

SECTION 2 : ENVIRONMENTAL TOPICS

PART 1 : AIR QUALITY

1.1 Methodology

- 1.1.1 Scoping and detailed air quality assessments have been undertaken to assess the effects of the proposed A453 widening scheme. The methodology is based on the guidance contained in the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 1 HA207/07 (May 2007) and the Department for Transport's Transport Analysis Guidance (TAG) Unit 3.3.3 (The Local Air Quality Sub-objective), Unit 3.3.4 (Regional Air Pollution) and Unit 3.3.5 (The greenhouse Gases Sub-objective). This part of the ES is a summary of the detailed A453 Environmental Impact Assessment (EIA) Air Quality report; reference A021959-REP-E-AQ-210, December 2008.
- 1.1.2 The scoping assessment determined which of the road links across the East Midlands region were predicted to experience a change of either 1000 annual average daily traffic (AADT) movements or 200 AADT heavy goods vehicle (HGV) movements as a consequence of the scheme. The Detailed Assessment considered the air quality effect of the scheme on all roads identified in the scoping assessment and also the main roads passing through all of the Air Quality Management Areas (AQMAs) in the region likely to be affected. The methodology for carrying out detailed air quality assessments is described in Local Air Quality Management Guidance note LAQM TG(03) and DMRB.
- 1.1.3 The detailed assessment is required to consider the worst year in air quality terms within the first 15 years after opening. This has been determined as the opening year 2012. Sufficient assessment was also undertaken to discount 2017, the year the adjacent M1 widening is programmed to be complete.
- 1.1.4 The Detailed Assessment has taken two approaches to quantifying the air quality effect of the proposed scheme. The first approach was used to assess the effect along the A453 corridor itself. An air quality model of the scheme was created using Atmospheric Dispersion Modelling System (ADMS) Roads. Air quality model predictions using ADMS Roads have been produced for receptor locations along the route of the A453 corridor in order to predict absolute air quality levels at these locations 'with' the scheme in 2012 for comparison against the UK National Air Quality Standards (UK-AQS). The model was also used to compare the relative change in air quality at these locations 'with' and 'without' the proposed scheme in order to predict the effect of the scheme on the relative contribution of road emissions to the absolute air quality levels.

- 1.1.5 Beyond the A453 corridor a further ADMS Roads model was created to include all roads meeting the criteria described in 1.1.2 as well roads within eleven Air Quality Management Areas in the region. The model was verified using data provided by Rushcliffe Borough Council from their AQMA 1 in West Bridgford. This model was used to produce air quality predictions for relevant receptors in all eleven AQMAs. The full methodology used is described in detail in A453 Environmental Impact Assessment (EIA) Air Quality report; reference A021959-REP-E-AQ-210, December 2008.
- 1.1.6 Traffic growth in both the 'with' and 'without' scenarios has included local growth factors. Traffic from all committed developments in the area of the study have been included in the traffic model with the committed development changes based on standard model predictions for each development type and development size. Additional growth factors have also been included for traffic changes other than from committed developments based on the TEMPRO model which provides specific local growth factors for each zone of the model.
- 1.1.7 A qualitative assessment of the construction phase has been undertaken based on the guidance contained in 'The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance' published by the London Councils and the Greater London Authority (Nov 2006). This advocates a risk assessment of the individual activities within a major construction project which have the potential to generate significant amounts of pollution and the adoption of mitigation measures based on the outcome of this assessment.
- 1.1.8 Air quality model predictions were produced for a total of 70 different locations, all representing existing residential receptors within the study area and at locations near to roads most affected by the scheme. The ADMS Roads model produced predicted road traffic contributions of nitrogen dioxide (NO₂) and respirable particulates (PM₁₀) at each location.
- 1.1.9 The ADMS Roads model was verified using passive diffusion tube monitoring data from 14 monitoring locations collected during a 12 month air quality survey. Each tube was exposed for 12 periods of between 3 to 5 weeks to monitor total nitrogen dioxide (NO₂) concentrations. The tube data itself was bias corrected by comparing the results from a tube co-located with the Nottingham automatic monitoring station. The predictions produced by the model matched those obtained from the monitoring data to within 4% accuracy. A verification factor was obtained from the comparison and was used as an uncertainty adjustment factor on all modelled data along the A453 core model.
- 1.1.10 For the purposes of the local air quality assessment, all of the roads in the study area identified as meeting the criteria in paragraph 1.1.2 were included. The relevant roads were divided into sections and air quality predictions were obtained from the ADMS Roads model at distances of 20m, 70m, 125m and 175m from the centreline of each road section to represent levels of NO₂ and PM₁₀ within the distance bands 0-50m, 50-100m, 100-150m and 150-200m respectively. The

changes in total emissions on each section were calculated and incorporated into the TAG spreadsheet in order to produce an Overall Assessment Score for each of the two pollutants indicating change in exposure across all affected routes. The Overall Assessment Score is reported in Appendix C of the detailed EIA report reference A021959-REP-E-AQ-210, December 2008.

- 1.1.11 The purpose of the regional air quality assessment is to quantify the effects of the scheme on a different basket of pollutants than that of the local assessment. The pollutants considered, particularly nitrogen oxides (NO_x) and total hydrocarbons (THC) are of importance in terms of acidification, excess nitrogen deposition and generation of tropospheric ozone. All of the roads subject to the Local Air Quality Sub-Objective assessment were included in the regional assessment. Data relating to the road length, annual average daily traffic flow (AADT), annual average speed and vehicle type composition for all road links were entered into the DMRB screening method spreadsheet. The spreadsheet produced total emissions of NO_x, PM₁₀, THC and carbon monoxide in kg per year for all roads. The Regional Assessment Score is reported in Appendix D of the detailed EIA report reference A021959-REP-E-AQ-210, December 2008.
- 1.1.12 A greenhouse gas assessment has quantified the effects of the scheme on total carbon emissions. The carbon dioxide emission calculation is derived from TUBA and is based on a spatial model of the A453 multi-modal study which covers the east midlands and beyond.

1.2 Key Guidance and Legislation

- 1.2.1 European Directive 1999/30/EC has set limit values not to be exceeded for nitrogen dioxide (NO₂) and respirable particulates (PM₁₀) in ambient air. These are the principal emissions of concern for local air quality from road traffic. These limit values have been adopted in England as Air Quality Standards (UK-AQS) within the National Air Quality Strategy.
- 1.2.2 Under the 1995 Environment Act local authorities have a duty to review and assess the air quality in their areas to determine if it meets the UK-AQS. Where there are predicted exceedences of the Standards there is a duty on the local authorities to declare Air Quality Management Areas (AQMAs) covering the affected areas and to produce Air Quality Action Plans (AQAP) to demonstrate how they will work towards meeting the Standards.

1.3 Consultations

- 1.3.1 Consultations relating to the scope and methodology used for the Detailed Assessment have been undertaken with Rushcliffe Borough Council, North West Leicestershire District Council and Nottingham City Council.

1.4 The Study Area

1.4.1 The study area consists of roads and nearby residential receptors meeting the DMRB assessment criteria described in paragraph 1.1.2 above and relevant Air Quality Management Areas declared by Rushcliffe Borough Council, Nottingham City Council, North West Leicestershire District Council, Erewash Borough Council and Broxtowe District Council. The A52 corridor from its junction with the A60 to the A46 was also included in the study area.

1.5 Baseline Conditions

1.5.1 A verified model of baseline conditions for 2006 was produced in ADMS Roads. The model used traffic data, air quality monitoring data and meteorological data from 2006. Background air quality data for NO₂ and PM₁₀ for 2006 was obtained from the UK Air Quality Archive. The air quality monitoring data was collected from 14 locations representing existing residential receptors along the A453 corridor. Table 2.1.1 over the page shows the results of the NO₂ diffusion tube survey. A description of the address, locations and ordinance survey grid coordinates of the monitoring locations is provided in Table 3 of the detailed EIA report reference A021959-REP-E-AQ-210, December 2008.

1.5.2 These WYG Environment (WYG E) diffusion tube results suggest that pollutant levels surrounding the A453 in 2006 are all significantly below the National Air Quality Objectives with the exception of tube location WYG 6. This was located at the Crusader Roundabout in Clifton which is not a receptor location and is subject to particularly high emissions from the vehicles using the roundabout.

1.5.3 The potential contribution of other local emissions sources from the power station at Ratcliffe on Trent were considered as part of the baseline assessment.

1.5.4 There are no designated sensitive ecological sites within 200 metres of those roads meeting the DMRB criteria or that are close enough to the proposed scheme that will be affected.

1.5.5 Potentially sensitive receptors include all places where the general public may be exposed to high levels of air pollution for prolonged periods, such as residential dwellings, schools, hospitals, nursing homes and nurseries. 41 receptor locations were chosen for the purposes of the detailed assessment, representing worst-case local residential receptors in the vicinity of the A453 corridor that could be affected by the scheme. The addresses and ordinance survey reference points for each receptor is included in Table 8 of the detailed EIA report reference A021959-REP-E-AQ-210, December 2008. Further receptors have been chosen outside the area of the scheme to represent those areas also requiring a detailed assessment. Only existing receptor locations have been chosen. New receptors likely to emerge as a consequence of committed developments, such as the Lark Hill Retirement Village (under construction), are already adequately represented by the receptor locations.

- 1.5.6 Receptor locations outside the A453 corridor were chosen to represent receptors closest to the roads network in the areas requiring a detailed assessment. Some of these are also existing local authority monitoring locations. Local authority monitoring locations were only chosen where the authority were able to provide bias corrected monitoring data for 2006, accurate ordinance survey co-ordinates for the exact tube location and where they were representative of sensitive receptor locations.
- 1.5.7 Close to the A453 eleven AQMAs have been declared within the Broxtowe, Erewash, North West Leicestershire, Nottingham City and Rushcliffe administrative areas due to predicted breaches of the annual average AQS for NO₂ predominantly due to traffic emissions. The location of these AQMAs is shown in Figure 2.1.1 in the ES Volume 2.

Table 2.1.1: Results of NO₂ Diffusion Tube Survey

Month / Period	1	2	3	4	5	6	7	8	9	10	11	12	Annual Average 2006/7	Annual Corrected Average
Location	07/04/06 - 11/05/06	11/05/06 - 10/07/06	10/07/06 - 15/08/06	15/08/06 - 25/09/06	25/09/06 - 16/10/06	16/10/06 - 10/11/06	13/11/06 - 14/12/06	14/12/06 - 11/01/07	11/01/07 - 16/02/07	16/02/07 - 15/03/07	15/03/07 - 19/04/07	19/04/07 - 03/05/07		
WYG 1	-*	40.8	37.9	31.13	24.75	31.13	34.41	44.41	46.36	-*	38.99	-*	36.7	30.42
WYG 2	24.3	25.7	22.1	19.5	21.63	19.5	18.73	22.99	25.07	30.64	31.32	24.68	23.8	19.79
WYG 3	31.77	25.9	31.2	17.87	-*	17.87	20.03	22.94	26.44	32.57	-*	28.4	25.5	21.16
WYG 4	38.79	38.7	21.8	27.73	25.95	27.73	32.08	67.26	8.7	40.82	40.02	33.21	33.6	27.86
WYG 5	34.62	40.2	33.7	-*	16.58	-*	40.09	39.07	40.88	37.86	37.59	41.03	36.2	30.01
WYG 6	69.56	68.9	69.4	55.82	51.13	55.82	63.62	39.85	52.88	73.66	79.43	65.77	62.2	51.59
WYG 7	32.84	29.4	27.5	24.23	16.99	24.23	24.14	29.59	32.73	35.38	-*	28.72	27.8	23.07
WYG 8	32.38	43.1	35.3	31.58	28.99	31.58	36.44	38.55	38.05	-*	33.39	39.16	35.3	29.31
WYG 9	-*	-*	-*	18.59	29.23	18.59	34.32	40.48	41.28	47.44	48.95	-*	34.9	28.93
WYG 10	-*	38.5	31.0	30.92	37.38	30.92	40.21	33.61	33.94	43.68	40.77	29.41	35.5	29.45
WYG 11	31.42	32.0	31.0	31.0	31.52	31.0	33.23	33.74	33.34	46.19	36.73	43.03	34.5	28.65
WYG 12	33.53	30.4	29.9	37.85	17.73	37.85	26.66	28.38	32.02	39.25	38.7	41.87	32.8	27.26
WYG 13	30.21	25.3	24.1	22.48	18.39	22.48	23.28	25.45	27.71	35.75	30.03	29.03	26.2	21.73
WYG 14	49.86	-*	24.2	19.13	-*	19.13	-*	33.28	29.75	36.96	30.39	29.67	30.3	25.12

All values presented are nitrogen dioxide concentrations given in µg/m³.

* Tube locations marked blank were missing by the end of the exposure period, usually having been stolen or vandalised.

1.6 Potential Impacts

- 1.6.1 Clean air is an essential ingredient for a good quality of life. The Government is committed to meeting health based air quality criteria for human health and for the protection of vegetation and ecosystems. The Government also has targets to reduce emissions of greenhouse gases as these are linked with climate change.
- 1.6.2 Road transport sources account for a large proportion of the emissions of several air pollutants, not only at the local scale (local air quality impacts) but at the regional, national and international scale (regional air quality impacts) due to the long range nature of the impact of some pollutants.
- 1.6.3 Major road schemes, smaller improvement projects and technology improvements may change the characteristics of the traffic in an area, with corresponding impacts on pollutant emissions and air quality. These projects can have positive or negative effects on local air quality or, as is more often the case, beneficial effects in one area and adverse effects in another, depending on where traffic conditions change.

1.7 Design and Mitigation Measures

- 1.7.1 The qualitative risk assessment of the construction phase concluded that the scheme was 'high risk' in terms of its potential to create dust and PM₁₀ emissions. Based on the London Best Practice Guide, measures will be undertaken to mitigate dust during the construction activities. The Construction Environmental Management Plan (CEMP) for the scheme will contain details of measures to avoid and reduce dust during construction. Further details can be found in Section 2 Part 3 of this ES.
- 1.7.2 On the basis of the assessment of impacts no mitigation measures are considered necessary during the operational period.

1.8 Magnitude of Impacts

Local Air Quality

- 1.8.1 Table 2.1.2 below indicates the predicted 2012 annual average nitrogen dioxide model results for all relevant receptors along the A453 corridor. Table 2.1.3 indicates the predicted 2012 annual average nitrogen dioxide model results for all relevant receptors in surrounding Air Quality Management Areas and additional receptors on the A52 in Gamston and Ratcliffe on Trent. The tables provide predictions of the traffic contribution at each location in the 'Do Minimum' and 'Do Something' scenarios, along with the predicted background contribution and the calculated total annual average NO₂ result.
- 1.8.2 From Table 2.1.2 it can be seen that the annual average objective for nitrogen dioxide is predicted to be achieved at all representative receptors along the core

A453 corridor both 'with' and 'without' the proposed scheme. The highest predicted result at a receptor in the A453 corridor 'with' the scheme is 23.98 $\mu\text{g}/\text{m}^3$ (microgrammes per cubic metre) at receptor REC 38, which is below the UK-AQS objective of 40 $\mu\text{g}/\text{m}^3$.

Table 2.1.2: 2012 Predicted Annual Average Nitrogen Dioxide Results (as $\mu\text{g}/\text{m}^3$) Within the A453 Corridor

Ref	Location	2012 road contribution		Background	Total (after adjustment)		Difference
		Without Development	With Development		Without Development	With Development	
REC 1	Long Lane Farm	2.18	2.59	20.10	22.28	22.74	0.46
REC 2	Cedar Isle	2.59	3.29	15.70	18.29	19.06	0.77
REC 3	Manor Cottage	1.48	1.84	15.80	17.28	17.68	0.40
REC 4	Riverside Farm	2.61	3.26	15.80	18.41	19.13	0.72
REC 5	Winking Hill Fm	1.35	1.80	15.70	17.05	17.53	0.48
REC 6	Hillside Cottage	0.96	1.27	15.30	16.26	16.59	0.33
REC 7	Manor Farm Ct	3.56	4.77	15.30	18.86	20.16	1.30
REC 8	Fields Farm	1.88	2.59	15.70	17.58	18.34	0.76
REC 9	Glebe Farm	0.96	1.41	15.00	15.96	16.44	0.48
REC 10	Top Farm Cottage	1.29	1.09	15.20	16.49	16.31	-0.18
REC 11	Barton Lodge	3.08	2.55	15.20	18.28	17.80	-0.48
REC 12	Plum tree Cottage	0.63	0.73	15.40	16.03	16.15	0.12
REC 13	26 Barbury Drive	1.79	1.55	16.20	17.99	17.78	-0.21
REC 14	Burrows Farm	0.70	0.80	16.20	16.90	17.02	0.12
REC 15	9 Todd Close	3.33	4.53	16.20	19.53	20.82	1.29
REC 16	3 Krebs Close	3.73	4.77	17.30	21.03	22.17	1.14
REC 17	60 Jasmine Close	1.67	2.14	17.30	18.97	19.48	0.51
REC 18	133 Gardendale	1.21	1.34	17.30	18.51	18.67	0.16
REC 19	3 Fleming Gardens	1.66	1.87	17.30	18.96	19.20	0.24
REC 20	22 Wilkins Gardens	2.36	2.99	17.30	19.66	20.35	0.69
REC 21	14 Lindon Ave	3.21	4.02	17.30	20.51	21.40	0.89
REC 22	9 Richardson Close	3.45	4.40	17.30	20.75	21.79	1.04
REC 23	Crusader PH	3.98	4.44	17.30	21.28	21.83	0.55
REC 24	13 Richardson Close	3.45	4.40	17.30	20.75	21.79	1.04
REC 25	53 Gardendale Road	2.29	2.79	17.30	19.59	20.14	0.55
REC 26	17 The Leys	4.13	4.62	17.30	21.43	22.02	0.59
REC 27	33 Gardendale Road	2.55	2.96	17.30	19.85	20.32	0.47
REC 28	1 Dalehead Road	2.09	2.58	17.30	19.39	19.93	0.54

Ref	Location	2012 road contribution		Background	Total (after adjustment)		Difference
		Without Development	With Development		Without Development	With Development	
REC 29	12 Morgan Mews	4.55	4.12	17.30	21.85	21.50	-0.35
REC 30	7 Clapton Lane	3.07	3.68	17.30	20.37	21.06	0.69
REC 31	23 Kinsale Walk	3.35	3.36	17.30	20.65	20.72	0.07
REC 32	7 Clevely Way	3.03	3.15	18.30	21.33	21.51	0.18
REC 33	47 Rivergreen	3.44	3.77	18.50	21.94	22.35	0.41
REC 34	1 Medan Close	2.84	3.31	18.30	21.14	21.68	0.54
REC 35	19 Rivergreen Road	3.40	3.98	18.30	21.70	22.36	0.66
REC 36	4 Farnborough drive	3.37	4.43	18.30	21.67	22.82	1.15
REC 37	8 Fleam Road	2.17	2.68	18.30	20.47	21.03	0.56
REC 38	1 Farnborough Road	4.09	5.57	18.30	22.39	23.98	1.59
REC 39	16 Tywford Gardens	2.99	3.78	18.30	21.29	22.16	0.87
REC 40	66 Sturgeon Ave	3.49	3.89	18.30	21.79	22.26	0.47
REC 41	15 Westerfield	2.93	3.22	20.20	23.13	23.48	0.35

Table 2.1.3: 2012 Predicted Annual Average Nitrogen Dioxide Results (as $\mu\text{g}/\text{m}^3$) Beyond the A453 Corridor

Ref	Location	2012 road contribution		Background	Total		Difference
		Without Development	With Development		Without Development	With Development	
	Rushcliffe AQMA 1 (West Bridgford)						
RC 3	Radcliffe Road	4.29	5.58	23.30	35.86	37.55	1.69
RC 4	Trent Boulevard A	3.17	3.25	23.30	34.15	34.52	0.37
RC 5	Trent Boulevard B	4.89	5.05	23.30	36.59	36.86	0.27
RC 6	Trent House (Residential)	4.33	4.29	23.30	35.92	35.86	-0.06
RC 8	Wilford Lane (Residential)	3.28	3.37	23.30	34.55	34.67	0.12
RC 9	The Point, Loughborough Road	2.01	2.10	20.50	29.27	29.38	0.11

Ref	Location	2012 road contribution		Background	Total		Difference
		Without Development	With Development		Without Development	With Development	
RC 10	Particulate Monitor, Loughborough Road,	2.96	3.00	20.50	30.50	30.54	0.04
RC 11	Loughborough Road (Residential)	2.63	2.67	20.50	30.07	30.12	0.05
RC 12	1 Loughborough Road	3.19	3.23	20.50	30.80	30.84	0.04
	Rushcliffe AQMA 2 (Nottingham Knight)						
REC 42	34 Maythorn Close	3.84	3.84	18.50	29.04	29.04	0.00
REC 43	2 Botany close	3.15	3.16	18.50	28.14	28.16	0.02
REC 46	Windyways	3.91	3.82	18.50	29.13	29.02	-0.11
RC 16	Cloverlands, WB.	4.67	4.69	18.5	30.12	30.15	0.03
	Nottingham AQMA 3						
NCC 1	8 Beeston Rd	6.90	6.56	23.70	39.78	39.34	-0.44
NCC 2	25 Beeston Rd	5.82	5.53	23.70	38.38	38.00	-0.38
NCC 3	31 Clifton Boulevard	4.81	4.76	22.10	34.98	34.92	-0.06
	Nottingham south of AQMA 2						
NCC4	1 Beardsley Gardens	2.63	2.69	24.50	35.27	35.35	0.08
	North West Leicestershire AQMA 1						
NWL1	Molehill Farm	8.70	8.73	21.60	30.30	30.33	0.03
	Erewash AQMA 1						
EBC2	222 Derby Road, Sandiacre	8.35	8.31	21.30	29.65	29.61	-0.04
	Erewash AQMA 2						
EBC1	23 Purbeck Close	0.40	0.40	21.20	21.60	21.60	0.00
	Broxtowe AQMA 1						
Bx07	7 Colonsay Close, Trowell	5.02	4.98	23.90	28.92	28.88	-0.04

Ref	Location	2012 road contribution		Background	Total		Difference
		Without Development	With Development		Without Development	With Development	
Bx11	34 Iona Drive, Trowell	7.90	7.84	23.90	31.80	31.74	-0.06
Bx31	18 Tiree Close, Trowell	10.05	9.98	23.80	33.85	33.78	-0.07
	Broxtowe AQMA 2						
Bx32	30 Derbyshire Avenue, Trowell	8.99	8.93	23.90	32.89	32.83	-0.06
	Broxtowe AQMA 3						
Bx33	81 Nottingham Road, Trowell	0.03	0.03	20.80	20.83	20.83	0.00
	Broxtowe AQMA 4						
Bx01	19 Nottingham Road, Nuthall	1.41	1.37	21.80	23.21	23.17	-0.04
Bx13	20 Nottingham Road, Nuthall	1.30	1.27	21.80	23.10	23.07	-0.03
	Rushcliffe Non AQMA locations						
REC 44	22 Ullswater Close, Gamston	2.05	2.04	17.10	19.15	19.14	-0.01
REC 45	86 Whitworth Drive, Radcliffe on Trent	5.31	5.48	17.41	22.72	22.89	0.17

- 1.8.3 From Table 2.1.3 it can be seen that the scheme is predicted to reduce nitrogen dioxide levels in five of the AQMAs in the region and increase levels in four. The greatest increase is at a receptor in the Rushcliffe AQMA 1 in West Bridgford where road traffic emissions are predicted to increase by a maximum of $1.69 \mu\text{g}/\text{m}^3$ (RC 3 on Radcliffe Road). The greatest decrease is at receptors in the Nottingham AQMA 3 where road traffic emissions are predicted to decrease by a maximum of $0.44 \mu\text{g}/\text{m}^3$ (NCC 1, 8 Beeston Road). The annual average UK-AQS is predicted to be met at all receptor locations.
- 1.8.4 The annual average objective for respirable particulate is predicted to be achieved at all representative receptors along the core A453 corridor both 'with' and 'without' the proposed scheme. Table 2.1.4 below indicates the results for predicted annual average PM_{10} in 2012. The highest predicted result at a receptor in the A453 corridor 'with' the scheme is $21.65 \mu\text{g}/\text{m}^3$ (REC 41) which is below the UK-AQS objective of $40 \mu\text{g}/\text{m}^3$. The greatest predicted increase at any of the receptors along the proposed route is $0.18 \mu\text{g}/\text{m}^3$ (REC 7). The greatest predicted decrease along the proposed route is $0.12 \mu\text{g}/\text{m}^3$ (REC 29).
- 1.8.5 Nitrogen dioxide levels at the receptor within the A453 corridor predicted to experience the greatest increase in road emissions will go up by 7.1% (REC 38). Levels at the receptor to benefit the most are predicted to decrease by 2.6% (REC 11). Beyond the A453 corridor, nitrogen dioxide levels at the receptor in an AQMA predicted to experience the greatest increase in road emissions will go up by 4.7% (RC 3). Levels at the receptor in an AQMA to benefit the most are predicted to reduce by 1.1% (NCC 1).
- 1.8.6 Respirable particulate levels at the receptor within the A453 corridor predicted to experience the greatest increase in road emissions will increase by 0.9% (REC 7). Levels at the receptor to benefit the most are predicted to reduce by 0.6% (REC 29).
- 1.8.7 The overall TAG appraisal of local air quality indicates that the scheme has an overall neutral effect in terms of receptor exposure to PM_{10} and a slight net disbenefit in terms of receptor exposure to NO_2 . The regional assessment predicts a net decrease in the total PM_{10} emissions of 0.739 tonnes per annum. Exposure to PM_{10} will reduce at 12,587 across the region whilst exposure will increase at 5043 receptors. The proposed scheme is predicted to result in a net reduction of 47.267 tonnes in nitrogen oxide (NO_x) emissions across the area being assessed. 13,304 properties are predicted to be exposed to reduced NO_2 emissions while 6080 are predicted to be exposed to increased NO_2 emissions.

Table 2.1.4: 2012 Predicted Annual Average PM₁₀ (as µg/m³) Results at all Receptors

Receptor Ref	Traffic Contribution		Background	Total		Difference
	Without Development	With Development		Without Development	With Development	
REC 1	0.06	0.09	20.60	20.66	20.69	0.03
REC 2	0.08	0.13	21.00	21.08	21.13	0.05
REC 3	0.04	0.06	21.00	21.04	21.06	0.02
REC 4	0.08	0.14	19.00	19.08	19.14	0.06
REC 5	0.04	0.07	21.00	21.04	21.07	0.03
REC 6	0.02	0.04	19.40	19.42	19.44	0.02
REC 7	0.18	0.36	19.40	19.58	19.76	0.18
REC 8	0.06	0.13	19.80	19.86	19.93	0.07
REC 9	0.02	0.05	18.90	18.92	18.95	0.03
REC 10	0.04	0.04	19.00	19.04	19.04	0.00
REC 11	0.14	0.13	19.00	19.14	19.13	-0.01
REC 12	0.02	0.02	19.10	19.12	19.12	0.00
REC 13	0.07	0.06	19.40	19.47	19.46	-0.01
REC 14	0.02	0.02	19.30	19.32	19.32	0.00
REC 15	0.14	0.24	19.40	19.54	19.64	0.10
REC 16	0.17	0.27	19.90	20.07	20.17	0.10
REC 17	0.06	0.08	19.90	19.96	19.98	0.02
REC 18	0.04	0.05	19.90	19.94	19.95	0.01
REC 19	0.07	0.08	19.90	19.97	19.98	0.01
REC 20	0.08	0.12	19.90	19.98	20.02	0.04
REC 21	0.16	0.20	19.90	20.06	20.10	0.04
REC 22	0.17	0.24	19.90	20.07	20.14	0.07
REC 23	0.24	0.26	19.90	20.14	20.16	0.02
REC 24	0.17	0.24	19.90	20.07	20.14	0.07
REC 25	0.10	0.12	19.90	20.00	20.02	0.02
REC 26	0.25	0.27	19.90	20.15	20.17	0.02
REC 27	0.11	0.13	19.90	20.01	20.03	0.02
REC 28	0.08	0.10	19.90	19.98	20.00	0.02
REC 29	0.35	0.23	19.90	20.25	20.13	-0.12
REC 30	0.15	0.18	19.90	20.05	20.08	0.03
REC 31	0.18	0.15	19.90	20.08	20.05	-0.03

Receptor Ref	Traffic Contribution		Background	Total		Difference
	Without Development	With Development		Without Development	With Development	
REC 32	0.16	0.15	20.50	20.66	20.65	-0.01
REC 33	0.19	0.20	20.50	20.69	20.70	0.01
REC 34	0.15	0.17	20.50	20.65	20.67	0.02
REC 35	0.18	0.20	20.50	20.68	20.70	0.02
REC 36	0.17	0.26	20.50	20.67	20.76	0.09
REC 37	0.09	0.12	20.50	20.59	20.62	0.03
REC 38	0.26	0.42	20.50	20.76	20.92	0.16
REC 39	0.14	0.20	20.50	20.64	20.70	0.06
REC 40	0.18	0.20	20.50	20.68	20.70	0.02
REC 41	0.13	0.15	21.50	21.63	21.65	0.02
Bx07	0.21	0.23	23.90	24.11	24.13	0.02
Bx11	0.44	0.48	23.90	24.34	24.38	0.04
Bx31	0.70	0.76	23.80	24.50	24.56	0.06
Bx32	0.56	0.60	23.90	24.46	24.50	0.05
Bx33	0.00	0.00	20.80	20.80	20.80	0.00
Bx01	0.04	0.04	21.80	21.84	21.84	0.00
Bx13	0.04	0.04	21.80	21.84	21.84	0.00
RC 3	0.32	0.51	22.80	23.12	23.31	0.19
RC 4	0.04	0.04	22.80	22.84	22.84	0.00
RC 5	0.03	0.04	22.80	22.83	22.84	0.00
RC 6	0.73	1.00	22.80	23.53	23.80	0.26
RC 8	0.37	0.38	22.80	23.17	23.18	0.01
RC 9	0.18	0.19	21.40	21.58	21.59	0.01
RC 10	0.36	0.36	21.40	21.76	21.76	0.00
RC 11	0.29	0.29	21.40	21.69	21.69	0.00
RC 12	0.37	0.36	21.40	21.77	21.76	-0.01
REC 42	0.27	0.27	20.60	20.87	20.87	0.00
REC 43	0.37	0.37	20.60	20.97	20.97	0.01
REC 46	0.29	0.28	22.80	23.09	23.08	-0.01
RC 16	0.32	0.32	20.6	20.92	20.92	0.00

Receptor Ref	Traffic Contribution		Background	Total		Difference
	Without Development	With Development		Without Development	With Development	
REC 44	0.11	0.11	20.22	20.33	20.33	0.00
REC 45	0.50	0.53	19.26	19.76	19.79	0.03
NCC 1	0.64	0.61	23.50	24.14	24.11	-0.03
NCC 2	0.44	0.41	23.50	23.94	23.91	-0.02
NCC 3	0.30	0.30	23.50	23.80	23.80	0.00
NCC4	0.11	0.11	24.00	24.11	24.11	0.00
NWL1	0.53	0.53	21.00	21.53	21.53	0.00
EBC1	0.01	0.01	21.10	21.11	21.11	0.00
EBC2	0.55	0.59	21.80	22.35	22.39	0.04

Regional Impacts

- 1.8.8 The TAG appraisal of regional air quality shows that emissions of nitrogen oxides (NO_x) from traffic on roads affected by the scheme are predicted to be 47 tonnes (3%) less with the A453 scheme than in the Do-Minimum scenario in 2012.
- 1.8.9 Emissions of total hydrocarbons (THC) from traffic on roads affected by the scheme are predicted to be 8 tonnes (3.3%) less with the A453 scheme than in the Do-Minimum scenario in 2012.
- 1.8.10 Emissions of carbon monoxide (CO) from traffic on roads affected by the scheme are predicted to be 40 tonnes (2.6%) less with the A453 scheme than in the Do-Minimum scenario in 2012.
- 1.8.11 The reductions in total emissions of NO_x and PM₁₀ in the do-minimum scenarios reflect the expected improvement in tailpipe emissions from the fleet between 2006 and 2012. The reduction in the emissions of all pollutants in the Do-Something scenario compared to the Do-Minimum are attributable to a slight reduction in the total road length and slight reduction in HGV component of the traffic fleet.

Table 2.1.5: Regional Air Quality Appraisal (figures expressed as tonnes per year)

	Do-Minimum 2006	Do-Minimum 2012	Do-Something 2012	2006 Do Minimum – 2012 Do Something	2012 Do Minimum – 2012 Do Something
NO_x	1,754	1,579	1,532	-222	-47
THC	205	240	232	27	-8
CO	1,205	1,520	1,480	275	-40
PM₁₀	51	40	40	-11	0

- 1.8.12 The greenhouse gas assessment shows that traffic emissions of carbon dioxide are expected to show a reduction between the current (2006) baseline and the opening year. This decrease is expected due to ongoing improvements in vehicle emission technology and the continuing development of cleaner fuels. These cumulative reductions in vehicle emissions will compensate for the increase in vehicle numbers resulting from the scheme. The emissions of CO₂ are expected to show a very small (0.05%) increase compared to the 'do-minimum' scenario.

Table 2.1.6: Greenhouse Gas Appraisal (figures expressed as tonnes per year)

	Do-Minimum 2006	Do-Minimum 2012	Do-Something 2012	2006 Do Minimum – 2012 Do Something	2012 Do Minimum – 2012 Do Something
CO₂	1,435,130	1,415,133	1,415,821	19,309	-688

1.9 Significance of Effects

- 1.9.1 The proposed A453 scheme will generally result in slight increases in nitrogen dioxide and PM₁₀ levels at receptors closest to the road along the A453 corridor. Despite this general increase, no receptors in the A453 corridor are predicted to be exposed to exceedences of any of the national air quality objectives. The overall significance of the air quality effect of the scheme on properties within the A453 corridor is considered to be slight negative.
- 1.9.2 Beyond the A453 corridor exposure of key receptors to nitrogen dioxide will reduce in five AQMAs in the region and increase in four AQMAs. Receptors in all of the AQMAs are predicted to meet the nitrogen dioxide national air quality objective in 2012. The overall significance of the air quality effect of the scheme on receptors in AQMAs in the region is considered to be neutral.
- 1.9.3 The local assessment of the proposed scheme predicts a slight net reduction in exposure to PM₁₀ of all receptors across the study area. There is a slight net increase in exposure to NO₂. The overall significance of effect of the scheme on local air quality is considered to be neutral.
- 1.9.4 The regional assessment of the proposed scheme predicts an overall net beneficial effect by virtue of reduced NO_x, total hydrocarbons and carbon monoxide emissions within the study area. The overall significance of the air quality effect in the region is considered to be slight positive.
- 1.9.5 The greenhouse gas assessment predicts an overall slight increase in total carbon dioxide emissions across the area covered by the full transport model. The overall significance of the scheme on greenhouse gas emissions is considered to be slight negative.

1.10 Summary

- 1.10.1 The scheme is predicted to result in a slight increase in nitrogen dioxide and PM₁₀ exposure at receptors along the A453 corridor. The scheme is not predicted to result in any exceedence of National Air Quality Objectives at any receptors close to the A453.

- 1.10.2 The scheme is predicted to result in a slight increase in nitrogen dioxide exposure at receptors in two Air Quality Management Areas in Rushcliffe (AQMA 1 & AQMA 2), one in Nottingham (AQMA 2) and one in North West Leicestershire (AQMA 1). The scheme is predicted to result in a slight reduction in nitrogen dioxide exposure at receptors in three Air Quality Management Areas in Broxtowe (AQMA 1, AQMA 2 & AQMA 4), one in Nottingham (AQMA 1) and one in Erewash (AQMA 1).
- 1.10.3 13,304 properties within 200m of roads significantly affected by the proposed scheme are predicted to experience reductions in nitrogen dioxide, and 6,080 properties are predicted to experience increases in nitrogen dioxide. Overall exposure to nitrogen dioxide will slightly increase. 12,587 properties within 200m of roads significantly affected by the proposed scheme are predicted to experience reductions in PM₁₀, and 5,043 properties are predicted to experience increases in PM₁₀. Overall exposure to PM₁₀ will slightly reduce.
- 1.10.4 The scheme will result in a slight negative effect on receptors near to the road scheme, but will be of benefit to air quality in the study area. Overall there will be a neutral effect on air quality.
- 1.10.5 The scheme will result in a slight increase in greenhouse gas emissions from road traffic in the region.
- 1.10.6 The construction phase of the scheme has been ranked as 'high' risk due to the potential to produce dust and PM₁₀. Mitigation measures have been proposed to minimise this.

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