total emissions projected for 2017 from the transport sector for the UK as a whole, as provided in the National Atmospheric Emissions Inventory (Defra, 2019d).

Table 13-14 Opening Year and Design Year Regional Assessment for the Proposed Scheme (tonnes)

Pollutant	Do-Minimum (2024)	Do-Something (2024)	Do-Minimum (2039)	Do-Something (2039)	National Atmospheric Emissions Inventory		2024 Impact (% of NAEI All Sources/ Transport Sources)	2039 Impact (% of NAEI All Sources/ Transport Sources)
					All sources	Transport Sources		
NOx (tonnes/ yr)	59	78	40	39	874,000	282,000	19 (0.0002 /0.0007)	-1 (-0.000001 /0.000004)
PM_{10} (tonnes/ yr)	7	10	8	8	169,000	19,000	3 (0.0000/0.0002)	0 (0.000001/ 0.00001)
CO2 (tonnes/ yr)	39,103	52,302	42,014	41,567	102,756,000	31,021,000	13199 (0.0001 /0.0004)	-357 (-0.000003 /-0.00001)

13.6.24 As seen in Table 13-14 all NO_x and CO_2 are predicted to have a small increase with the Proposed Scheme in operation in 2024 but by 2039, these are predicted to have a small decrease with the Proposed Scheme in operation. PM_{10} is predicted to not have any notable change in emissions. The impact is due to an increase in speed and decrease in vehicle kilometres travelled. The total quantity of pollutants and the impact of the Proposed Scheme (2024) are greater in the opening year than in the design year (2039), because of the anticipated improvement in vehicle emissions technology by 2039.

Significance of Operational Phase Assessment

13.6.25 The modelled results indicate that there would be no receptors that experience an exceedance of any national objectives explicitly because of the Proposed Scheme. Table 13-15 'Summary of the Magnitudes of Change of Pollutants at Receptors' presents an overview of the magnitudes of change associated with the pollutants considered at the selected receptors, along with guidelines for how many receptors would constitute a significant effect for each magnitude.

Table 13-15 Summary of the Magnitudes of Change of Pollutants at Receptors

Consideration of Pollutants		Total Number of Receptors with:	
Pollutant	Magnitude of Change in Annual Average NO_2, PM_{10} or $PM_{2.5}$ / µg m^3	Worsening of air quality objective already above objective or creation of new exceedance (*number needed to constitute as a significant effect*)	Improvement of an air quality objective already above objective or the removal of an existing exceedance (*number needed to constitute as a significant effect*)
NO_2	Large (>4)	0 (1-10)	0 (1-10)

Consideration of Pollutants		Total Number of Receptors with:	
	Medium (2-4)	0 (10-30)	0 (10-30)
	Small (0.4-2)	0 (30-60)	0 (30-60)
	Imperceptible (<0.4)	0	0
PM_{10}	Large (>1.8)	0 (1-10)	0 (1-10)
	Medium (0.9-1.8)	0 (10-30)	0 (10-30)
	Small (0.18-0.9)	0 (30-60)	0 (30-60)
	Imperceptible (<0.18)	0	0
$PM_{2.5}$	Large (>1.0)	0 (1-10)	0 (1-10)
	Medium (0.5-1.0)	0 (10-30)	0 (10-30)
	Small (0.1-0.5)	0(30-60)	0 (30-60)
	Imperceptible (<0.1)	0	0

13.6.26 The data in Table 13-15 indicates there is likely to be no significant effects from the Proposed Scheme when considering national air quality objectives and also when considering the key questions outlined in IAN 174/13 as outlined in Table 13-16 'Evaluation of Local Air Quality Significance'.

Table 13-16 Evaluation of Local Air Quality Significance

Key Criteria Questions	Yes/No	Supporting Information
Is there a risk that environmental standards will be breached?	No	No modelled results under either the DM or DS scenario are expected to exceed their respective standards. Please refer to Section 13.6.
Will there be a large change in environmental conditions?	No	The largest change in environmental conditions for NO_2 is -1.7 µg m^{-3} for R5 and +1.3 µg m^{-3} at R9 which are both a small change, for PM_{10} the largest change is +0.4 µg m^{-3} at R2 and for $PM_{2.5}$ the largest change is +0.2 µg m^{-3} at R1 and R2. There are either small or imperceptible changes in concentrations for all pollutants. Please refer to Section 13.6.
Will the effect continue for a long time?	No	Operational effects will be long-term, but there will be no large adverse changes in air quality above an air quality objectives that would last a long time
Will many people be affected?	No	Those receptors that have been modelled are seen as representative of the local area. As these do not have significant affects, it is unlikely any other people will be affected.
Is there a risk that designated sites, areas, or features will be affected?	No	Designated ecological sites will not be affected, however other sites of ecological significance have been considered in Chapter 9 - Nature Conservation
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No	Although there is little that can be done to minimise the negative impacts, as they are small and Imperceptible and not significant.

Evidence in support of Judgment:

- Air quality assessment was undertaken in accordance with appropriate methodologies that were aligned with the appropriate criteria considerate with the EIA.
- All receptors are predicted to experience annual average concentrations of PM_{10} and $PM_{2.5}$ that are below the air quality objective, both with and without the Proposed Scheme in 2024.
- No receptors are predicted to exceed the annual objective for NO_2 without or with the Proposed Scheme in place in 2024.
- It is therefore considered that the overall changes in air quality predicted due to the Proposed Scheme are not significant. Based on the above, an overall evaluation of "not significant" has been assigned to the Proposed Scheme operational air quality effects.
- For construction, through good mitigation, effects will be minimised so effects are not significant. Please refer to Section 13.7.

Cumulative Impacts

13.6.27 There have been no Type 1 cumulative impacts identified within this topic assessment, as described in Chapter 19 - Cumulative Assessment. Chapter 19 assesses the potential for cumulative impacts resulting from the combination of impacts which have been identified as part of this ES which are likely to result in new or different likely significant effects, or an effect of greater significance than any one of the impacts on their own.

13.6.28 The air quality assessment reported in this chapter does account for Type 2 cumulative impacts, as described in Chapter 19 – Cumulative Assessment. The traffic data used to inform the assessment is inherently cumulative, by including traffic flows associated with reasonably foreseeable developments in modelled future scenarios.

13.7 Mitigation

Construction Phase

13.7.1 Determining site-specific mitigation measures corresponds to Step 3 of the IAQM assessment methodology being followed (Appendix 13.5 - Construction Phase Air Quality and Dust Risk Assessment).

13.7.2 A number of mitigation measures should be adopted to reduce the production and/or dispersal of dust to lessen the potential for nuisance and limit the human health impacts. Ideally dust should be controlled at the source as once airborne it is more difficult to suppress.

13.7.3 According to the IAQM Guidance (IAQM, 2016), the dust risk for each of the activities determined in Step 2C should be used to define the appropriate site-specific mitigation measures to be adopted. Where a negligible risk of dust impacts was determined, no mitigation measures, beyond those required by legislation are required. However, mitigation measures may be (and typically are) applied as good practice.

13.7.4 Appropriate mitigation measures, taking into consideration the risk of dust impacts determined in Step 2C, are provided in Table 13-17 ‘Likely Site Operations and Appropriate Methods of Controlling Dust’. Mitigation should be implemented through a site-specific Construction Environmental Management Plan (CEMP), and the measures should be enforced and adhered to. Contractors should also carry the ‘Considerate Contractors’ registration.

Table 13-17 Likely Site Operations and Appropriate Methods of Controlling Dust

Activity	Dust Control Methods
Communication	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. • Display the head or regional office contact information. • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Site Management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the log book.
Monitoring	• Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log available to the local authority when asked. • Carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked.

Activity	Dust Control Methods
	• Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Consult on dust deposition, dust flux, or rea;-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing and maintaining the site	• Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible. • Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site. • Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period, where possible • Avoid site runoff of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site. • Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary – no idling vehicles. • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work area. • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. • Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights. • Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	• Avoid bonfires and burning of waste materials
Earthworks & Construction	• Re-vegetate earthworks and exposed areas/ soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian or mulches where it is not possible to re-vegetate or cover the topsoil as soon as practicable. • Only remove the cover in small areas during work and not all at once. • Avoid scabbling (roughening of concrete surfaces) if possible. • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. • For smaller supplies of fine power materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Track out	• Use water assisted dust sweeper(s) on the access and local roads, to remove, as necessary any material tracked out of the site. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport. • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Implement a wheel washing system.

Operational Phase

13.7.5 Having concluded that the effects of the Proposed Scheme will not be significant, it is not considered necessary to employ any specific mitigation measures during the operational phase.

Summary of Mitigation Measures

13.7.6 The following table, Table 13-18 'Summary of Air Quality Mitigation Measures', provides a summary of the nature conservation mitigation measures proposed. This table is also included within Chapter 20 – Schedule of Environmental Commitments which will be used to inform the commitments in the contract document.

Table 13-18 Summary of Air Quality Mitigation Measures

Mitigation Item	Location/ Approximate Chainage	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Potential Monitoring Requirements
AQ-1	Throughout the Proposed Scheme	Pre-Construction & Construction	The following construction mitigation measures should be implemented through a site-specific Construction Environmental Management Plan (CEMP): • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. • Display the head or regional office contact information. • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the log book. • Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log available to the local authority when asked. • Carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible. • Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site. • Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site.	Reduce the production and/or dispersal of dust during construction to lessen the nuisance and limit the human health impacts	Consultation with the relevant local authorities, other statutory bodies and regulatory authorities.	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the log book. • Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log available to the local authority when asked. • Carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Mitigation Item	Location/ Approximate Chainage	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Potential Monitoring Requirements
			• Cover, seed or fence stockpiles to prevent wind whipping. • Ensure all vehicles switch off engines when stationary – no idling vehicles. • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work area. • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and conveyors and covered skips • Minimise drop heights • Avoid bonfires and burning of waste materials • Re-vegetate earthworks and exposed areas/ soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian or mulches where it is not possible to re-vegetate or cover the topsoil as soon as practicable. • Only remove the cover in small areas during work and not all at once. • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out • Use water assisted dust sweeper(s) on the access and local roads, to remove, as necessary any material tracked out of the site. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport. • Implement a wheel washing system.			

13.8 Residual Effects

Construction Phase

13.8.1 Determining the residual impacts corresponds to Step 4 of the assessment methodology.

13.8.2 The impacts associated with the construction phase of the Proposed Scheme have been qualitatively assessed with reference to the Institute of Air Quality Management (IAQM) published draft 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2016).

13.8.3 The IAQM guidance states that 'in the case of demolition / construction it is assumed that mitigation (secured by planning conditions, legal requirements or required by regulations) will ensure that a potential significant adverse effect will not occur, so the residual effect will normally be 'not significant''.

13.8.4 Therefore, overall it is considered that the impacts during the construction phase will be not significant.

Operational Phase

13.8.5 Since no mitigation measures were necessary the residual impacts for the operational phase are the same as those reported is Section 13.6 'Potential Impacts'.

Summary of Residual Impacts

13.8.6 The following table. Table 13-19'Potential Air Quality Construction and Operation Impacts and Residual Effects' provides a summary of the pre-mitigation construction and operation impacts, mitigation measures and residual effects that have been described within this chapter.

Table 13-19 Potential Air Quality Construction and Operation Impacts and Residual Effects

Phase	Predicted Impacts	Magnitude of Predicted Impact /Dust Emission Magnitude	Sensitivity of Receptor/Area	Significance of Effect	Mitigation Measures	Residual Effects
Construction	There is the potential for earthworks and construction activities to generate dust and increase the rate of dust soiling at sensitive locations closest to the construction site boundary	Earthworks and Construction: Large; Trackout: Small	High/Low	Without mitigation, there is the risk that impacts could have a significant effect.	A number of mitigation measures for the construction dust assessment have been outlined in Section13.7 – Construction Phase.	Not significant
Operation	The Proposed Scheme causes a worsening in local air quality at the majority of locations, due to the increase in vehicle flows (and emissions) on the local road network.	Small/ Imperceptible	N/A	Not significant	Having concluded that the effects of the Proposed Scheme will not be significant, it is not necessary to employ any specific mitigation measures.	Not significant

13.9 Compliance with Policies and Plans

13.9.1 The approach used within this DMRB Stage 3 Assessment to assess compliance with policies and plans has involved the following:

- describing the existing and, where appropriate, emerging planning policy guidance framework as applicable to the Proposed Scheme;
- describing the existing, and where appropriate, emerging development plan framework as applicable to the Proposed Scheme;
- assessing the likely impacts of the Proposed Scheme on the achievement of the objectives and policies identified; and
- reporting the likely conflicts or compliance of the Proposed Scheme on key strategic and local planning policy objectives.

13.9.2 This process has identified that:

- An aim of the Proposed Scheme is to reduce congestion in the vicinity of the proposed scheme, which complies with policy within National Planning Framework 3 and Scottish Planning Policy.
- The Proposed Scheme complies with Cleaner Air for Scotland, the South East Scotland Strategic Development Plan and Proposed Plan, Midlothian Local Development Plan, East Lothian Local Development Plan and City of Edinburgh Local Development Plan as it provides improved sustainable travel options with designated footpaths and cycleways.

13.9.3 The Proposed Scheme complies with South East Scotland Strategic Development Plan, South East Scotland Strategic Development Plan and Midlothian Local Development Plan by considering its impact on local air quality and identifying no impact that will cause an exceedance of the Scottish Air Quality objective, or the worsening of a pollutant concentration that is already exceeding an objective. Statement of Significance

13.9.4 This section provides a summary of any significant effects, based on the residual impacts that take into account the mitigation measures described in Section 13.7 – Mitigation. The construction phase assessment has not identified an impact that would have a significant effect following the application of the mitigation measures.

13.9.5 The overall effect of the construction phase assessment is negligible and not significant.

13.9.6 The operational phase assessment has not identified an impact that would have a significant effect. This is because the small magnitude of change in air quality predicted does not cause an exceedance of the air quality objective values, nor does it occur at locations that are already above the air quality objectives.

13.9.7 The construction and operation of the Proposed Scheme does not contravene local or national air quality policy.

13.10 Statement of Significance

13.10.1 This section provides a summary of any significant effects, based on the residual impacts that take into account the mitigation measures described in Section 13.7 ‘Mitigation’.

13.10.2 The construction phase assessment has not identified an impact that would have a significant effect following the application of the mitigation measures described in Section 13.7 ‘Mitigation’. The overall effect of the construction phase assessment is negligible and not significant.

13.10.3 The operational phase assessment has not identified an impact that would have a significant effect. This is because the small magnitude of change in air quality predicted does not cause an exceedance of the air quality objective values, nor does it occur at locations that are already above the air quality objectives.

13.10.4 The construction and operation of the Proposed Scheme does not contravene local or national air quality policy.

13.11 Monitoring

13.11.1 As no significant effects have been identified for the air quality construction or operation assessments, no monitoring of significant effects is proposed.

13.11.2 However, as detailed in Section 13.7, due to the risks associated with dust impacts during the Scheme construction phase, monitoring would be carried out as outlined in Table 13.17 ‘Likely Site Operations and Appropriate Methods of Controlling Dust’

13.12 References

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