Appendix 6.1

Air Quality Calculations

Impact Significance Criteria

Table AQ1.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2 / PM_{10}	Days PM_{10} >50 $\mu g/m^3$
Very large	Increase/decrease > 25%	Increase/decrease > 25 days
Large	Increase/decrease 15-25%	Increase/decrease 15-25 days
Medium	Increase/decrease 10-15%	Increase/decrease 10-15 days
Small	Increase/decrease 5-10%	Increase/decrease 5-10 days
Very Small	Increase/decrease 1-5%	Increase/decrease 1-5 days
Extremely Small	Increase/decrease <1%	Increase/decrease <1 day

Table AQ1.2 Air Quality Impact Significance Criteria

Absolute Concentration in Relation to Objective	Change in Concentration					
	Extremely Small	**Very Small**	**Small**	**Medium**	**Large**	**Very Large**
Decrease with Scheme						
Above Objective with Scheme	slight beneficial	slight beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Above Objective in Do-min Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Below (but not well below) Objective in Do-min	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Objective in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Objective in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Objective in Do-min Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below (but not well below) Objective with Scheme	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse
Well Below Objective with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

Well below the objective = < 75% of the objective level.
Below objective is effectively below or equal to objective.

Dispersion Modelling Methodology

1.1.1 Traffic Data

SIAS have supplied traffic data from the Central Scotland Transport Model for four separate scenarios: 1) 2001 baseline; 2) 2010 Committed Do-Minimum (CDM); 3) 2010 Enhanced Do-Minimum (EDM); and 4) 2010 With Scheme. The baseline year for the air quality assessment is 2004. Following a methodology provided by SIAS, 2004 traffic flows for each link have been derived by link-specific interpolation between 2001 and the 2010 CDM. In the rare event that a road was present in 2004, but was not present in 2001, the 2010 CDM data for that link were factored using the average interpolation factors derived from the entire road network. Average speeds and fleet composition statistics were appropriately flow-weighted.

The dispersion model requires a diurnal profile of traffic flows. These data were unavailable from the traffic model and locally-specific data were not deemed appropriate to use. A diurnal traffic profile from Dft (2005) which represents a UK average was thus used.

The traffic data were supplied both as annual average daily flows and as peak-hour data. The dispersion model requires peak-hour traffic data, but because the primary concern for air quality is long-term concentrations, and because the relationship between peak-hour flow and annual average flow is not constant, the air quality modelling used a pseudo-peak hour flow, which was derived from the annual average daily flow, using the diurnal profile described above.

1.1.2 Background Concentrations

These have been taken from the national maps supplied by Defra and the DAs (2007a). The specific background concentration for the particular grid square in which each receptor lies has been used. Because these background maps already include road transport sources there will inevitably be some double counting.

1.1.3 Meteorological Data

Meteorological data from the Glasgow Meteorological Office station from 2004 was used for each of the model runs. When this assessment began, 2004 was the most recent full calendar year of both meteorological and air quality monitoring data and was thus the most appropriate year to use.

1.1.4 Model Set-Up

All of the roads explicitly included in the model (as described within the main report) were assigned real-world geography. This was done using Geographical Information System software to snap the road model links to Ordnance Survey Landline road centrelines.

SIAS provided average speeds for each link in the road model. However, in order to take account of the reduced speeds around some road junctions, the following approach was taken. For each road where (based on a review of the junction shape, maps and aerial photographs) it was deemed that vehicles would slow on approach to the junction (or

accelerate on departure from the junction), a 50m buffer was drawn along the road, stretching away from the junction. Each section of a road within one of these buffers was assigned a speed one third of that of the remainder of the link. The application of this rule was based on professional judgement, because it would clearly have been inappropriate to apply it to very short links.

1.1.5 Model Verification

The algorithms on which the AAQuIRE dispersion model is based have undergone extensive international validation. This validation has not, however, been performed for this specific geographical area and these specific input data. It is thus important to verify the model results by comparing them with local measurements. By adjusting the model to agree closely with the measured data, any uncertainties inherent in the model can be minimised. The model has thus been verified against the automatic monitoring data collected by North Lanarkshire Council during 2004 - this being the most recent full year of data available when the assessment began.

Oxides of Nitrogen

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone (NOx = NO + NO_2). It is therefore most appropriate to verify the model in terms of primary pollutant emissions. The model has been run to predict annual mean concentrations of NOx during 2004 at the five automatic monitoring sites run by North Lanarkshire Council for which the Council was able to supply precise locations. The sites included are discussed below. Because pollutant concentrations can vary considerably over a short distance it was decided to exclude the other two sites (Calder Court and Kirk o' Shotts), for which precise locations were unavailable, from the verification analysis.

Of the five sites, 3 were run for 6 months during 2004, one was run for 12 months during 2004, and one was only run for 2 months during 2004. North Lanarkshire Council supplied all of the data available to them at the time, and these have been used to derive the most appropriate model adjustment possible. The following approach was used.

Motherwell Civic Centre; Motherwell Roadside; and Wishaw. Approximately 6 months of nitrogen dioxide and NOx measurements from each site (3 months summer and 3 months winter), adjusted to a 2004 annual mean equivalent by North Lanarkshire Council.

Hirst Road, Harthill. 12 months of measurements during 2004. The Council supplied measured NOx concentrations. This site has been assigned twice the weight of each of the other sites in calculating the best-fit relationship between the measurements and the modelled results, simply because the monitoring period was twice as long and the measured annual mean concentrations are thus more reliable.

Chapelhall. Only 2 months of measurements during 2004. However, the Council's 2005 air quality Progress Report (North Lanarkshire, 2005) also presents nitrogen dioxide

measurements from this site up to the end of March, 2005. The same approach as that used by the Council[1] has been used to derive a 2004 annual mean equivalent nitrogen dioxide concentration. The NOx from NO_2 calculator published by Defra and the DAs (2005) was then used to predict the corresponding NOx concentration[2].

The raw model outputs relate to road-NOx (i.e. the component of total NOx coming from road traffic). This has been compared with the measured road-NOx, which has been derived by subtracting the estimated background NOx concentrations from the total measured NOx. The result of this comparison is shown in Figure AQ1.1. There is considerable scatter around the 1:1 line, and overall, the model appears to under-predict concentrations (i.e. most of the data lie below the 1:1 line). Applying ordinary least squares regression (forced through zero) the best fit relationship between the data points in Figure AQ1.1 can be described by:

measured road-NOx = modelled road NOx x 1.918.

The raw modelled road-NOx concentrations have therefore been multiplied by 1.918.

The adjusted modelled road-NOx was then added to the predicted background NOx for each receptor, before road-NO_2 concentrations were calculated following the relationship advised by Defra and the DAs (2003b)[2]:

road-NO_2 = -0.068 x LN total-NOx + 0.53 x road-NOx

Total-NO_2 concentrations were then derived by summing the road-NO_2 with the predicted background NO_2 for the relevant receptor. Figure AQ1.2 shows how the adjusted total NO_2 concentrations compare with the relevant measured (annual mean equivalent) values. The fit is generally good, but it does appear that the adjusted model may tend to over-predict concentrations toward the lower end of the measured range and to under-predict the higher concentrations.

[1] i.e. adjusting the short-term mean in line with long-term trends at the Glasgow Centre AURN site.
[2] The NOx from NO_2 calculator published by Defra and the DAs (2005) uses the relationship defined in Defra and the DAs 2003b. Defra and the DAs (2007a and 2007b) describe an updated approach which takes account of recent empirical observations from across the UK. Defra and the DAs (2007a and 2007b) explain that so long as modelling studies verify against both NOx and NO_2 (as has been done here), the implications of the update will be negligible. Defra and the DAs (2007a and 2007b) also show that differences between relationships during 2004 and those in the very latest measurements are negligible. This current approach to verification uses local NOx to NO_2 relationships measured during 2004. It is felt that in this instance, consistency with the approach presented in the air quality assessment for the proposed Raith upgrade scheme is more important than updating to the latest published relationship. The approach has thus not been updated to take account of the latest relationship. Any implications of this will be negligible.

PM_{10}

It has not been possible to apply the same approach to verifying PM_{10} as was used for NOx because of uncertainty surrounding predictions of background PM_{10} concentrations. An alternative approach has thus been applied which makes use of the conclusions of the NOx verification described above.

PM_{10} is not measured at Wishaw and so the PM_{10} verification relied on just four monitoring sites. As with nitrogen dioxide, the data from Chapelhall were augmented with those from the additional monitoring period and the annual mean was subsequently derived using the same method as that used by North Lanarkshire Council. Data from Hirst Road were not assigned double-weight (as they were for nitrogen dioxide) because there was quarrying in the vicinity of the monitor and it is not known whether this will have influenced the data.

The same processes that influence emissions and dispersion of road-NOx will also influence road-PM_{10}. Road-PM_{10} has thus been adjusted by the same factor as road-NOx (1.918). Not to do this would risk underestimating PM_{10} concentrations.

It is well-known that in this region, the background pollutant maps published by Defra and the DAs (2006a) can over-predict PM_{10} concentrations. This can be demonstrated by the fact that the predicted background concentration during 2005 at Carnie Place in Whitburn (15 $\mu g/m^3$ in 2005) is greater than the measured concentration at Carnie Place (14 $\mu g/m^3$ in 2004). The predicted background concentrations have been adjusted in line with the measured data as follows:

1) Road-PM_{10} was multiplied by 1.918 (as described above).

2) Background-PM_{10} was multiplied by unknown “A”.

3) The adjusted road-PM_{10} and adjusted background-PM_{10} were summed to give adjusted total-PM_{10}.

4) The best fit relationship between measured PM_{10} and adjusted total-PM_{10} (ordinary least squares regression, forced through zero) was calculated.

5) Unknown “A” was then varied until the best fit relationship described above became y = x. The optimal background adjustment factor was thus 0.7504.

In summary, total modelled PM_{10} is the sum of (modelled x 1.918) and (background x 0.7504). Figure AQ1.3 sets out how the adjusted modelled data and the measured data compare.

Since there is no reliable way to model the background component of 24-hour mean PM_{10} concentrations, the number of exceedences of 50 $\mu g/m^3$ as a 24-hour mean PM_{10} concentration has been calculated from the adjusted-modelled total annual mean concentration following the relationship advised by Defra and the DAs (2003b):

A = -18.5 + 0.00145 B3 = 206/B

where A is the number of exceedences of 50 µg/m^3 as a 24-hour mean PM_{10} concentration and B is the annual mean PM_{10} concentration. The relationship is only applied to annual mean concentrations greater than 16.5 µg/m^3, below this concentration, the number of 24-hour exceedences is assumed to be zero.

Figure AQ1.1 Measured vs Modelled Road-NOx (unadjusted**)**

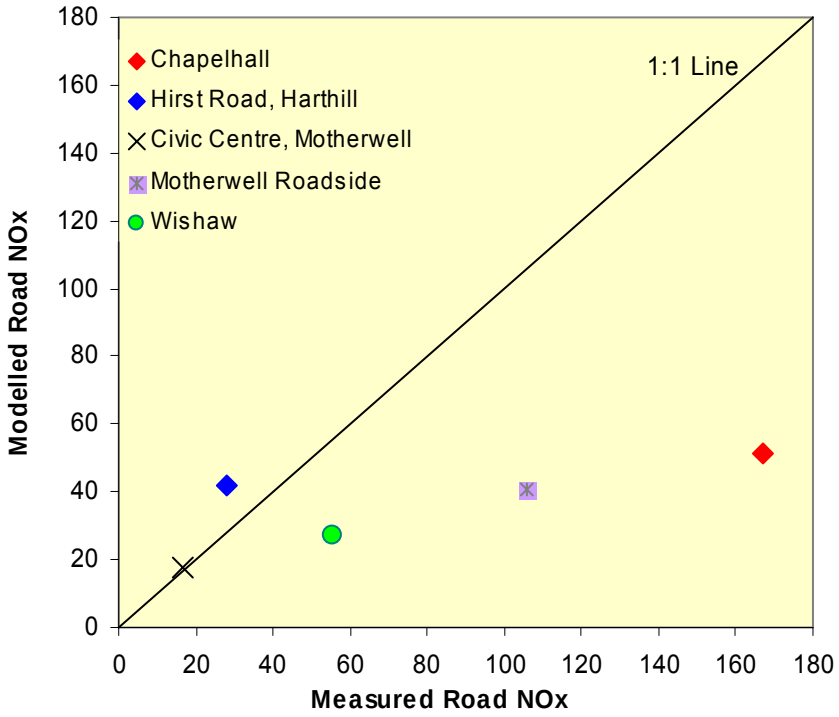


Figure AQ1.2 Measured vs Modelled Nitrogen Dioxide (adjusted)

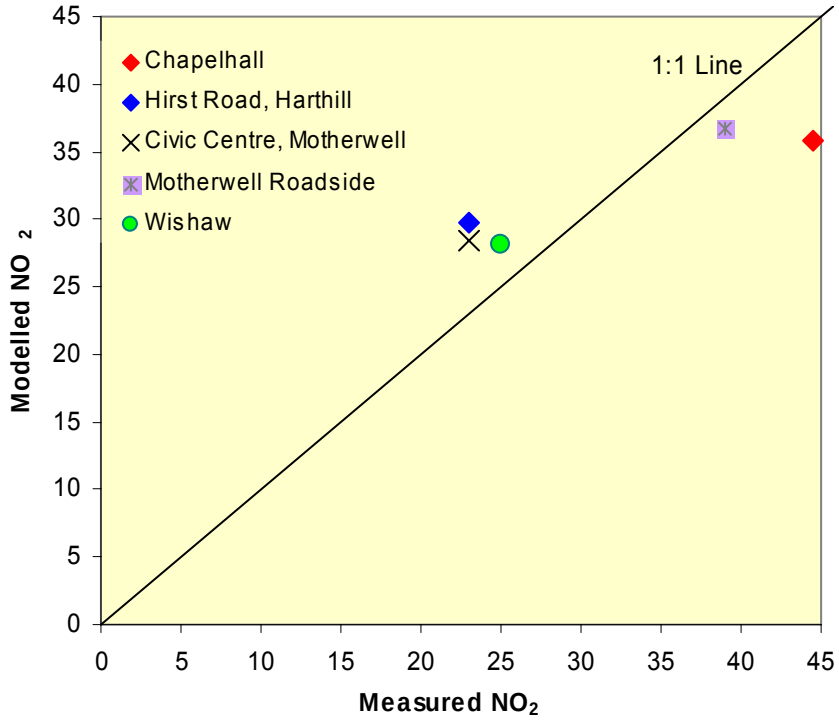
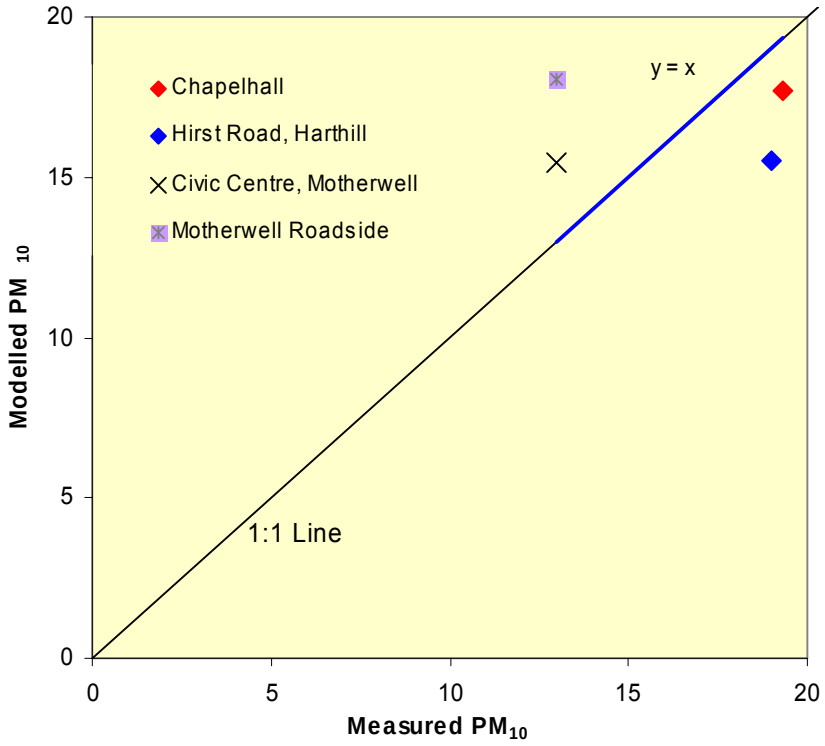


Figure AQ1.3 Measured vs Modelled PM_{10} (adjusted)



Model Results

Table AQ1.2 Modelled Annual Mean Nitrogen Dioxide Concentrations (μg/m^3) with and Without the Proposed Scheme. Receptors that are also presented in the main report are shaded.

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
1	-	Chapelhall Monitor **(AQMA)**	35.8	26.9	24.1	-11	Medium	Slight Beneficial
2	-	Civic Centre Monitor **(AQMA)**	28.4	23.9	24.0	0	Extremely Small	Negligible
3	-	Hirst Road Monitor	29.8	22.6	22.9	1	Very Small	Negligible
4	2	Motherwell Cross Monitor **(AQMA)**	36.7	30.0	29.8	-1	Extremely Small	Negligible
5	-	Wishaw Monitor	28.1	21.1	21.2	0	Extremely Small	Negligible
6	3	2 Manse Road, Newmains, Wishaw	29.8	22.6	22.7	0	Extremely Small	Negligible
7	4	135 Main Street, Newmains, Wishaw	20.2	14.5	14.2	-2	Very Small	Negligible
8	5	91 Wildman Road, Law, Carluke	12.8	9.6	9.3	-3	Very Small	Negligible
9	6	3 Brownlee Road, Law, Carluke	13.6	10.6	10.2	-4	Very Small	Negligible
10	7	126 Main Street, Overtown, Wishaw	16.0	12.0	11.9	-1	Extremely Small	Negligible
11	8	173a Wishaw Road, Wishaw	18.6	14.7	14.4	-2	Very Small	Negligible
12	9	2 Stewarton Street, Wishaw	32.8	24.9	24.9	0	Extremely Small	Negligible
13	-	23 Mission Gardens, Wishaw	17.3	13.2	13.4	1	Very Small	Negligible
14	-	65-67 Main Street, Cleland, Motherwell	20.4	15.9	16.2	2	Very Small	Negligible
15	-	Omoa Road, Cleland, Motherwell	21.2	16.8	17.4	3	Very Small	Negligible
16	10	Motherwell Road,	32.2	24.9	25.4	2	Very Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Motherwell						
17	-	High Street, Motherwell 1	26.1	20.7	20.5	-1	Extremely Small	Negligible
18	-	High Street, Motherwell 2	26.4	19.2	19.2	0	Extremely Small	Negligible
19	-	Southview, Edinburgh Road, Newhouse, Motherwell	33.4	24.9	24.8	0	Extremely Small	Negligible
20	-	Allandale, Edinburgh Road, Newhouse, Motherwell	35.1	26.4	26.8	2	Very Small	Negligible
21	-	Carlisle Road, Cleland, Motherwell	19.0	14.2	14.3	1	Extremely Small	Negligible
22	11	Merry Street, Motherwell	31.9	26.6	26.9	1	Extremely Small	Negligible
23	12	Jerviston Street, New Stevenston, Motherwell	24.5	19.1	19.4	1	Very Small	Negligible
24	-	Stevenston Street, Motherwell	29.2	25.2	25.2	0	Extremely Small	Negligible
25	-	Main Street, Holytown, Motherwell	37.7	33.0	31.8	-4	Very Small	Slight Beneficial
26	-	63 Holytown Road, Bellshill	31.7	25.6	24.4	-5	Very Small	Negligible
27	-	610 Main Street, Bellshill	36.2	30.1	28.1	-6	Small	Slight Beneficial
28	13	56 Calder Road, Bellshill	28.8	23.7	23.5	-1	Very Small	Negligible
29	14	174 Motherwell Road, Bellshill	30.5	26.1	26.1	0	Extremely Small	Negligible
30	15	62 Hamilton Road, Bellshill	31.1	27.8	27.1	-2	Very Small	Negligible
31	**16**	47 South View, Bellshill	32.6	29.0	29.7	2	Very Small	Negligible
32	**17**	6 Lysa Vale Place, Bellshill	38.6	33.3	33.9	2	Very Small	Slight Adverse
33	18	26 Caldwell Grove, Bellshill	34.1	28.4	30.0	6	Small	Slight Adverse
34	19	2	31.8	26.8	27.0	1	Extremely Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Rowanden Avenue, Bellshill						
35	20	5 Huntly Avenue, Bellshill	37.1	31.8	31.0	-2	Very Small	Slight Beneficial
36	21	Bellshill Road, Motherwell	27.6	23.5	23.4	0	Extremely Small	Negligible
37	-	Airbles Farm Road, Motherwell	27.2	23.4	23.6	1	Extremely Small	Negligible
38	**22**	7 Clydeview, Bothwell, Glasgow	27.1	24.1	24.2	0	Extremely Small	Negligible
39	**23**	Strathclyde Park Inn, Hamilton Road, Motherwell	36.2	30.7	30.7	0	Extremely Small	Negligible
40	24	72 Wordsworth Way, Bothwell, Glasgow	28.9	25.2	25.3	1	Extremely Small	Negligible
41	25	38 Sheepburn Road, Uddingston, Glasgow	38.2	32.8	32.7	0	Extremely Small	Negligible
42	26	17 Kilpatrick Way, Uddingston, Glasgow	32.9	27.4	27.3	0	Extremely Small	Negligible
43	27	285 New Edinburgh Road, Uddingston, Glasgow	35.7	29.9	30.1	1	Extremely Small	Negligible
44	28	21 Maryville View, Uddingston, Glasgow	37.2	31.2	31.1	0	Extremely Small	Negligible
45	-	106 Main Street, Baillieston, Glasgow	34.7	28.8	29.1	1	Very Small	Negligible
46	-	2 Rhindhouse Road, Baillieston, Glasgow	32.5	26.0	24.9	-4	Very Small	Negligible
47	-	22 Crossview Place, Baillieston, Glasgow	34.6	27.2	27.2	0	Extremely Small	Negligible
48	-	43 Roslyn Drive, Baillieston,	36.3	29.2	29.9	2	Very Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Glasgow						
49	-	606 Coatbridge Road, Baillieston, Glasgow	39.6	32.1	32.3	1	Extremely Small	Negligible
50	-	725 Coatbridge Road, Baillieston, Glasgow	33.7	27.4	27.6	1	Extremely Small	Negligible
51	-	Townhead Road, Coatbridge	23.1	17.1	17.3	1	Very Small	Negligible
52	-	Blair Road, Coatbridge	24.0	20.4	20.5	0	Extremely Small	Negligible
53	-	Woodside Street, Coatbridge	28.9	24.0	24.3	1	Very Small	Negligible
54	-	Carmyle Gardens, Coatbridge	36.3	29.5	28.4	-4	Very Small	Negligible
55	-	Whifflet Street, Coatbridge **(Close to AQMA)**	45.6	37.2	35.7	-4	Very Small	Slight Beneficial
56	29	Whifflet Street, Coatbridge **(AQMA)**	34.3	28.1	28.2	0	Extremely Small	Negligible
57	30	16-17 John Smith Gardens, Coatbridge	32.2	27.4	27.1	-1	Extremely Small	Negligible
58	-	Sykeside Cottage, Airdrie	32.0	28.1	27.7	-1	Very Small	Negligible
59	31	Sweethill Terrace, Coatbridge	28.5	24.5	25.7	5	Small	Slight Adverse
60	-	141 Carlisle Road, Airdrie	41.6	37.1	37.8	2	Very Small	Slight Adverse
61	-	170 Main Street, Calderbank, Airdrie	29.2	24.9	27.4	10	Small	Slight Adverse
62	-	48 Main Street, Chapelhall, Airdrie **(AQMA)**	36.2	27.1	23.5	-13	Medium	Slight Beneficial
63	-	5 Doune Crescent, Chapelhall, Airdrie	31.9	26.7	26.4	-1	Very Small	Negligible
64	-	Bailside Farm, Airdrie	32.1	24.5	24.7	1	Extremely Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
65	-	1 Broomknoll Street, Airdrie	24.7	21.1	21.3	1	Very Small	Negligible
66	-	8 Aitchison Street, , Airdrie	27.2	20.5	20.8	1	Very Small	Negligible
67	-	130a Coatbridge Road, Glenmavis, Airdrie	27.5	21.9	22.1	1	Extremely Small	Negligible
68	-	123 Lochend Road, Gartcosh, Glasgow	26.5	22.6	23.3	3	Very Small	Negligible
69	-	73 Wardie Road, Glasgow	36.4	28.1	28.2	1	Extremely Small	Negligible
70	-	6 Rhindmuir Path, Baillieston, Glasgow	34.5	26.8	27.0	1	Extremely Small	Negligible
71	-	39 Airdrie Road, Caldercruix, Airdrie	16.8	13.2	12.9	-3	Very Small	Negligible
72	-	Adjacent to 339 Main Street, Salsburgh, Shotts	33.9	26.2	26.2	0	Extremely Small	Negligible
73	-	Property east of Manse Rd, between Hirst Rd and M8, Shotts	35.4	27.4	27.4	0	Extremely Small	Negligible
74	-	183 Muirhall Terrace, Salsburgh, Shotts	28.7	21.9	22.1	1	Extremely Small	Negligible
75	-	Mayfield West Cottage, Edinburgh Road, Newhouse, Motherwell	36.4	29.2	28.2	-3	Very Small	Negligible
76	-	Parkhaven Lodge, Woodhall Estate, Calderbank, Airdrie	30.2	25.1	27.6	10	Small	Slight Adverse
77	**32**	Ivycott, Carnbroe Road, Coatbridge	42.8	36.0	31.3	-13	Medium	Moderate Beneficial

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
78	-	Orchard Farm Cottage, Bellshill [d]	31.1	25.9	35.5	37	Very Large	Substantial Adverse
79	-	Carnbroe Mains Cottage, Bellshill [d]	30.8	25.8	34.8	35	Very Large	Substantial Adverse
80	-	Douglas Support, Coatbridge [d]	31.2	26.0	30.1	16	Large	Moderate Adverse
81	-	Higherness Way, Coatbridge	36.7	30.1	26.7	-11	Medium	Moderate Beneficial
82	-	Bankhead Farm , Coatbridge [d]	28.6	23.7	25.0	5	Small	Slight Adverse
83	-	75 Rosebank Terrace, Baillieston, Glasgow	35.0	28.2	28.2	0	Extremely Small	Negligible
84	-	36 Mainhill Road, Baillieston, Glasgow	35.2	28.2	28.7	2	Very Small	Negligible
85	33	25 Ayr Road, Shawsburn, Larkhall	21.2	14.7	14.5	-1	Very Small	Negligible
86	-	1 Main Street, Shotts	18.9	13.9	13.9	0	Extremely Small	Negligible
87	-	1 Dewshill Cottages, Salsburgh, Shotts	42.8	33.5	33.7	0	Extremely Small	Negligible
88	-	19 Shottsburn Road, Salsburgh, Shotts	26.6	20.1	20.3	1	Extremely Small	Negligible
89	-	46 Torbane Drive, East Whitburn	38.5	28.8	29.0	1	Extremely Small	Negligible
90	-	Beechview, Avonbridge Road, Slamannan	13.5	10.8	10.8	0	Extremely Small	Negligible
91	-	Netherdale Cockridge Road, Lanark	12.1	8.7	8.7	0	Extremely Small	Negligible
92	**34**	Auld House, Whifflet Street, Coatbridge **(AQMA)**	34.5	28.6	28.6	0	Extremely Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
93	**1**	Manse Road, Motherwell **(AQMA)**	32.5	26.9	26.9	0	Extremely Small	Negligible

[a] Number used to describe the same receptor in the Raith Junction Stage 3 Assessment. Those that were included in the main report of the Raith Junction Stage 3 Assessment are shown in bold.
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] These properties are non-residential and so the objectives do not apply here.

Table AQ1.3 Modelled Annual Mean PM_{10} Concentrations ($\mu g/m^3$) with and Without the Proposed Scheme. Receptors that are also presented in the main report are shaded. Objective exceedences are shown in bold.

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
1	-	Chapelhall Monitor **(AQMA)**	17.7	16.5	15.8	-4	Very Small	Slight Beneficial
2	-	Civic Centre Monitor **(AQMA)**	15.5	14.5	14.5	0	Extremely Small	Negligible
3	-	Hirst Road Monitor	15.5	14.4	14.7	2	Very Small	Slight Adverse
4	2	Motherwell Cross Monitor **(AQMA)**	18.0	16.6	16.5	0	Extremely Small	Negligible
5	-	Wishaw Monitor	14.8	13.8	13.8	0	Extremely Small	Negligible
6	3	2 Manse Road, Newmains, Wishaw	16.0	14.3	14.3	0	Extremely Small	Negligible
7	4	135 Main Street, Newmains, Wishaw	12.9	11.7	11.6	-1	Very Small	Negligible
8	5	91 Wildman Road, Law, Carluke	10.9	10.3	10.2	-1	Very Small	Negligible
9	6	3 Brownlee Road, Law, Carluke	11.3	11.0	10.6	-3	Very Small	Negligible
10	7	126 Main Street, Overtown, Wishaw	11.6	11.3	11.1	-1	Very Small	Negligible
11	8	173a Wishaw Road, Wishaw	12.4	11.8	11.7	-1	Extremely Small	Negligible
12	9	2 Stewarton Street, Wishaw	16.6	15.2	15.2	0	Extremely Small	Negligible
13	-	23 Mission Gardens,	11.8	11.1	11.2	0	Extremely Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Wishaw						
14	-	65-67 Main Street, Cleland, Motherwell	13.0	12.3	12.5	2	Very Small	Negligible
15	-	Omoa Road, Cleland, Motherwell	13.2	12.5	12.7	2	Very Small	Negligible
16	10	Motherwell Road, Motherwell	16.6	15.6	16.1	3	Very Small	Slight Adverse
17	-	High Street, Motherwell 1	14.7	13.8	13.9	1	Very Small	Slight Adverse
18	-	High Street, Motherwell 2	13.9	13.2	13.4	2	Very Small	Negligible
19	-	Southview, Edinburgh Road, Newhouse, Motherwell	16.1	14.8	14.9	1	Very Small	Slight Adverse
20	-	Allandale, Edinburgh Road, Newhouse, Motherwell	16.2	14.9	15.3	2	Very Small	Slight Adverse
21	-	Carlisle Road, Cleland, Motherwell	12.3	11.6	11.7	1	Very Small	Negligible
22	11	Merry Street, Motherwell	16.7	16.0	16.2	1	Very Small	Slight Adverse
23	12	Jerviston Street, New Stevenston, Motherwell	13.8	13.5	13.6	1	Extremely Small	Negligible
24	-	Stevenston Street, Motherwell	15.5	15.1	15.1	0	Extremely Small	Negligible
25	-	Main Street, Holytown, Motherwell	18.4	17.8	17.3	-3	Very Small	Slight Beneficial
26	-	63 Holytown Road, Bellshill	15.7	15.3	14.6	-4	Very Small	Slight Beneficial
27	-	610 Main Street, Bellshill	17.5	17.1	15.9	-7	Small	Slight Beneficial
28	13	56 Calder Road, Bellshill	15.0	14.6	14.4	-1	Extremely Small	Negligible
29	14	174 Motherwell Road, Bellshill	15.8	15.2	15.2	-1	Extremely Small	Negligible
30	15	62 Hamilton Road,	16.0	15.9	15.7	-1	Very Small	Slight Beneficial

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Bellshill						
31	**16**	47 South View, Bellshill	16.4	16.7	17.1	2	Very Small	Slight Adverse
32	**17**	6 Lysa Vale Place, Bellshill	19.1	**18.7**	**19.2**	2	Very Small	Slight Adverse
33	18	26 Caldwell Grove, Bellshill	16.7	16.0	17.0	6	Small	Slight Adverse
34	19	2 Rowanden Avenue, Bellshill	16.6	15.8	15.8	0	Extremely Small	Negligible
35	20	5 Huntly Avenue, Bellshill	18.5	17.5	17.0	-3	Very Small	Slight Beneficial
36	21	Bellshill Road, Motherwell	15.0	14.3	14.2	0	Extremely Small	Negligible
37	-	Airbles Farm Road, Motherwell	14.9	14.2	14.2	0	Extremely Small	Negligible
38	**22**	7 Clydeview, Bothwell, Glasgow	14.3	14.3	14.4	1	Extremely Small	Negligible
39	**23**	Strathclyde Park Inn, Hamilton Road, Motherwell	17.9	17.7	17.8	1	Extremely Small	Negligible
40	24	72 Wordsworth Way, Bothwell, Glasgow	15.0	14.7	14.7	0	Extremely Small	Negligible
41	25	38 Sheepburn Road, Uddingston, Glasgow	19.1	**18.8**	**18.8**	0	Extremely Small	Slight Beneficial
42	26	17 Kilpatrick Way, Uddingston, Glasgow	16.5	15.3	15.2	-1	Extremely Small	Negligible
43	27	285 New Edinburgh Road, Uddingston, Glasgow	17.5	16.2	16.5	2	Very Small	Slight Adverse
44	28	21 Maryville View, Uddingston, Glasgow	18.0	17.5	17.4	0	Extremely Small	Negligible
45	-	106 Main Street, Baillieston, Glasgow	16.9	16.4	16.8	3	Very Small	Slight Adverse
46	-	2	15.5	14.4	14.0	-3	Very Small	Slight Beneficial

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Rhindhouse Road, Baillieston, Glasgow						
47	-	22 Crossview Place, Baillieston, Glasgow	16.3	15.1	15.2	1	Extremely Small	Negligible
48	-	43 Roslyn Drive, Baillieston, Glasgow	17.0	16.2	16.7	4	Very Small	Slight Adverse
49	-	606 Coatbridge Road, Baillieston, Glasgow	18.5	17.5	17.7	1	Very Small	Slight Adverse
50	-	725 Coatbridge Road, Baillieston, Glasgow	16.0	15.2	15.1	-1	Extremely Small	Negligible
51	-	Townhead Road, Coatbridge	12.7	12.2	12.2	0	Extremely Small	Negligible
52	-	Blair Road, Coatbridge	13.2	12.6	12.6	0	Extremely Small	Negligible
53	-	Woodside Street, Coatbridge	14.6	13.9	13.9	0	Extremely Small	Negligible
54	-	Carmyle Gardens, Coatbridge	17.8	17.1	16.3	-4	Very Small	Slight Beneficial
55	-	Whifflet Street, Coatbridge **(Close to AQMA)**	21.7	**20.0**	**19.6**	-2	Very Small	Slight Beneficial
56	29	Whifflet Street, Coatbridge **(AQMA)**	16.7	15.8	15.9	0	Extremely Small	Negligible
57	30	16-17 John Smith Gardens, Coatbridge	16.3	15.5	15.4	0	Extremely Small	Negligible
58	-	Sykeside Cottage, Airdrie	16.3	16.1	15.8	-2	Very Small	Slight Beneficial
59	31	Sweethill Terrace, Coatbridge	15.4	15.1	15.6	4	Very Small	Slight Adverse
60	-	141 Carlisle Road, Airdrie	20.5	**19.7**	**19.8**	1	Extremely Small	Slight Adverse
61	-	170 Main Street, Calderbank, Airdrie	15.6	15.0	15.7	5	Very Small	Slight Adverse

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
62	-	48 Main Street, Chapelhall, Airdrie **(AQMA)**	17.6	16.1	15.3	-5	Very Small	Slight Beneficial
63	-	5 Doune Crescent, Chapelhall, Airdrie	16.3	15.5	15.9	3	Very Small	Slight Adverse
64	-	Bailside Farm, Airdrie	16.4	15.7	15.7	0	Extremely Small	Negligible
65	-	1 Broomknoll Street, Airdrie	14.0	13.3	13.5	1	Very Small	Negligible
66	-	8 Aitchison Street, , Airdrie	14.8	13.9	14.1	1	Very Small	Slight Adverse
67	-	130a Coatbridge Road, Glenmavis, Airdrie	14.5	13.8	13.7	-1	Extremely Small	Negligible
68	-	123 Lochend Road, Gartcosh, Glasgow	13.3	12.8	13.3	4	Very Small	Negligible
69	-	73 Wardie Road, Glasgow	17.4	16.0	16.1	1	Extremely Small	Negligible
70	-	6 Rhindmuir Path, Baillieston, Glasgow	16.3	15.0	15.1	1	Extremely Small	Negligible
71	-	39 Airdrie Road, Caldercruix, Airdrie	12.7	11.9	11.9	0	Extremely Small	Negligible
72	-	Adjacent to 339 Main Street, Salsburgh, Shotts	18.2	17.3	17.6	2	Very Small	Slight Adverse
73	-	Property east of Manse Rd, between Hirst Rd and M8, Shotts	19.0	18.0	**18.5**	3	Very Small	Moderate Adverse
74	-	183 Muirhall Terrace, Salsburgh, Shotts	14.4	13.3	13.5	1	Very Small	Negligible
75	-	Mayfield West Cottage, Edinburgh Road,	17.3	16.2	15.9	-2	Very Small	Slight Beneficial

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Newhouse, Motherwell						
76	-	Parkhaven Lodge, Woodhall Estate, Calderbank, Airdrie	15.8	15.1	16.5	9	Small	Slight Adverse
77	**32**	Ivycott, Carnbroe Road, Coatbridge	21.2	**21.2**	**18.2**	-14	Medium	Substantial Beneficial
78	-	Orchard Farm Cottage, Bellshill [d]	15.7	15.2	**20.7**	36	Very Large	Very Substantial Adverse
79	-	Carnbroe Mains Cottage, Bellshill [d]	15.7	15.1	**20.1**	33	Very Large	Very Substantial Adverse
80	-	Douglas Support, Coatbridge [d]	16.0	15.2	17.3	14	Medium	Moderate Adverse
81	-	Higherness Way, Coatbridge	17.9	17.3	15.5	-10	Medium	Moderate Beneficial
82	-	Bankhead Farm , Coatbridge [d]	14.7	14.0	14.6	4	Very Small	Slight Adverse
83	-	75 Rosebank Terrace, Baillieston, Glasgow	16.8	15.8	15.9	1	Extremely Small	Negligible
84	-	36 Mainhill Road, Baillieston, Glasgow	16.6	15.7	16.2	3	Very Small	Slight Adverse
85	33	25 Ayr Road, Shawsburn, Larkhall	12.3	11.5	11.4	-1	Very Small	Negligible
86	-	1 Main Street, Shotts	13.8	12.8	12.8	0	Extremely Small	Negligible
87	-	1 Dewshill Cottages, Salsburgh, Shotts	22.9	**21.9**	**22.6**	4	Very Small	Slight Adverse
88	-	19 Shottsburn Road, Salsburgh, Shotts	15.2	14.1	14.3	1	Very Small	Slight Adverse
89	-	46 Torbane Drive, East Whitburn	19.6	**18.7**	**19.0**	2	Very Small	Slight Adverse
90	-	Beechview, Avonbridge	10.3	9.7	9.6	-1	Extremely Small	Negligible

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	% Change	Impact Magnitude	Impact Significance
		Road, Slamannan						
91	-	Netherdale Cockridge Road, Lanark	9.9	9.2	9.2	-1	Extremely Small	Negligible
92	**34**	Auld House, Whifflet Street, Coatbridge **(AQMA)**	16.6	15.3	15.4	0	Extremely Small	Negligible
93	**1**	Manse Road, Motherwell **(AQMA)**	17.4	15.9	15.9	0	Extremely Small	Negligible

[a] Number used to describe the same receptor in the Raith Junction Stage 3 Assessment. Those that were included in the main report of the Raith Junction Stage 3 Assessment are shown in bold.
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] These properties are non-residential and so the objectives do not apply here.

Table AQ1.4 Modelled Number of 24-hour PM_{10} Exceedences ($\mu g/m^3$) with and Without the Proposed Scheme. Receptors that are also presented in the main report are shaded.

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	Impact Magnitude	Impact Significance
1	-	Chapelhall Monitor **(AQMA)**	17.7	16.5	15.8	-4	Very Small
2	-	Civic Centre Monitor **(AQMA)**	15.5	14.5	14.5	0	Extremely Small
3	-	Hirst Road Monitor	15.5	14.4	14.7	2	Very Small
4	2	Motherwell Cross Monitor **(AQMA)**	18.0	16.6	16.5	0	Extremely Small
5	-	Wishaw Monitor	14.8	13.8	13.8	0	Extremely Small
6	3	2 Manse Road, Newmains, Wishaw	16.0	14.3	14.3	0	Extremely Small
7	4	135 Main Street, Newmains, Wishaw	12.9	11.7	11.6	-1	Very Small
8	5	91 Wildman Road, Law, Carluke	10.9	10.3	10.2	-1	Very Small
9	6	3 Brownlee Road, Law, Carluke	11.3	11.0	10.6	-3	Very Small
10	7	126 Main Street, Overtown, Wishaw	11.6	11.3	11.1	-1	Very Small
11	8	173a Wishaw Road, Wishaw	12.4	11.8	11.7	-1	Extremely Small
12	9	2 Stewarton Street, Wishaw	16.6	15.2	15.2	0	Extremely Small
13	-	23 Mission Gardens, Wishaw	11.8	11.1	11.2	0	Extremely Small
14	-	65-67 Main Street, Cleland, Motherwell	13.0	12.3	12.5	2	Very Small
15	-	Omoa Road, Cleland, Motherwell	13.2	12.5	12.7	2	Very Small
16	10	Motherwell Road, Motherwell	16.6	15.6	16.1	3	Very Small

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	Impact Magnitude	Impact Significance
17	-	High Street, Motherwell 1	14.7	13.8	13.9	1	Very Small
18	-	High Street, Motherwell 2	13.9	13.2	13.4	2	Very Small
19	-	Southview, Edinburgh Road, Newhouse, Motherwell	16.1	14.8	14.9	1	Very Small
20	-	Allandale, Edinburgh Road, Newhouse, Motherwell	16.2	14.9	15.3	2	Very Small
21	-	Carlisle Road, Cleland, Motherwell	12.3	11.6	11.7	1	Very Small
22	11	Merry Street, Motherwell	16.7	16.0	16.2	1	Very Small
23	12	Jerviston Street, New Stevenston, Motherwell	13.8	13.5	13.6	1	Extremely Small
24	-	Stevenston Street, Motherwell	15.5	15.1	15.1	0	Extremely Small
25	-	Main Street, Holytown, Motherwell	18.4	17.8	17.3	-3	Very Small
26	-	63 Holytown Road, Bellshill	15.7	15.3	14.6	-4	Very Small
27	-	610 Main Street, Bellshill	17.5	17.1	15.9	-7	Small
28	13	56 Calder Road, Bellshill	15.0	14.6	14.4	-1	Extremely Small
29	14	174 Motherwell Road, Bellshill	15.8	15.2	15.2	-1	Extremely Small
30	15	62 Hamilton Road, Bellshill	16.0	15.9	15.7	-1	Very Small
31	**16**	47 South View, Bellshill	16.4	16.7	17.1	2	Very Small
32	**17**	6 Lysa Vale Place, Bellshill	19.1	**18.7**	**19.2**	2	Very Small
33	18	26 Caldwell Grove, Bellshill	16.7	16.0	17.0	6	Small
34	19	2 Rowanden Avenue, Bellshill	16.6	15.8	15.8	0	Extremely Small
35	20	5 Huntly Avenue, Bellshill	18.5	17.5	17.0	-3	Very Small
36	21	Bellshill Road, Motherwell	15.0	14.3	14.2	0	Extremely Small
37	-	Airbles Farm Road, Motherwell	14.9	14.2	14.2	0	Extremely Small
38	**22**	7 Clydeview, Bothwell, Glasgow	14.3	14.3	14.4	1	Extremely Small
39	**23**	Strathclyde Park Inn, Hamilton Road, Motherwell	17.9	17.7	17.8	1	Extremely Small
40	24	72 Wordsworth Way, Bothwell, Glasgow	15.0	14.7	14.7	0	Extremely Small
41	25	38 Sheepburn Road, Uddingston, Glasgow	19.1	**18.8**	**18.8**	0	Extremely Small
42	26	17 Kilpatrick Way,	16.5	15.3	15.2	-1	Extremely Small

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	Impact Magnitude	Impact Significance
		Uddingston, Glasgow					
43	27	285 New Edinburgh Road, Uddingston, Glasgow	17.5	16.2	16.5	2	Very Small
44	28	21 Maryville View, Uddingston, Glasgow	18.0	17.5	17.4	0	Extremely Small
45	-	106 Main Street, Baillieston, Glasgow	16.9	16.4	16.8	3	Very Small
46	-	2 Rhindhouse Road, Baillieston, Glasgow	15.5	14.4	14.0	-3	Very Small
47	-	22 Crossview Place, Baillieston, Glasgow	16.3	15.1	15.2	1	Extremely Small
48	-	43 Roslyn Drive, Baillieston, Glasgow	17.0	16.2	16.7	4	Very Small
49	-	606 Coatbridge Road, Baillieston, Glasgow	18.5	17.5	17.7	1	Very Small
50	-	725 Coatbridge Road, Baillieston, Glasgow	16.0	15.2	15.1	-1	Extremely Small
51	-	Townhead Road, Coatbridge	12.7	12.2	12.2	0	Extremely Small
52	-	Blair Road, Coatbridge	13.2	12.6	12.6	0	Extremely Small
53	-	Woodside Street, Coatbridge	14.6	13.9	13.9	0	Extremely Small
54	-	Carmyle Gardens, Coatbridge	17.8	17.1	16.3	-4	Very Small
55	-	Whifflet Street, Coatbridge **(Close to AQMA)**	21.7	**20.0**	**19.6**	-2	Very Small
56	29	Whifflet Street, Coatbridge **(AQMA)**	16.7	15.8	15.9	0	Extremely Small
57	30	16-17 John Smith Gardens, Coatbridge	16.3	15.5	15.4	0	Extremely Small
58	-	Sykeside Cottage, Airdrie	16.3	16.1	15.8	-2	Very Small
59	31	Sweethill Terrace, Coatbridge	15.4	15.1	15.6	4	Very Small
60	-	141 Carlisle Road, Airdrie	20.5	**19.7**	**19.8**	1	Extremely Small
61	-	170 Main Street, Calderbank, Airdrie	15.6	15.0	15.7	5	Very Small
62	-	48 Main Street, Chapelhall, Airdrie **(AQMA)**	17.6	16.1	15.3	-5	Very Small
63	-	5 Doune Crescent, Chapelhall, Airdrie	16.3	15.5	15.9	3	Very Small
64	-	Bailside Farm, Airdrie	16.4	15.7	15.7	0	Extremely Small
65	-	1 Broomknoll Street, Airdrie	14.0	13.3	13.5	1	Very Small
66	-	8 Aitchison Street, ,	14.8	13.9	14.1	1	Very Small

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	Impact Magnitude	Impact Significance
		Airdrie					
67	-	130a Coatbridge Road, Glenmavis, Airdrie	14.5	13.8	13.7	-1	Extremely Small
68	-	123 Lochend Road, Gartcosh, Glasgow	13.3	12.8	13.3	4	Very Small
69	-	73 Wardie Road, Glasgow	17.4	16.0	16.1	1	Extremely Small
70	-	6 Rhindmuir Path, Baillieston, Glasgow	16.3	15.0	15.1	1	Extremely Small
71	-	39 Airdrie Road, Caldercruix, Airdrie	12.7	11.9	11.9	0	Extremely Small
72	-	Adjacent to 339 Main Street, Salsburgh, Shotts	18.2	17.3	17.6	2	Very Small
73	-	Property east of Manse Rd, between Hirst Rd and M8, Shotts	19.0	18.0	**18.5**	3	Very Small
74	-	183 Muirhall Terrace, Salsburgh, Shotts	14.4	13.3	13.5	1	Very Small
75	-	Mayfield West Cottage, Edinburgh Road, Newhouse, Motherwell	17.3	16.2	15.9	-2	Very Small
76	-	Parkhaven Lodge, Woodhall Estate, Calderbank, Airdrie	15.8	15.1	16.5	9	Small
77	**32**	Ivycott, Carnbroe Road, Coatbridge	21.2	**21.2**	**18.2**	-14	Medium
78	-	Orchard Farm Cottage, Bellshill [d]	15.7	15.2	**20.7**	36	Very Large
79	-	Carnbroe Mains Cottage, Bellshill [d]	15.7	15.1	**20.1**	33	Very Large
80	-	Douglas Support, Coatbridge [d]	16.0	15.2	17.3	14	Medium
81	-	Higherness Way, Coatbridge	17.9	17.3	15.5	-10	Medium
82	-	Bankhead Farm , Coatbridge [d]	14.7	14.0	14.6	4	Very Small
83	-	75 Rosebank Terrace, Baillieston, Glasgow	16.8	15.8	15.9	1	Extremely Small
84	-	36 Mainhill Road, Baillieston, Glasgow	16.6	15.7	16.2	3	Very Small
85	33	25 Ayr Road, Shawsburn, Larkhall	12.3	11.5	11.4	-1	Very Small
86	-	1 Main Street, Shotts	13.8	12.8	12.8	0	Extremely Small
87	-	1 Dewshill Cottages, Salsburgh, Shotts	22.9	**21.9**	**22.6**	4	Very Small
88	-	19 Shottsburn Road, Salsburgh, Shotts	15.2	14.1	14.3	1	Very Small
89	-	46 Torbane Drive,	19.6	**18.7**	**19.0**	2	Very Small

R	Raith R [a]	Description	2004	2010 EDM[b]	2010 DS[c]	Impact Magnitude	Impact Significance
		East Whitburn					
90	-	Beechview, Avonbridge Road, Slamannan	10.3	9.7	9.6	-1	Extremely Small
91	-	Netherdale Cockridge Road, Lanark	9.9	9.2	9.2	-1	Extremely Small
92	**34**	Auld House, Whifflet Street, Coatbridge **(AQMA)**	16.6	15.3	15.4	0	Extremely Small
93	**1**	Manse Road, Motherwell **(AQMA)**	17.4	15.9	15.9	0	Extremely Small

[a] Number used to describe the same receptor in the Raith Junction Stage 3 Assessment. Those that were included in the main report of the Raith Junction Stage 3 Assessment are shown in bold.
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] These properties are non-residential and so the objectives do not apply here.

Cumulative Model Impact Results

Table AQ1.6 Modelled Annual Mean Nitrogen Dioxide Concentrations ($\mu g/m^3$) in 2010 Under Various Scenarios.

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
1	26.7	26.9	24.1	-11	-10	Slight Beneficial	Slight Beneficial	
2	23.9	23.9	24.0	0	1	Negligible	Negligible	
3	22.5	22.6	22.9	1	2	Negligible	Negligible	
4	30.1	30.0	29.8	-1	-1	Negligible	Slight Beneficial	X
5	21.1	21.1	21.2	0	0	Negligible	Negligible	
6	22.7	22.6	22.7	0	0	Negligible	Negligible	
7	15.0	14.5	14.2	-2	-5	Negligible	Negligible	
8	9.8	9.6	9.3	-3	-5	Negligible	Slight Beneficial	X
9	10.7	10.6	10.2	-4	-4	Negligible	Negligible	
10	12.6	12.0	11.9	-1	-5	Negligible	Slight Beneficial	X
11	14.9	14.7	14.4	-2	-3	Negligible	Negligible	
12	24.9	24.9	24.9	0	0	Negligible	Negligible	
13	13.2	13.2	13.4	1	2	Negligible	Negligible	
14	15.7	15.9	16.2	2	3	Negligible	Negligible	
15	16.7	16.8	17.4	3	4	Negligible	Negligible	
16	24.8	24.9	25.4	2	2	Negligible	Negligible	
17	20.5	20.7	20.5	-1	0	Negligible	Negligible	
18	19.1	19.2	19.2	0	0	Negligible	Negligible	
19	24.9	24.9	24.8	0	-1	Negligible	Negligible	
20	26.3	26.4	26.8	2	2	Negligible	Negligible	
21	14.2	14.2	14.3	1	1	Negligible	Negligible	
22	26.7	26.6	26.9	1	1	Negligible	Negligible	
23	18.9	19.1	19.4	1	3	Negligible	Negligible	
24	25.0	25.2	25.2	0	1	Negligible	Negligible	
25	32.5	33.0	31.8	-4	-2	Slight Beneficial	Slight Beneficial	
26	25.1	25.6	24.4	-5	-3	Negligible	Negligible	
27	29.4	30.1	28.1	-6	-4	Slight Beneficial	Negligible	X
28	23.1	23.7	23.5	-1	2	Negligible	Negligible	
29	25.4	26.1	26.1	0	3	Negligible	Negligible	

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
30	26.4	27.8	27.1	-2	3	Negligible	Negligible	
31	27.0	29.0	29.7	2	10	Negligible	Slight Adverse	X
32	32.0	33.3	33.9	2	6	Slight Adverse	Slight Adverse	
33	27.9	28.4	30.0	6	7	Slight Adverse	Slight Adverse	
34	26.5	26.8	27.0	1	2	Negligible	Negligible	
35	31.3	31.8	31.0	-2	-1	Slight Beneficial	Negligible	X
36	23.1	23.5	23.4	0	1	Negligible	Negligible	
37	23.4	23.4	23.6	1	1	Negligible	Negligible	
38	22.7	24.1	24.2	0	7	Negligible	Slight Adverse	X
39	30.2	30.7	30.7	0	1	Negligible	Slight Adverse	X
40	24.5	25.2	25.3	1	3	Negligible	Negligible	
41	32.3	32.8	32.7	0	1	Negligible	Slight Adverse	X
42	27.7	27.4	27.3	0	-2	Negligible	Negligible	
43	30.0	29.9	30.1	1	0	Negligible	Negligible	
44	31.4	31.2	31.1	0	-1	Negligible	Negligible	
45	28.1	28.8	29.1	1	3	Negligible	Negligible	
46	26.0	26.0	24.9	-4	-4	Negligible	Negligible	
47	27.4	27.2	27.2	0	-1	Negligible	Negligible	
48	29.3	29.2	29.9	2	2	Negligible	Negligible	
49	32.5	32.1	32.3	1	-1	Negligible	Negligible	
50	27.7	27.4	27.6	1	0	Negligible	Negligible	
51	17.2	17.1	17.3	1	1	Negligible	Negligible	
52	20.4	20.4	20.5	0	1	Negligible	Negligible	
53	24.0	24.0	24.3	1	1	Negligible	Negligible	
54	29.6	29.5	28.4	-4	-4	Negligible	Negligible	
55	36.9	37.2	35.7	-4	-3	Slight Beneficial	Slight Beneficial	
56	28.1	28.1	28.2	0	1	Negligible	Negligible	
57	27.2	27.4	27.1	-1	0	Negligible	Negligible	
58	27.5	28.1	27.7	-1	1	Negligible	Negligible	

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
59	24.2	24.5	25.7	5	6	Slight Adverse	Slight Adverse	
60	36.7	37.1	37.8	2	3	Slight Adverse	Slight Adverse	
61	24.6	24.9	27.4	10	11	Slight Adverse	Slight Adverse	
62	27.1	27.1	23.5	-13	-13	Slight Beneficial	Slight Beneficial	
63	26.5	26.7	26.4	-1	-1	Negligible	Negligible	
64	24.5	24.5	24.7	1	1	Negligible	Negligible	
65	20.9	21.1	21.3	1	2	Negligible	Negligible	
66	20.7	20.5	20.8	1	1	Negligible	Negligible	
67	22.0	21.9	22.1	1	0	Negligible	Negligible	
68	22.6	22.6	23.3	3	3	Negligible	Negligible	
69	28.2	28.1	28.2	1	0	Negligible	Negligible	
70	27.0	26.8	27.0	1	0	Negligible	Negligible	
71	13.2	13.2	12.9	-3	-2	Negligible	Negligible	
72	26.0	26.2	26.2	0	1	Negligible	Negligible	
73	27.2	27.4	27.4	0	1	Negligible	Negligible	
74	21.9	21.9	22.1	1	1	Negligible	Negligible	
75	28.9	29.2	28.2	-3	-2	Negligible	Negligible	
76	24.9	25.1	27.6	10	11	Slight Adverse	Slight Adverse	
77	35.8	36.0	31.3	-13	-12	Moderate Beneficial	Moderate Beneficial	
78	25.8	25.9	35.5	37	37	Substantial Adverse	Substantial Adverse	
79	25.6	25.8	34.8	35	36	Substantial Adverse	Substantial Adverse	
80	26.1	26.0	30.1	16	15	Moderate Adverse	Moderate Adverse	
81	30.2	30.1	26.7	-11	-12	Moderate Beneficial	Moderate Beneficial	
82	23.7	23.7	25.0	5	5	Slight Adverse	Slight Adverse	
83	28.4	28.2	28.2	0	0	Negligible	Negligible	
84	28.3	28.2	28.7	2	1	Negligible	Negligible	
85	15.2	14.7	14.5	-1	-5	Negligible	Negligible	
86	14.1	13.9	13.9	0	-1	Negligible	Negligible	
87	33.4	33.5	33.7	0	1	Negligible	Negligible	

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
88	20.0	20.1	20.3	1	1	Negligible	Negligible	
89	28.6	28.8	29.0	1	1	Negligible	Negligible	
90	10.8	10.8	10.8	0	0	Negligible	Negligible	
91	8.8	8.7	8.7	0	-1	Negligible	Negligible	
92	28.4	28.6	28.6	0	1	Negligible	Negligible	
93	26.9	26.9	26.9	0	0	Negligible	Negligible	

[a] Committed Do-Minimum
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] The change between the Enhanced Do Minimum and the With Scheme
[e] The change between the Committed Do Minimum and the With Scheme
[f] Flagged if the Cumulative Impact Significance is different from the Scheme Impact Significance

Table AQ1.7 Modelled Annual Mean PM_{10} Concentrations ($\mu g/m^3$) in 2010 Under Various Scenarios.

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
1	16.4	16.5	15.8	-4	-4	Slight Beneficial	Slight Beneficial	
2	14.5	14.5	14.5	0	0	Negligible	Negligible	
3	14.4	14.4	14.7	2	2	Slight Adverse	Slight Adverse	
4	16.6	16.6	16.5	0	0	Negligible	Negligible	
5	13.8	13.8	13.8	0	0	Negligible	Negligible	
6	14.3	14.3	14.3	0	0	Negligible	Negligible	
7	11.8	11.7	11.6	-1	-2	Negligible	Negligible	
8	10.4	10.3	10.2	-1	-2	Negligible	Negligible	
9	11.0	11.0	10.6	-3	-4	Negligible	Negligible	
10	11.4	11.3	11.1	-1	-2	Negligible	Negligible	
11	11.9	11.8	11.7	-1	-2	Negligible	Negligible	
12	15.2	15.2	15.2	0	0	Negligible	Negligible	
13	11.1	11.1	11.2	0	1	Negligible	Negligible	
14	12.2	12.3	12.5	2	2	Negligible	Negligible	
15	12.4	12.5	12.7	2	3	Negligible	Negligible	
16	15.7	15.6	16.1	3	3	Slight Adverse	Slight Adverse	
17	13.7	13.8	13.9	1	2	Slight Adverse	Slight Adverse	
18	13.1	13.2	13.4	2	2	Negligible	Negligible	
19	14.8	14.8	14.9	1	1	Slight Adverse	Slight Adverse	
2	14.9	14.9	15.3	2	3	Slight Adverse	Slight Adverse	

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
0								
21	11.5	11.6	11.7	1	2	Negligible	Negligible	
22	15.9	16.0	16.2	1	2	Slight Adverse	Slight Adverse	
23	13.3	13.5	13.6	1	3	Negligible	Slight Adverse	X
24	14.8	15.1	15.1	0	2	Negligible	Slight Adverse	X
25	17.4	17.8	17.3	-3	0	Slight Beneficial	Negligible	X
26	14.8	15.3	14.6	-4	-1	Slight Beneficial	Slight Beneficial	
27	16.4	17.1	15.9	-7	-3	Slight Beneficial	Slight Beneficial	
28	14.1	14.6	14.4	-1	2	Negligible	Slight Adverse	X
29	14.9	15.2	15.2	-1	2	Negligible	Slight Adverse	X
30	15.0	15.9	15.7	-1	5	Slight Beneficial	Slight Adverse	X
31	15.3	16.7	17.1	2	11	Slight Adverse	Moderate Adverse	X
32	17.8	**18.7**	**19.2**	2	8	Slight Adverse	Substantial Adverse	X
33	15.7	16.0	17.0	6	8	Slight Adverse	Slight Adverse	
34	15.6	15.8	15.8	0	1	Negligible	Slight Adverse	X
35	17.2	17.5	17.0	-3	-1	Slight Beneficial	Slight Beneficial	
36	14.1	14.3	14.2	0	1	Negligible	Slight Adverse	X
37	14.2	14.2	14.2	0	0	Negligible	Negligible	
38	13.4	14.3	14.4	1	7	Negligible	Slight Adverse	X
39	16.9	17.7	17.8	1	5	Negligible	Slight Adverse	X
40	14.3	14.7	14.7	0	3	Negligible	Slight Adverse	X
41	**18.3**	**18.8**	**18.8**	0	2	Slight Beneficial	Slight Adverse	X
42	15.4	15.3	15.2	-1	-1	Negligible	Slight Beneficial	X
43	16.4	16.2	16.5	2	1	Slight Adverse	Negligible	X
44	17.5	17.5	17.4	0	0	Negligible	Negligible	
45	16.2	16.4	16.8	3	4	Slight Adverse	Slight Adverse	
46	14.5	14.4	14.0	-3	-3	Slight Beneficial	Slight Beneficial	
47	15.1	15.1	15.2	1	1	Negligible	Negligible	
48	16.2	16.2	16.7	4	3	Slight Adverse	Slight Adverse	
4	17.6	17.5	17.7	1	0	Slight Adverse	Negligible	X

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
9								
50	15.3	15.2	15.1	-1	-1	Negligible	Slight Beneficial	X
51	12.2	12.2	12.2	0	0	Negligible	Negligible	
52	12.5	12.6	12.6	0	0	Negligible	Negligible	
53	13.8	13.9	13.9	0	0	Negligible	Negligible	
54	17.0	17.1	16.3	-4	-4	Slight Beneficial	Slight Beneficial	
55	**19.7**	**20.0**	**19.6**	-2	0	Slight Beneficial	Slight Beneficial	
56	15.7	15.8	15.9	0	1	Negligible	Slight Adverse	X
57	15.3	15.5	15.4	0	1	Negligible	Negligible	
58	15.8	16.1	15.8	-2	0	Slight Beneficial	Negligible	X
59	14.8	15.1	15.6	4	6	Slight Adverse	Slight Adverse	
60	**19.5**	**19.7**	**19.8**	1	2	Slight Adverse	Slight Adverse	
61	14.8	15.0	15.7	5	6	Slight Adverse	Slight Adverse	
62	16.0	16.1	15.3	-5	-4	Slight Beneficial	Slight Beneficial	
63	15.3	15.5	15.9	3	3	Slight Adverse	Slight Adverse	
64	15.6	15.7	15.7	0	1	Negligible	Negligible	
65	13.3	13.3	13.5	1	1	Negligible	Negligible	
66	13.8	13.9	14.1	1	2	Slight Adverse	Slight Adverse	
67	13.7	13.8	13.7	-1	0	Negligible	Negligible	
68	12.8	12.8	13.3	4	3	Negligible	Negligible	
69	16.0	16.0	16.1	1	1	Negligible	Negligible	
70	15.0	15.0	15.1	1	1	Negligible	Negligible	
71	11.9	11.9	11.9	0	0	Negligible	Negligible	
72	17.1	17.3	17.6	2	3	Slight Adverse	Slight Adverse	
73	17.9	18.0	**18.5**	3	3	Moderate Adverse	Moderate Adverse	
74	13.3	13.3	13.5	1	2	Negligible	Negligible	
75	16.1	16.2	15.9	-2	-1	Slight Beneficial	Slight Beneficial	
76	15.0	15.1	16.5	9	10	Slight Adverse	Moderate Adverse	X
77	**21.0**	**21.2**	**18.2**	-14	-13	Substantial Beneficial	Substantial Beneficial	
7	15.1	15.2	**20.7**	36	37	Very Substantial	Very Substantial	

R	CDM [a]	EDM [b]	DS[c]	Scheme % Change[d]	Cumulative % Change[e]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
8						Adverse	Adverse	
79	14.9	15.1	**20.1**	33	35	Very Substantial Adverse	Very Substantial Adverse	
80	15.2	15.2	17.3	14	14	Moderate Adverse	Moderate Adverse	
81	17.4	17.3	15.5	-10	-11	Moderate Beneficial	Moderate Beneficial	
82	14.0	14.0	14.6	4	4	Slight Adverse	Slight Adverse	
83	15.9	15.8	15.9	1	0	Negligible	Negligible	
84	15.8	15.7	16.2	3	3	Slight Adverse	Slight Adverse	
85	11.7	11.5	11.4	-1	-3	Negligible	Negligible	
86	12.8	12.8	12.8	0	0	Negligible	Negligible	
87	**21.7**	**21.9**	**22.6**	4	4	Slight Adverse	Slight Adverse	
88	14.1	14.1	14.3	1	1	Slight Adverse	Slight Adverse	
89	**18.5**	**18.7**	**19.0**	2	3	Slight Adverse	Slight Adverse	
90	9.7	9.7	9.6	-1	-1	Negligible	Negligible	
91	9.2	9.2	9.2	-1	-1	Negligible	Negligible	
92	15.2	15.3	15.4	0	1	Negligible	Negligible	
93	16.0	15.9	15.9	0	0	Negligible	Negligible	

[a] Committed Do-Minimum
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] The change between the Enhanced Do Minimum and the With Scheme
[e] The change between the Committed Do Minimum and the With Scheme
[f] Flagged if the Cumulative Impact Significance is different from the Scheme Impact Significance

Table AQ1.8 Modelled Number of 24-hour PM_{10} Exceedences in 2010 Under Various Scenarios.

R	CDM [a]	EDM [b]	DS[c]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
1	0	1	0	Negligible	Negligible	
2	0	0	0	Negligible	Negligible	
3	0	0	0	Negligible	Negligible	
4	1	1	1	Negligible	Negligible	
5	0	0	0	Negligible	Negligible	
6	0	0	0	Negligible	Negligible	
7	1	1	2	Negligible	Negligible	
8	3	3	3	Negligible	Negligible	
9	2	2	3	Negligible	Negligible	

R	CDM [a]	EDM [b]	DS[c]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
10	2	2	2	Negligible	Negligible	
11	1	1	1	Negligible	Negligible	
12	0	0	0	Negligible	Negligible	
13	2	2	2	Negligible	Negligible	
14	1	1	1	Negligible	Negligible	
15	1	1	1	Negligible	Negligible	
16	0	0	0	Negligible	Negligible	
17	0	0	0	Negligible	Negligible	
18	0	0	0	Negligible	Negligible	
19	0	0	0	Negligible	Negligible	
20	0	0	0	Negligible	Negligible	
21	2	2	1	Negligible	Negligible	
22	0	0	0	Negligible	Negligible	
23	0	0	0	Negligible	Negligible	
24	0	0	0	Negligible	Negligible	
25	1	1	1	Negligible	Negligible	
26	0	0	0	Negligible	Negligible	
27	0	1	0	Negligible	Negligible	
28	0	0	0	Negligible	Negligible	
29	0	0	0	Negligible	Negligible	
30	0	0	0	Negligible	Negligible	
31	0	1	1	Negligible	Negligible	
32	1	2	2	Negligible	Negligible	
33	0	0	1	Negligible	Negligible	
34	0	0	0	Negligible	Negligible	
35	1	1	1	Negligible	Negligible	
36	0	0	0	Negligible	Negligible	
37	0	0	0	Negligible	Negligible	
38	0	0	0	Negligible	Negligible	
39	1	1	1	Negligible	Negligible	
40	0	0	0	Negligible	Negligible	
41	2	2	2	Negligible	Negligible	
42	0	0	0	Negligible	Negligible	
43	0	0	0	Negligible	Negligible	
44	1	1	1	Negligible	Negligible	
45	0	0	1	Negligible	Negligible	
46	0	0	0	Negligible	Negligible	
47	0	0	0	Negligible	Negligible	
48	0	0	1	Negligible	Negligible	
49	1	1	1	Negligible	Negligible	
50	0	0	0	Negligible	Negligible	
51	1	1	1	Negligible	Negligible	
52	1	1	1	Negligible	Negligible	
53	0	0	0	Negligible	Negligible	
54	1	1	0	Negligible	Negligible	
55	3	3	3	Negligible	Negligible	
56	0	0	0	Negligible	Negligible	

R	CDM [a]	EDM [b]	DS[c]	Scheme Impact Significance[d]	Cumulative Impact Significance[e]	Change in Significance[f]
57	0	0	0	Negligible	Negligible	
58	0	0	0	Negligible	Negligible	
59	0	0	0	Negligible	Negligible	
60	3	3	3	Negligible	Negligible	
61	0	0	0	Negligible	Negligible	
62	0	0	0	Negligible	Negligible	
63	0	0	0	Negligible	Negligible	
64	0	0	0	Negligible	Negligible	
65	0	0	0	Negligible	Negligible	
66	0	0	0	Negligible	Negligible	
67	0	0	0	Negligible	Negligible	
68	1	1	0	Negligible	Negligible	
69	0	0	0	Negligible	Negligible	
70	0	0	0	Negligible	Negligible	
71	1	1	1	Negligible	Negligible	
72	1	1	1	Negligible	Negligible	
73	1	1	2	Negligible	Negligible	
74	0	0	0	Negligible	Negligible	
75	0	0	0	Negligible	Negligible	
76	0	0	1	Negligible	Negligible	
77	5	5	2	Negligible	Negligible	
78	0	0	4	Negligible	Negligible	
79	0	0	4	Negligible	Negligible	
80	0	0	1	Negligible	Negligible	
81	1	1	0	Negligible	Negligible	
82	0	0	0	Negligible	Negligible	
83	0	0	0	Negligible	Negligible	
84	0	0	0	Negligible	Negligible	
85	1	2	2	Negligible	Negligible	
86	1	1	1	Negligible	Negligible	
87	6	6	7	Negligible	Negligible	
88	0	0	0	Negligible	Negligible	
89	2	2	2	Negligible	Negligible	
90	4	4	4	Negligible	Negligible	
91	5	5	5	Negligible	Negligible	
92	0	0	0	Negligible	Negligible	
93	0	0	0	Negligible	Negligible	

[a] Committed Do-Minimum
[b] Enhanced Do-Minimum
[c] Do Something (With Scheme)
[d] The change between the Enhanced Do Minimum and the With Scheme
[e] The change between the Committed D-Minimum and the With Scheme
[f] Flagged if the Cumulative Impact Significance is different from the Scheme Impact Significance. This column is empty as there are no changes.

Air Quality Impacts on Vegetation

The potential for air quality impacts of the proposed Scheme on sensitive ecosystems has been assessed in accordance with Interim Advice Note 61/05 which supplements DMRB 11.3.1. This note sets out a method of assessing the potential air quality impacts of road schemes on protected habitats.

There is evidence that elevated concentrations of NOx can damage particularly sensitive vegetation. In addition, there is evidence that the deposition of nitrogen to the ground can damage certain habitats. Critical levels have been defined to prevent gaseous pollutants directly affecting plants. Defra (2001) define a Critical Level as "the concentration of a pollutant in the atmosphere, below which vegetation is unlikely to be damaged according to present knowledge". In addition to the Critical Levels, Critical Loads have been defined to prevent the long-term effects of deposition. Defra (2001) define Critical Loads as "the amount of pollutant deposited below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge".

In the UK, the statutory nature conservation agencies use a Critical Level for NOx of 30 $\mu g/m^3$ at internationally designated conservation sites and SSSIs. The same level is also set as an EU Limit Value. As a Limit Value, it only applies at distances greater than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas. The Critical Loads are specific to different types of habitat

1.1.6 Site Identification

In accordance with Interim Advice Note 61/05, all SACs, SPAs, cSPAs, Ramsar or SSSI sites within 200m of any road on which potentially significant changes in traffic flows (as defined in the main text of the report) have been identified. There are no European designated sites that meet these criteria but there are four SSSIs: Hamilton Low Parks, Woodend Loch, Milburn and Tailend Moss. Advice has been taken from ecology specialists at Young Associates regarding the feature of interest at each site.

The direct effects which IAN 61/05 assesses relate to terrestrial vegetation. The feature of interest at Hamilton Low Parks is birds, which will not be directly influenced by nitrogen deposition. This site has thus been scoped out of the assessment. Woodend Loch has also been scoped out, because nitrogen dioxide does not deposit in appreciable quantities to water bodies (Marner and Harrison, 2004). The assessment thus focuses on Milburn and Tailend Moss.

1.1.7 Ambient Concentrations of Nitrogen Oxides

NOx concentrations for the base year (2004) and the year of opening both with and without the Scheme were calculated at each receptor using the DMRB screening model as recommended in IAN 61/05. The results are presented in Table AQ1.9.

Predicted NOx concentrations for 2004 exceed the Critical Level adjacent to the road within both SSSIs. Anticipated improvements brought about at the national level are

expected to lead to concentrations falling between 2004 and 2010, but in the 2010 baseline, the critical level will still be exceeded within 50m of the M8 at Tailend Moss. The Scheme is expected to reduce NOx concentrations at both sites[3]. With the Scheme in 2010, the critical levels would still be exceeded at Tailend Moss SSSI, but by a smaller amount than they would without the Scheme. According to the criteria set out in Tables AQ1.1 and AQ1.2, at the roadside receptor of both sites, the Scheme would bring about a very small change in concentrations and a slight beneficial impact.

Table AQ1.9 NOx Concentrations Near to Potentially Sensitive Ecological Sites

Site	Distance from Road Centre (m)	NOx Annual Mean (µg/m^3)			% Change [a]	Change as % of 30 µg/m^3
		2004	2010 EDM	2010 with Scheme		
Milburn	12.5	**33.1**	22.4	21.8	-2	-2
	25	27.9	19.2	18.8	-2	-1
	50	22.2	15.6	15.4	-1	-1
	100	17.5	12.7	12.7	<1[b]	<1[b]
	200	15.8	11.7	11.7	<1[b]	<1[b]
Tailend Moss	12.5	**100.3**	**65.3**	**64.3**	-2	-3
	25	**76.3**	**50.2**	**49.6**	-1	-2
	50	**49.4**	**33.3**	**32.9**	-1	-1
	100	27.4	19.5	19.4	<1[b]	<1[b]
	200	19.5	14.5	14.4	<1[b]	<1[b]

[a] Change between 2010 with Scheme and 2010 EDM

[b] The precise figure, as calculated, is between zero and minus one.

1.1.8 Nitrogen Deposition

The DMRB screening model, which is recommended in IAN 61/05, has also been used to predict ambient nitrogen dioxide concentrations. These concentrations have been adjusted following the guidance of Defra and the DAs (2007a and 2007b)[4]. Nitrogen deposition flux at each of the receptors listed above has been calculated following the methodology set out in IAN 61/05. Results are presented in Table A1.10.

Table AQ1.10 Nitrogen Deposition Near to Potentially Sensitive Ecological Sites

Site	Distance from Road Centre (m)	Nitrogen Deposition (kg-N/ha/yr)				% Change [a]	Change as % of Critical Load
		2004	2010 EDM	2010 with Scheme	Critical Load		
Milburn	12.5	**28.4**	**25.0**	**25.0**	10 - 20	<1[b]	<1[b]
	25	**28.2**	**24.9**	**24.9**		<1[b]	<1[b]
	50	**28.1**	**24.8**	**24.8**		<1[b]	<1[b]
	100	**27.9**	**24.7**	**24.7**		<1[b]	<1[b]
	200	**27.9**	**24.7**	**24.7**		<1[b]	<1[b]
	12.5	**25.1**	**21.9**	**21.8**	5 - 10	<1[b]	<1[b]

[3] At Tailend Moss, this reflects changes in average speeds and predicted vehicle fleet composition.

[4] It is considered more important to adjust the DMRB results to take account of the latest NOx to NO_2 trends than it is the dispersion model results, since the DMRB results are not verified against local NOx and NO_2 measurements.

Site	Distance from Road Centre (m)	Nitrogen Deposition (kg-N/ha/yr)				% Change [a]	Change as % of Critical Load
		2004	2010 EDM	2010 with Scheme	Critical Load		
Tailend Moss	12.5	**25.1**	**21.9**	**21.8**	5 - 10	<1[b]	<1[b]
	25	**24.7**	**21.6**	**21.5**		<1[b]	<1[b]
	50	**24.2**	**21.2**	**21.2**		<1[b]	<1[b]
	100	**23.7**	**20.8**	**20.8**		<1[b]	<1[b]
	200	**23.4**	**20.6**	**20.6**		<1[b]	<1[b]

[a] Change between 2010 with Scheme and 2010 EDM

[b] The precise figure, as calculated, is between zero and minus one.

The critical loads are likely to be exceeded at both sites in the baseline case and also in 2010 with or without the proposed Scheme. The Scheme is expected to bring about an extremely small reduction in nitrogen deposition flux to both SSSIs (the change at Milburn is so small that it does not show up when rounding the data to one decimal place in Table AQ1.10). Because the Critical Load is exceeded, the changes amount to a slight beneficial impact according to the criteria defined in Table AQ1.2.

1.1.9 Cumulative Impacts at SSSIs

Tables AQ1.11 and AQ1.12 set out the predicted cumulative impacts of the proposed Scheme along with the proposed Raith junction improvement works and the Associated Network Improvements at the two SSSIs that were assessed for the Scheme-only impacts[5]. At both sites, the cumulative impacts would bring about a greater improvement than the Scheme-only impacts, but all of the changes in NOx concentrations and nitrogen deposition would remain as slight beneficial in terms of the descriptors set out in Table AQ1.2.

Table AQ1.11 Cumulative NOx Concentrations Near to Potentially Sensitive Ecological Sites

Site	Distance from Road Centre (m)	NOx Annual Mean (µg/m^3)			% Change [a]	Change as % of 30 µg/m^3
		2004	2010 CDM	2010 with Scheme		
Milburn	12.5	**33.1**	24.0	21.8	-9	-7
	25	27.9	20.3	18.8	-7	-5
	50	22.2	16.2	15.4	-5	-3
	100	17.5	12.9	12.7	-2	<1[b]
	200	15.8	11.7	11.7	<1[b]	<1[b]
Tailend Moss	12.5	**100.3**	**65.4**	**64.3**	-2	-4
	25	**76.3**	**50.3**	**49.6**	-1	-2
	50	**49.4**	**33.3**	**32.9**	-1	-1
	100	27.4	19.5	19.4	<1[b]	<1[b]
	200	19.5	14.5	14.4	<1[b]	<1[b]

[5] As noted in the main report, the selection of significant links was not expanded to account for cumulative impacts.

[a] Change between 2010 with Scheme and 2010 CDM
[b] The precise figure, as calculated, is between zero and minus one.

Table AQ1.12 Cumulative Nitrogen Deposition Near to Potentially Sensitive Ecological Sites

Site	Distance from Road Centre (m)	Nitrogen Deposition (kg-N/ha/yr)				% Change	Change as % of Critical Load
		2004	2010 CDM	2010 with Scheme	Critical Load		
Milburn	12.5	**28.4**	**25.0**	**25.0**	10 - 20	<1[b]	<1[b]
	25	**28.2**	**25.0**	**25.0**		<1[b]	<1[b]
	50	**28.1**	**24.9**	**24.9**		<1[b]	<1[b]
	100	**27.9**	**24.8**	**24.8**		<1[b]	<1[b]
	200	**27.9**	**24.7**	**24.7**		<1[b]	<1[b]
Tailend Moss	12.5	**25.1**	**21.9**	**21.8**	5 - 10	<1[b]	<1[b]
	25	**24.7**	**21.6**	**21.5**		<1[b]	<1[b]
	50	**24.2**	**21.2**	**21.2**		<1[b]	<1[b]
	100	**23.7**	**20.8**	**20.8**		<1[b]	<1[b]
	200	**23.4**	**20.6**	**20.6**		<1[b]	<1[b]

[a] Change between 2010 with Scheme and 2010 CDM

[a] The precise figure, as calculated, is between zero and minus one.

EFFECTS OF CONGESTION ON EMISSIONS

The average speed used in modelling can have a significant effect on the calculated emissions and does not always represent the worst case. This note sets out how congestion, which has not been taken into account explicitly in the modelling, could affect the results. It compares emissions based on assumption of a steady average speed with emissions calculated assuming periods of low speed and periods of higher speed, giving rise to the same overall average speed.

Using the Bureau Veritas/AEA Emission Factor calculator version 2 (available from www.bv-modelling.co.uk), emissions have been calculated for a 1 km length of road with a daily flow of 100,000 vehicles, with 10% Heavy Duty Vehicles, for the year 2010.

Do Minimum Scenario: Daily average speed of 84 kph
Nitrogen oxides (NOx) missions are calculated assuming:

a) a steady 84 kph for all hours of the day
b) a congestion scenario, with an average speed of 84 kph made up of 2 hours at 20 kph affecting 20% of the traffic and 22 hours at 100 kph affecting 80% of the traffic.

With Scheme Scenario: Daily average speed of 100 kph
Emissions are calculated assuming:

c) a steady 100 kph for all hours of the day

Table AQ1.13: Emissions based on average speed of 84 kph

Speed	NOx emissions (kg)	PM_{10} emissions (kg)
a) Do Minimum Steady Speeds	647	16.5
b) Do Minimum Congestion	751	22.9
Increase with Congestion	16%	39%
c) With Scheme	727	21.9

Not allowing for congestion will mean that do-minimum emissions may have been underestimated. In this example, the emissions without allowing for congestion increase by 12% between do-minimum and with scheme scenarios, from 647 to 727 kg NOx. This becomes a 3% decrease from 751 to 727 kg NOx if congestion is allowed for. A similar pattern will apply to the other pollutants covered in this assessment, including carbon dioxide. In practice it is very difficult to allow for congestion, as the necessary information is normally not available. The modelling for this assessment has just relied on average speeds, with no allowance for congestion at different times of day.

Although not dealt with in this example, similar issues arise in terms of using an average link speed, with no explicit allowance for emissions from queuing traffic at junctions. Transport Scotland is currently exploring ways to improve the calculation procedures, so

as to improve the accuracy of the calculation of emissions and to allow the true benefits of reducing congestion and queuing at junctions to be reflected in the emissions calculations.