5 Air Quality

5.1 Introduction

5.1.1 Background

This section provides the air quality assessment for the proposed A68 Improvement Scheme between Soutra South and Oxton.

Section 3, Part 1 of DMRB Volume 11 (HA 207/07), and the guidance in the Department for Transport "Transport Analysis Guidance (TAG)", provides guidance on the assessment of air quality. This guidance has been used as the basis of the air quality assessment for the proposed improvement scheme.

A DMRB Stage 2 Environmental Assessment Report was prepared by YA on behalf of the SE in November 2005. The Stage 2 report considered two potential scheme options and the results of the assessment have shown that the residual impacts of the proposed improvements to the A68 on air quality concentrations are predicted to have no significant adverse impact at the representative properties within 200m of the proposed scheme.

The Stage 2 report indicated that both of the proposed scheme options are not expected to significantly increase or decrease concentrations of nitrogen dioxide or particulate matter at receptors along the A68 corridor and the associated road network.

The following assessment does not consider either of the two possible scheme options included in the Stage 2 report as neither of these comprise the exact chosen scheme option. However, Option 2 is similar to the chosen scheme considered for this assessment.

5.1.2 The Proposed Scheme and Existing Road Network

The location of the section of the A68 proposed for the Soutra South Road Improvement Scheme is shown in Figure 1.1 and covers a length of approximately 2.15km.

The chosen A68 Soutra Scheme comprises a new alternating WS2+1 carriageway with dedicated overtaking opportunity constructed on the existing alignment between an existing climbing lane and a DAL (Figures 2.1a - c).

Widening will take place on the eastern side of the carriageway at the northern end of the scheme to avoid the residential property at Riggsyde and, further south on the western side to tie in with the existing widening for the DAL at the southern end.

The proposed road improvement scheme will not cause changes in traffic flows on the A68 route of +/-10%, which is the TAG criterion for assessment of air quality. However, the scheme will result in changes in average traffic speeds on the A68 and the scheme

will incorporate a new side road and some alterations to the alignment and at several junctions where roads connect to the existing A68.

The stretch of the A68, which is relevant to the proposed scheme, has several small roads that connect to it. These are shown in Figures 2.1a - c and comprise:

- The D47/5 Road;
- The C83 Road (leading to the D1/5, the D8/5 and into the village of Oxton); and
- The C84 Road (leading into the village of Oxton).
- A new side road (as shown on Figures 2.1b and c) is also proposed to connect the C83 Road to the C84 Oxon.

As part of the A68 Soutra South scheme, several of these routes will be affected by the proposed option. Traffic data provided by SIAS Ltd / SBC confirms the following changes in traffic flow.

The details are as follows:

- The Kirktonhill C83 Junction will be stopped up. There will be no traffic on the section of the C83 adjacent to the A68 prior to the D1/5 Junction i.e. the reduction in flows will be greater than 10%.
- On the C83 between the D1/5 Junction and the C83/C84 Junction in Oxton traffic flows will decrease by more than 10%.
- A proposed new side road will be constructed to link up the C83 (at the junction of the D1/5 Kirktonhill) with the C84 (just south west of the A68 junction). The side road will prevent the closure of Kirktonhill C83 junction from increasing traffic flows through the centre of Oxton on the C83/C84.
- The traffic flows within the village of Oxton on the C83 and C84 will both be affected by the closure of the C83 at the A68. Traffic data provided by SIAS / SBC confirms that on the short section of the C84 between the A68 and side road junction there will be an increase in traffic flows >10%.
- On the C84 between the side road junction and the C83 junction in the centre of Oxton there will be an overall slight decrease in the total traffic flow (of less than 10%).
- The D47/5 will be realigned at its junction with the A68 to provide improved access onto the trunk road for people on the Carfrae side of the A68. This new realigned

length of side road will need to be assessed in relation to its possible impact on The Shieling property.

- The existing private access to Riggsyde will be stopped up and a new means of private access will be provided off the proposed new side road which will be located approximately 40 metres south of the Riggsyde property. The new side road will need to be assessed in relation to its possible impact at the Riggsyde property.

The changes in traffic flows in Oxton and on the C83/C84 are shown on Figure 10.1 (Existing and predicted total traffic flows in and around Oxton with new side road).

5.2 Methodology

5.2.1 The Air Quality Assessment

This air quality assessment follows guidance contained in DMRB, Volume 11, Section 3, Part 1, HA 207/07 May 2007 and Department for Transport "Transport Analysis Guidance (TAG)".

It should be noted that the May 2007 Version of DMRB, Volume 11, Section 3, Part 1 includes a new set of criteria for the purposes of scoping for both a local air quality and regional air quality assessment.

For local air quality, the roads likely to be affected by the scheme should be identified. Affected roads are those that meet any of the following criteria.

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

In accordance with these criteria the only relevant routes are the new side road (as this is a new link), the new access where the D47/5 meets the A68 and the A68 (as this constitutes a new road). The C83 and C84 do not otherwise meet the DMRB assessment criteria.

5.2.2 Identification of Sensitive Receptor Locations

For the purposes of the DMRB assessment, the only roads which meet the traffic / alignment criteria are the proposed new side road, the new access where the D47/5 meets the A68 and the A68 where the road is widened by 5 metres in some places. The only properties which are relevant to the DMRB assessment i.e. those that lie

within 200 metres of these routes are therefore No 2 Station Road, Trostan, Leaderbank, The Shieling and Riggsyde. To determine the ambient air pollutant concentrations at each of these receptors the following routes have been assessed:

- At No 2 Station Road the new side road, C84 and A68 has been assessed;
- At Trostan the new side road and C84 traffic flows have been assessed;
- At Leaderbank the new side road and C84 traffic flows have been assessed;
- At The Shieling the A68 and D47/5 traffic flows have been assessed; and
- At Riggsyde the A68 and new side road have been assessed.

TAG has slightly different criteria to DMRB. This recommends that roads affected by a 10% change in traffic or more as a result of the new scheme should be assessed. The TAG assessment would therefore consider The Shieling, Riggsyde, properties <200m from the C84 (i.e. the section between the new side road junction and A68) and properties <200m from the C83 in Oxton.

Figures 5.1a and 5.1b identify those routes which in accordance with TAG will be affected by a 10% change in traffic or more. 50, 100, 150 and 200 metres distance bands are shown on the figures. It is possible to see that there are a number of properties which lie within 200 metres distance of the affected routes.

5.2.3 Estimated Pollutant Concentrations

DMRB requires that pollutant concentrations are calculated for representative properties along each affected route and compared to the National Air Quality Strategy (NAQS) objectives included in the Air Quality (Scotland) Regulations 2000 and Air Quality (Scotland) (Amendment) Regulations 2002 shown in Appendix 2. The pollutant concentrations are calculated using the DMRB spreadsheet “The Local Impacts Screening Method”.

DMRB requires that the air pollutant concentrations are estimated for the opening year, and design year with and without the proposals in place.

The DMRB assessment has been carried out for two different years. The details are as follows:

- The proposed opening year 2010: This is considered for both a do-minimum and a do-something scenario.
- The design year 2025: This is considered for both a do-minimum and a do-something scenario.

For the purposes of this report the air pollutant concentrations predicted for future years without the proposed scheme in place are referred to as a 'do-minimum' scenario and future years with the proposed scheme in place as a 'do-something' scenario.

A base year scenario has not been assessed as there is no baseline air quality monitoring data available for the site to use for the basis of verification.

The DMRB assessment has therefore been carried out for a total of four scenarios for existing receptors within 200m of each affected route:

Scenario 1: 2010 Do-minimum

Scenario 2: 2010 Do-something

Scenario 3: 2025 Do-minimum

Scenario 4: 2025 Do-something

The traffic flows, speeds and HGV percentages for the A68 have been provided by SIAS. Traffic flows for the C84, C83 and new side road have also been provided by SBC. Using the traffic data provided by SIAS and SBC the following links have been included in the air quality assessment:

Link A: The C83 between the junction with the D1/5 Kirktonhill and the C84;

Link B: The C84 west of the C83 junction in Oxton;

Link C: The C84 Station Road (link between the A68 and the C83 in Oxton);

Link D: With Scheme only – Section of C84 between the new side road and A68; and

Link E: With Scheme only – New side road.

For the purposes of the DMRB assessment the receptors No 2 Station Road, Trostan, Leaderbank, Riggsyde and The Shieling have been considered. In accordance with the criteria detailed in the May 2007 version of DMRB Volume 11, Section 3 Part 1 HA 207/07 these are the only receptors which need to be considered.

DMRB has been revised; however TAG Unit 3.3.3 has not. DMRB no longer requires a quantitative assessment of the two major road traffic pollutants PM_{10} and NO_2. However for the purposes of the TAG once pollutant concentrations have been calculated a quantitative assessment of the two major road traffic pollutants PM_{10} and NO_2 is required. The purpose of the quantitative assessment is to estimate the change in people's exposure to concentrations in PM_{10} and NO_2. The quantitative assessment should be carried out for either the year for which the objective concentration needs to be achieved, or for the opening year of the scheme. Pollutant concentrations need to be assessed for both the "do-minimum" and "do-something" scenarios for all affected

routes. For the purpose of the TAG air quality assessment the opening year, 2010, has been assessed.

DMRB requires pollutant concentrations to be estimated for sensitive receptors, i.e. residential properties and properties where there are likely to be vulnerable occupants, such as schools, nursing homes and hospitals. For the purposes of the TAG assessment, in addition to the five receptor locations identified for the DMRB assessment several additional specific receptors have been considered adjacent to the routes experiencing a change in traffic flows of 10%. The complete list of receptors assessed is detailed below and it includes the Channel Kirk Primary School, adjacent to the C83. The receptors are also shown on Figures 5.2a and 5.2b:

Receptor 1: The Shieling

Receptor 2: Riggsyde

Receptor 3: No 2 Station Road

Receptor 4: Trostan

Receptor 5: Leaderbank

Receptor 6: 1 The Row

Receptor 7: Heathfield

Receptor 8: Channelkirk Primary School.

In addition to the estimation of pollutants at specific sensitive receptors TAG requires that a quantitative assessment is carried out to estimate the overall change in people's exposure to concentrations of PM_{10} and NO_2. TAG requires the calculation of pollutants at specific distances of 20m, 70m, 115m and 175m measured from the centre of the road. The TAG assessment determines the change in exposure to the population by assessing the number of properties experiencing either an improvement or a deterioration in air quality at each specific distance. The assessment process uses the DMRB spreadsheet "The Local Impacts Screening Method".

5.2.4 Air Pollutant Data

DMRB states that for local impact assessments it is necessary to specify background concentrations upon which the local, traffic-derived pollution is superimposed. These may be through local, long term, ambient measurements at background sites, remote from immediate sources of pollution. As an alternative to measured background levels, DMRB recommends the use of background concentrations obtained from default concentration maps, which are produced by the National Environmental Technology Centre (NETCEN) on behalf of the Department for Environment Food and Rural Affairs (Defra).

Background pollutant concentrations have been obtained from NETCEN and corrected for the years 2010 and 2025 using the NETCEN Air Pollution – Year Adjustment Calculator as shown in Table 5.1. The NETCEN concentrations have been corrected

from the nearest year available and take into account factors from the proposed TG(03) update.

Table 5.1. Annual Average Background Air Pollutant Concentrations for 2010 and 2025.

Pollutant	Measured as	Concentration	
		2010	2025
Carbon Monoxide	mg/m^3	0.07	0.07
Benzene	$\mu g/m^3$	0.07	0.07
1,3 Butadiene	$\mu g/m^3$	0.02	0.02
Oxides of Nitrogen	$\mu g/m^3$	4.5	3.85
Nitrogen Dioxide	$\mu g/m^3$	3.53	3.27
Particles (PM_{10})	$\mu g/m^3$	10.2	9.94

5.2.5 DMRB/TAG Assessment: National Air Quality Strategy

Part IV of the Environment Act 1995[1] requires the Secretary of State to draw up a National Air Quality Strategy. The UK National Air Quality Strategy (NAQS) was published in March 1997[2]. A revised version The Air Quality Strategy (AQS)[3] 2000, which supersedes the 1997 Strategy, was published in January 2000. The AQS 2000 strengthened the objectives for a number of substances with the exception of that for particulates, which was replaced with the EU limit value.

The Air Quality Strategy objectives for each pollutant, except ozone, were given statutory status in the Air Quality (Scotland) Regulations, 2000. These objectives were amended by the Air Quality (Scotland) (Amendment) Regulations 2002 ('The Regulations').

In 2003, an Addendum[4] to the Air Quality Strategy 2000 was published. This Addendum incorporated tighter air quality objectives for particulates, benzene and carbon monoxide into the Air Quality Strategy. It also introduced an objective for polycyclic aromatic hydrocarbons (PAHs) in England, Scotland and Wales.

Proposals for revising the Strategy were put forward in April 2006 by DEFRA who produced a consultation document which set out options for further improvements in air quality. This document made the following pollutant specific proposals:

[1] Part IV Environment Act, Chapter 25, Air Quality, 1995

[2] Department for Environment Food and Rural Affairs, The UK National Air Quality Strategy, March 1997

[3] Department for Environment Food and Rural Affairs The Air Quality Strategy, January 2000

[4] Department for Environment Food and Rural Affairs The Air Quality Strategy Addendum, February 2003

- Retain the current 2005 NO_2 objectives with the view to continue to stimulate progress and national and local level towards the EU legally binding limit values in 2010.
- Retain the current 2004 PM_{10} objectives and to continue to work to eliminate all current exceedences as soon as possible.
- Retain the current objectives for SO_2, Pb, CO, 1,3 butadiene and benzene.

The Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC) defines the policy framework within which limit values for twelve air pollutants will be set. Four air quality Daughter Directives have been specified which set limits on levels of pollutants in ambient air so as to avoid, prevent or reduce, harmful effects on human health and on the environment as a whole.

The requirements of the 4th Daughter Directive have been transposed into the 2007 Air Quality Standards (Scotland) Regulations[5]. These replace the 2003 Air Quality Limit Values Regulations.

The Air Quality Objectives included in the Air Quality (Scotland) Regulations and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management are shown in Appendix 2.

Local Air Quality Management

The Local Air Quality Management (LAQM) legislation in the Environment Act 1995 requires local authorities to conduct periodic reviews and assessments of air quality. There are two rounds of review and assessment, which comprise of the following:

The first round of review and assessment (now completed)

The first round of review and assessment followed a phased approach consisting of a series of stages.

- Stage 1 review and assessment: All local authorities were required to carry out a first stage review and assessment to identify areas likely to exceed the AQS objectives. If the results indicate that there is the potential for one or more exceedances of the AQS objectives, then a second stage review and assessment is required.
- Stage 2 review and assessment: The purpose of the second stage review and assessment is to focus on the areas that the first stage identified as likely to exceed

[5] Crown Copyright 2007. The Air Quality Standards Regulations 2007, February 2007.

the AQS objectives. The second stage required monitoring of air pollutants and modelling to predict whether exceedances of the AQS objectives were unlikely to be met by the end of 2005. Air pollutants that were predicted to exceed the AQS objectives should be assessed further in a Stage 3 review and assessment.

- Stage 3 review and assessment: The third stage review and assessment required detailed monitoring and modelling to estimate the magnitude and geographical extent of potential exceedances of AQS objectives. Areas where AQS objective exceedances are identified at this stage should be declared as an Air Quality Management Area (AQMA) under Section 82(3) of the Environment Act 1995. Local authorities are then required to undertake a further, more detailed review and assessment (A stage 4 review and assessment) for public consultation and in preparation for the Air Quality Action Plan to state the local authority's schemes for improvement in air quality in pursuit of the AQS objectives.

The second round of review and assessment

Following the first round of review and assessment, in September 2001, Defra and the Devolved Administrations commissioned a detailed evaluation of the first round of air quality review and assessments undertaken by local authorities under Part IV of the Environment Act 1995. The evaluation report was published in March 2002 and one of the key recommendations was that the second round of air quality review and assessments should be carried out in two steps. Details of the two steps are provided in Policy Guidance document LAQM.PG(03), produced in 2003 and are summarised below.

- Step 1: Updating and Screening Assessment (USA): The purpose of the USA is to identify those aspects that have changed since the first round of review and assessment. The USA should also include an explanation of the conclusion reached as to whether the local authority should proceed to the second step comprising of a Detailed Assessment.

- Step 2 Detailed Assessment: The Detailed Assessment should consider those pollutants and specific locations that have been identified as requiring further work in the USA – i.e. where members of the public are likely to be exposed over the averaging period of the AQS objective.

Scottish Borders Council Local Air Quality Management Review and Assessment

SBC completed their most recent Updating and Screening Assessment in May 2006. The results of the assessment indicated that a Detailed Assessment was not required for any of the seven pollutants assessed. The assessment also concluded that none of

the UK air quality objectives are likely to be breached within the Scottish Borders District.

SBC has not declared the need for an Air Quality Management Area (AQMA). Due to the low background concentrations (Table 5.1), which are well below the current AQS objectives, any potential increase in air pollutants generated by the operation of the proposed scheme is, based upon initial assessment, unlikely to create the need for the designation of an AQMA.

5.2.6 Assessment of Significance Methodology

In order to assess the significance of the impact of the proposed alignment, the following criteria have been used (Table 5.2). The criteria have been formulated in conjunction with the qualitative comments in DMRB (section 11.3.3) and TAG (section 3.3.3). TAG requires a quantitative assessment of nitrogen dioxide and particulate matter, therefore significance criteria have been developed for each of these air pollutants only.

Table 5.2. Significance Criteria

Nitrogen Dioxide	
Major Adverse	'With development' results in an increase in concentrations over 'without development' concentrations of greater than 1 µg/m³ or 2.5%; where 'without development' concentrations are predicted to exceed the 40 µg/m-³ objective limit value; or 'With development' results in increases in concentrations greater than 1 µg/m³ or 2.5% that are predicted to cause exceedance of the 40 µg/m-³ objective limit value; where WITHOUT development concentrations are NOT predicted to exceed 40 µg/m-³ objective limit value; or 'With development' results in an increase in concentrations over 'without development' greater than 25%.
Moderate Adverse	'With development results in an increase in concentrations over 'without development' concentrations of less than 1 µg/m³ or 2.5%; where 'without development' concentrations are predicted to exceed the 40 µg/m-³ objective limit value; 'With development' results in an increase in concentrations over 'without development' of greater than 10% but less than 25%
Minor Adverse	'With development' results in an increase in concentrations over 'without development' concentrations of greater than 2.5% but less than 10%
No significance / insignificant	'With development' results in a change in concentrations over 'without development' concentrations of less than 1 µg/m³ or 2.5%
Minor Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 2.5% but less than 10%.
Moderate Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 10% but less than 25%.

Major Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 25%
Particulate Matter (PM_{10})	
Major Adverse	With development results in an increase in concentrations over without development concentrations of greater than 1 µg/m³ or 2.5%; where without development concentrations are predicted to exceed the 18 µg/m³ objective limit value or With development results in increases in concentrations greater than 1 µg/m³ or 2.5% that are predicted to cause exceedance of the 18 µg/m³ objective limit value; where without development concentrations are not predicted to exceed 18 µg/m³ objective limit value With development results in an increase in concentrations over without development greater than 25%
Moderate Adverse	With development results in increases in concentrations greater than 1 µg/m³ or 2.5% but the actual concentration does not cause an exceedance of the 18µg/m³ objective limit or With development results in an increase in concentrations over without development concentrations of less than 1 or 2.5%; where without development concentrations are predicted to exceed 18 µg/m³ objective limit value or With development results in an increase in concentrations over without development greater than 10% but less than 25%
Minor Adverse	With development results in an increase in concentrations over without development concentrations of greater than 1µg/m³ or 2.5% but less than 10%
No significance/ insignificant	With development results in concentrations over without development concentrations of less than 1 µg/m³ or 2.5%
Minor Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 1µg/m³ or 2.5% but less than %
Moderate Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 10% but less than 25%
Major Beneficial	With development results in a decrease in concentrations over without development concentrations of greater than 25%
NOTES	Where air quality impacts meet multiple criterion, the higher significance class will be applied.

5.3 Assessment of Significance

5.3.1 Identification of Sensitive Receptor Locations

TAG requires the number of properties to be identified within 200m of the centreline of all routes affected. Beyond 200 metres air pollutant concentrations should have declined sufficiently to become reduced to background levels. As the change in air pollutant concentration is dependent upon dispersion over distance, the number of properties exposed are separated into four distance bands of 0 - 50m, 50 – 100m, 100 – 150m, 150 – 200m. The properties in each band are assigned either a likely

improvement or deterioration in air quality when the proposed road improvement scheme is in place.

The distance bands 200m from the existing alignment are shown on Figures 5.1a and b and the distance bands 200m from the proposed alignment are shown on Figures 5.2a and b. The number of properties within each of the four distance bands is shown in Table 5.3 below. There are 99 properties, which lie within 200 metres of the affected routes. The locations of the properties that lie within 200 m of the affected routes can be seen on Figures 5.1a and b and 5.2a and b.

DMRB/TAG requires the number of properties in each band to be assigned either a likely improvement or deterioration in air quality when the proposed scheme is constructed, as shown in Table 5.3.

Table 5.3. Number of Properties and Distance from Affected Routes.

Distance from the existing routes	Total number of properties		Likely Improvement or Deterioration
	Do-minimum	Do-something	
A68 Riggsyde, The Shieling and No 2 Station Road.			
0-50 metres	1	1	No change
50 – 100 metres			
100 – 150 metres	1	1	No change
150 – 200 metres	1	1	No change
Total	*3*	*3*	
C83 Link A between the junction with D1/5 Kirktonhill and the C84.			
0-50 metres	23	23	Improvement
50 – 100 metres	23	23	Improvement
100 – 150 metres	30	30	Improvement
150 – 200 metres	18	18	Improvement
Total	*94*	*94*	
D47/5 Link D The Sheiling			
0-50 metres			
50 – 100 metres	N/A	1	No change
100 – 150 metres			
150 – 200 metres			
Total		*1*	
Link E New side road (Riggsyde, Trostan and Leaderbank)			
0-50 metres	N/A	1	No change
50 – 100 metres			
100 – 150 metres			
150 – 200 metres	N/A	2	No change
Total		*3*	
Total number of receptors affected by scheme without double counted properties: ***Do-minimum: 97, Do-something: 99***			

The Stage 1 DMRB assessment indicates that the receptors within 200m of the A68 are unlikely to experience a significant change in air quality as the traffic flows will not change by >10%. Properties along Link A, the C83, are likely to experience an improvement in air quality due to the 'stopping up' of the junction of the C83 and the A68, and the provision of the new side road. As part of the scheme a new side road and realignment of the D47/5 is proposed. Due to the very low flows on these routes no significant change in pollutant concentrations is likely.

The May 2007 version of DMRB also requires that nature conversation sites (Designated Sites) should be identified. The watercourses within 200m of the proposed scheme (Headshaw Burn, Mountmill Burn and Leader Water) are part of the River Tweed Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI). Further details are provided within Chapter 8 (Ecology and Nature Conservation), however the features of interest are salmonids, lamprey, otter and *Ranunculion fluitantis* / *Callitricho – Batrachion* communities. *Ranunculion fluitantis* / *Callitricho – Batrachion* communities have not been recorded within these watercourses and it is unlikely that the fish species or otter population will be sensitive to air pollutants and be adversely affected by the effect of local air quality.

5.3.2 Estimation of Air Pollutant Concentrations

DMRB requires that air pollutant concentrations are predicted for the opening year of the development and for a future year, for both a do-minimum and a do-something scenario. For the purposes of this assessment the air pollutant concentrations have been predicted for the opening year 2010 and design year 2025, for both do-minimum (do-min in the following tables) and do-something (do-som in the following tables) scenarios. The air pollutant concentrations have been calculated for the five receptors identified in 5.2.2.

In addition, in accordance with TAG, three additional receptors have been identified. The air pollutant concentrations have therefore been calculated for a total of eight receptors. The receptors are listed in 5.2.3 and shown on Figures 5.2a and 5.2b.

TAG also requires a quantitative assessment of the overall change of people's exposure to NO_2 and PM_{10} for the opening year (or the year 2005 if the option would be operational at this time). TAG does not require consideration of the design year 2025 for this assessment. The change in exposure is calculated at distances of 20m, 70m, 115m and 175m from the centre of the affected roads (TAG Paragraph 3.3.3). As the development is not operational in the year 2005, the quantitative assessment has been carried out for the opening year 2010.

The air pollutant concentrations have been calculated using the "Local" DMRB worksheet for each of the roads affected for the scenarios considered.

Predicted Concentrations at Selected Receptor Locations

Air pollutant concentrations have been predicted for the eight receptors identified. The results of the DMRB "Local" assessment for all air pollutant concentrations are shown in Appendix 3. The results for PM_{10} and NO_2 for the years 2010 and 2025 are shown in Table 5.4. The change in air pollutant concentrations from a do-min and a do-som scenario for 2010 and 2025 are also shown in Table 5.4.

Table 5.4. Nitrogen Dioxide and Particulate Concentrations at Receptors within 200 metres of the Affected Roads.

Receptor		Calculated Annual Mean Concentration			
		NO_2 µg/m^3		PM_{10} µg/m^3	
		2010	2025	2010	2025
Receptor 1	Do-min	4.28	3.92	10.37	10.08
The Sheiling	Do-som	4.27	3.92	10.36	10.08
	Do-som – Do-min	*-0.01*	*0.00*	*-0.01*	*-0.01*
Receptor 2	Do-min	8.79	7.90	11.60	11.11
Riggsyde	Do-som	8.80	7.88	11.65	11.14
	Do-som – Do-min	*+0.01*	*-0.02*	*+0.05*	*+0.03*
Receptor 3	Do-min	3.96	3.65	10.31	10.04
No 2 Station Road	Do-som	3.97	3.66	10.32	10.05
	Do-som – Do-min	*+0.01*	*+0.01*	*+0.01*	*+0.01*
Receptor 4	Do-min	3.78	3.50	10.27	10.01
Trostan	Do-som	3.80	3.51	10.28	10.01
	Do-som – Do-min	*+0.02*	*+0.1*	*+0.01*	*0.00*
Receptor 5	Do-min	3.68	3.40	10.24	9.98
Leaderbank	Do-som	3.69	3.41	10.25	9.98
	Do-som – Do-min	*+0.01*	*+0.01*	*+0.01*	*0.00*
Receptor 6	Do-min	4.17	3.84	10.39	10.11
1 The Row	Do-som	4.12	3.84	10.39	10.12
	Do-som – Do-min	*-0.05*	*0.00*	*0.00*	*+0.01*
Receptor 7	Do-min	3.93	3.62	10.32	10.04
Heathfield	Do-som	3.90	3.62	10.31	10.05
	Do-som – Do-min	*-0.03*	*0.00*	*-0.01*	*+0.01*
Receptor 8	Do-min	3.58	3.31	10.21	9.95
Channelkirk Primary	Do-som	3.57	3.31	10.21	9.95
School.	*Do-som – Do-min*	*-0.01*	*0.00*	*0.00*	*0.00*

The predicted DMRB results in Table 5.4 and Appendix 3 show that all receptor locations are well below the NAQS objectives for all years and that the changes in concentrations (Do-Som - Do-Min) are all significantly less than 1µg/m^3.

Statement of Significance

According to the significance criteria included in this assessment, the results of the PM_{10} and NO_2 predictions show that the change in air pollutant concentration between a do-minimum and a do-something scenario are insignificant.

TAG Quantitative Assessment

TAG requires a quantitative assessment of the overall change in people's exposure to NO_2 and PM_{10} for the opening year. The number of properties experiencing an improvement or deterioration in air quality for each link has been determined for the chosen scheme option. The results are included in Appendix 4.

The overall assessment scores for the aggregation of routes are shown for PM_{10} and NO_2 in Tables 5.5 and 5.6 respectively.

Table 5.5. PM_{10} summary of routes: The aggregated table.

	0 – 50m	50 – 100m	100–150m	150–200m	0 – 200m
Total properties across all routes (min)	26	24	30	19	99
Total properties across all routes (some)	26	24	30	19	99
Do-minimum PM_{10} assessment across all routes	271.11	245.2	298.2	189.23	1003.74
Do-something PM_{10} assessment across all routes	271.18	245.19	298.2	189.24	1003.81
Net total assessment for PM_{10} all routes	0.07	-0.01	0	0.01	0.07
Number of properties with an improvement					1
Number of properties with no change					94
Number of properties with a deterioration					4

Table 5.5 shows that 4 properties experience an increase in the pollutant PM_{10} and 1 property experiences a decrease in PM_{10}. 94 properties experience no change in the concentrations of the air pollutant PM_{10}.

Table 5.6. NO_2 summary of routes: The aggregated table.

	0 – 50m	50 – 100m	100–150m	150–200m	0 – 200m
Total properties across all routes (min)	26	24	30	19	99
Total properties across all routes (some)	24	24	30	21	99
Do-minimum NO_2 assessment across all routes	108.48	86.62	98.4	62.82	356.32
Do-something NO_2 assessment across all routes	107.36	86.38	98.4	62.83	354.97
Net total assessment for NO_2 all routes	-1.12	-0.24	0	0.01	-1.35
Number of properties with an improvement					47
Number of properties with no change					48
Number of properties with a deterioration					4

Table 5.6 shows that 4 properties experience an increase in the pollutant NO_2 and 47 properties experience a decrease in NO_2. 48 properties experience no change in the concentrations of the air pollutant NO_2.

No concentrations of PM_{10} increase by more than the 1μg/m^3, which TAG considers to be significant and no concentrations of NO_2 increase by more than the 2μg/m^3 which TAG considers to be significant. All changes in concentrations are significantly less than these significance criteria. All predicted concentrations are also well below the NAQS objectives for NO_2 and PM_{10}.

No exceedances of the NAQS objectives are predicted to occur and an AQMA will not be required. The overall impact of the scheme is therefore insignificant.

5.3.3 Regional Level

A DMRB regional level assessment is not required for the scheme in accordance with the criteria in the May 2007 version of DMRB. However TAG does require an assessment of total emissions. TAG requires that the total emissions are determined for the base year and the change in total emissions is found between a do-minimum and do-something scenario for the opening year and the design year of the scheme. The pollutants carbon monoxide (CO), total hydrocarbons (THC), oxides of nitrogen (NO_x), particulates (PM_{10}) and carbon (C) have been assessed using the 'Regional' application of the DMRB spreadsheet. The change in total emissions between a do-minimum and a do-something scenario has been calculated for the base year 2005, the proposed opening year 2010, and the design year 2025. Unlike the local assessment the regional assessment requires the consideration of the design year 2025.

The results are presented in Appendix 5. The change in total emissions for a do-minimum and do-something scenario for the air pollutants, NO_x and $PM_{10,}$ are shown in Table 5.7. The percentage changes in total emissions of CO_2 are shown in Table 5.8.

NO_x and PM_{10}

Table 5.7 shows the present vehicle emissions ('present') i.e. 2005 in the vicinity of the proposed route, the opening year 2010 and design year 2025 emissions ('future') for a do-minimum scenario and opening year 2010 and design year 2025 emissions generated for a do-something scenario ('do-something future').

Table 5.7 then goes on to compare the future 'Do something' emissions with the present 'Do minimum' and the future 'Do something' with the future 'Do minimum'.

Table 5.7. Regional Assessment of NO_x and PM_{10}.

	Do-minimum		Do-something	Do something compared with	
	Present (2005)	Future	Future	Present Do Min	Future Do-Min
2010					
PM_{10} kg/yr	240	131	138	-102	+7
NO_X kg/yr	7894	5027	5181	-2713	+154
2025					
PM_{10} kg/yr	240	108	115	-125	+7
NO_X kg/yr	7894	4281	4381	-3513	+100

Table 5.7 shows that the construction of the scheme will produce higher concentration of pollutants compared with a do-minimum scenario. This is due to an increase in traffic flow for a do-something scenario.

Carbon Dioxide

In accordance with the method outlined in TAG section 3.3.5 the difference in CO_2 emissions due to the scheme is determined by comparing the do-something to a do-minimum scenario. The difference is expressed as a percentage increase or decrease. The results are shown in Table 5.8.

Table 5.8. Regional Assessment of Carbon Dioxide.

	Do-minimum		Do-something	Do something compared with as a % of	
	Present (2005)	Future	Future	Present Do Min	Future Do-Min
2010					
CO_2 tonnes/yr	1347	1171	1217	90%	104%
2025					
CO_2 tonnes/yr	1347	1458	1490	111%	102%

Table 5.8 shows that the construction of the scheme i.e. do-something will produce higher concentrations of carbon dioxide compared with a do-minimum scenario. This is due to an increase in traffic flow for the do-something scenario.

5.4 Mitigation and Residual Impacts

All of the air pollutant concentrations for all receptors are well below the NAQS objectives for the assessment years. The air quality assessments for the proposed scheme have predicted that the overall impact will be insignificant. As the overall impact of the scheme will be insignificant, no mitigation measures are required during scheme operation.

As no mitigation measures are proposed as part of the development the residual

impacts will remain unchanged.

5.5 Conclusions

5.5.1 DMRB Assessment

The air quality assessment for the Stage 3 DMRB assessment for the chosen alignment of the A68 Soutra South has been carried out in accordance with the requirements of the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1, HA 207/07 (May 2007) and the Department of Transport "Transport Analysis Guidance (TAG)",

The numbers of properties within 200 metres of the existing routes and receptors that will be potentially affected by the scheme have been identified. 99 receptors were identified within 200 metres of the affected routes.

Air pollutant concentrations were predicted for 8 receptors within 200m of the routes affected by the scheme. The air pollutant concentrations were predicted using the DMRB spreadsheet "The Local Impacts Screening Method". The concentrations were predicted for the opening year 2010 (do-minimum and do-something) and the design year 2025 (do-minimum and do-something). The results of the assessment indicated that this scheme option would have an insignificant impact on air quality at all receptor locations. All air pollutant concentrations were well below the National Air Quality Standard objectives for all assessment years.

The overall change in NO_2 and PM_{10} experienced at the receptor locations was assessed. The change in pollutant concentrations between a do-minimum to a do-something scenario was identified for distances of 20, 70, 115 and 175 metres from the centreline for each road affected. The representative number of receptors experiencing a change in pollutant concentration at each distance was then assessed to identify the overall number of properties experiencing an improvement, deterioration or no change in concentration.

The number of properties experiencing deterioration in air quality for the pollutant PM_{10} is four, with 94 properties experiencing no change and one property experiencing an improvement. The number of properties experiencing deterioration in air quality for the pollutant NO_2 is four, with 48 properties experiencing no change and 47 properties experiencing an improvement.

All air pollutant concentrations were found to be well below the National Air Quality Standard objectives, and the overall impact was found to be insignificant. The realignment of the A68 will not create the need for an Air Quality Management Area; and no mitigation measures are considered necessary.

A regional assessment of the total change in emissions was carried out. The total emissions for NO_2 and PM_{10} were found to increase between a do-minimum to a do-something scenario due to the scheme.