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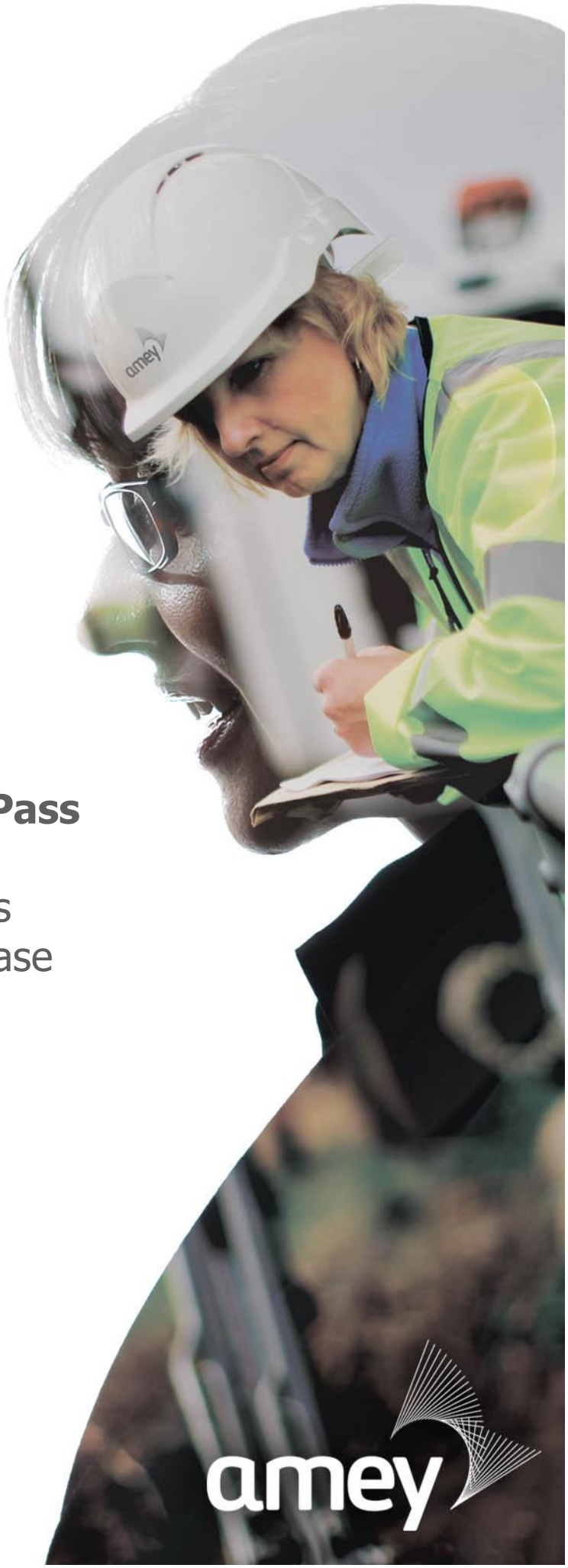

Gloucester South West By-Pass Improvements

Air Quality and Greenhouse Gas Assessment for Full Business Case

COGL43041117 /Air Revision 0

July 2017

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Document Control Sheet

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1 Introduction

1.1 Background to the scheme

1.1.1 Amey has been requested by Gloucestershire County Council (GCC) to recommend and design an improvement scheme for the Gloucester South West Bypass (GSWBP) in Gloucester. The scheme involves several improvements, including the widening of Llanthony Road, which could impact on the flow of traffic on the local road network. This has the potential to impact on air quality at local sensitive receptors.

1.2 Purpose and scope of report

1.2.1 This report describes a technical assessment of air quality to support the implementation of proposed improvement to the GSWBP. The report is based on the preferred design option and aims to provide the required detail to inform the Full the Business Case for the scheme.

1.2.2 For local air quality, the key requirement of the assessment is to identify the change in pollutant concentrations at receptors in close proximity to the scheme (and if required identify any mitigation measures necessary) and to identify receptors that could potentially qualify under Part 1 and Part 2 of the Land Compensation Act (Ref. 1). For regional air quality and greenhouse gas, the assessment aims to estimate the overall change in emissions to facilitate monetisation.

2 Legislation and Guidelines

2.1 Transport Analysis Guidance

2.1.1 The Department for Transport (DfT) has published guidance entitled 'Transport Analysis Guidance Unit A3 environmental impacts' (Ref. 2) on the appraisal of the environmental impacts of transport schemes. Air quality and greenhouse gas are two of the environmental topics covered and the guidance deals with the impacts on both the built and the natural environment, as well as on people. The guidance discusses the relationship between environmental impact appraisal and environmental impact assessment and the need to tailor the level of appraisal to the stage of development of the proposal.

2.2 Land Compensation Act 1973

2.2.1 Under Part 1 of the Land Compensation Act 1973 compensation can be claimed by people who own and who also occupy property that has depreciated in value (by more than £50) due to physical factors caused by the use of a new or altered road.

2.2.2 The physical factors are: noise, vibration, smell, fumes, smoke, artificial lighting and the discharge on to the property of any solid or liquid substance.

2.2.3 The cause of the physical factors must be due to the use of the new or altered road. For example, if a road is altered, the noise and other adverse effects must arise from the traffic using the altered section of road. Part 1 compensation cannot be claimed for the effects of traffic further down the road where no alteration has taken place.

2.2.4 Under the provisions of the Act, a road is altered only when there is a change to the location, width or level of the carriageway or an additional carriageway is provided beside, above or below an existing one. Part 1 compensation is not payable when the carriageway has simply been resurfaced.

2.2.5 Part 1 compensation is also not payable where part of the affected property has been compulsorily purchased for the construction of the new or altered road. This is because the effect of the use of the road on the value of the rest of the property must be taken into account in calculating the compensation for the part of the property taken.

2.2.6 Loss of view or privacy, personal inconvenience and physical factors arising during the construction of the road are also not included under Part 1 compensation.

2.3 European Union Air Quality

2.3.1 The 2008 ambient air quality directive (Ref. 3) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2). As well as having direct effects, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems.

2.3.2 The 2008 directive replaced nearly all the previous EU air quality legislation and was made law in England through the Air Quality Standards Regulations 2010 (Ref. 4).

2.4 National Air Quality Strategy

2.4.1 The UK Government is required under the Environment Act 1995 (Ref. 5) to produce a National Air Quality Strategy (AQS) (Ref. 6). This was last reviewed and published in 2007. The strategy sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. It prescribes air quality objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, polycyclic aromatic hydrocarbons, nitrogen dioxide, sulphur dioxide, particles – PM_{10} and $PM_{2.5}$ and ozone). It is proposed that a new AQS will be published in 2017.

2.4.2 The AQS includes 'objective values' which the UK Government and devolved administrations expect to be achieved by specific dates, taking into account the costs, benefits, feasibility and practicality of achieving these limits. These values related to this assessment are shown in Table 2:1.

Table 2:1: AQS objectives

Pollutant	Scope	Objective/ Limit Value	Measure as	Date to be achieved by and maintained thereafter		
				AQS	Regs	2008/50 /EC
PM_{10}	Protection of human health	50 µg/m^3 Not to be exceeded more than 35 times a	24-hour mean	31-Dec-04	31-Dec-04	1-Jan-05

		year				
		40 µg/m^3	Annual mean	31-Dec-04	31-Dec-04	1-Jan-05
NO_2	Protection of human health	200 µg/m^3 Not to be exceeded more than 18 times a year	1-hour mean	31-Dec-05	31-Dec-05	1-Jan-10
		40 µg/m^3	Annual mean	31-Dec-05	31-Dec-05	1-Jan-10
NO_x	Protection of vegetation and ecosystems	30 µg/m^3	Annual mean	31-Dec-00	31-Dec-00	19-Jul-01

2.4.3 Part IV of the Environment Act 1995 requires local authorities in the UK to review air quality in their area and designate Air Quality Management Areas (AQMA) if improvements are necessary. Where an AQMA is designated, local authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose. An Air Quality Action Plan (AQAP) describing the pollution reduction measures must then be put in place. These plans contribute to the achievement of air quality limit values at local level.

2.5 Climate Change Act

2.5.1 The Climate Change Act (Ref. 7) aims to manage and respond to climate change in the UK by setting legally binding targets, taking powers to meet the targets and establishing clear and regular accountability.

2.5.2 The main aims of the Act are to:

- improve carbon management which helps the move towards a low-carbon economy
- demonstrate international leadership in sharing responsibility for reducing global emissions.

2.5.3 The Act sets a legally binding target of at least 80% reduction in greenhouse gas emissions by 2050 (based on 1990 levels). A target to reduce emissions by 34% by 2020 is also in place. A carbon budgeting system has been put in place to track progress towards these targets as described in the UK Low Carbon Transition Plan (Ref. 8).

2.6 National Planning Policy Framework

2.6.1 The National Planning Policy Framework (NPPF) (Ref. 9) was published on 27 March 2012 and sets out the Government's planning policies for England and how these are expected to be applied. The purpose of the NPPF is to help achieve sustainable development, understood as positive growth.

2.6.2 Section 11 Conserving and Enhancing the Natural Environment considers air quality and pollution and Section 10 Meeting the Challenge of Climate Change, Flooding and Coastal Change highlights that planning plays a key role in mitigation against climate change.

2.6.3 Paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by, among others, preventing new development from contributing to unacceptable levels of air pollution.

2.6.4 Paragraph 124 states that planning policies should sustain compliance with and contribute towards EU limit values and national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in AQMAs is consistent with the local air quality action plan.

2.6.5 Further guidance on the NPPF is located in the Planning Practice Guidance Notes (PPGN) Ref. 10).

3 Methodology

3.1 Department for Transport TAG Unit A3

3.1.1 This report will described a 'plan' level WebTAG assessment of air quality and greenhouse gases in line with the appraisal method from the Department for Transport TAG Unit A3. The assessment uses a spatially detailed traffic model to assess and appraise the impact of the scheme on air quality and greenhouse gas impacts at the plan level to inform the Full Business Case.

3.2 DMRB HA 207/07

3.2.1 The processes outlined in the Design Manual for Roads and Bridges Volume 11, Section 3 Part 1 HA 207/07 Air Quality (Ref. 11), and subsequent Interim Advice Notes (IANs), will be used to provide the output for this appraisal.

3.2.2 HA 207/07 describes four levels of assessment: scoping, simple, detailed, and mitigation/enhancement and monitoring. Each level of assessment incorporates two components: local air quality, which is the estimation of the levels of pollutants that could change as a result of the scheme (temporary and permanent) at specific locations; regional air quality, which examines the change in emissions as a result of the operation of the scheme and the impacts this may have over a regional, national or international area.

3.3 Study area

3.3.1 As advised, sensitive receptors relative to the schemes were identified through the use of Geographical Information System data sourced from the Ordnance Survey and processed using appropriate computer software.

3.3.2 For instances where data for the quantitative appraisal is unavailable, such as for the temporary air quality impacts during construction, a qualitative appraisal using professional judgement will be undertaken.

3.3.3 The study area for local assessment is defined in HA 207/07 as 200m from an affected road. HA207/07 defines an affected road as meeting any of the following criteria:

- road alignment will change by 5 m or more
- daily traffic flows will change by 1,000 AADT or more

- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more
- daily average speed will change by 10 km/hr or more
- peak hour speed will change by 20 km/hr or more

3.3.4 The study area includes all sensitive receptors, such as residential properties and ecologically designated sites, and pays special attention to susceptible groups such as schools, hospitals and nursing homes.

3.3.5 The criteria for regional assessment are defined in HA 207/07 as affected roads meeting any of the following criteria:

- a change of more than 10% in AADT
- a change of more than 10% to the number of heavy duty vehicles
- a change in daily average speed of more than 20 km/hr.

3.4 Determining the baseline

3.4.1 Air quality monitoring in the area of the scheme is currently undertaken by Gloucester City Council. In line with LAQM TG (16) (Ref. 12) the council undertakes air quality monitoring at sensitive locations within the council area. The council operates one continuous monitoring station as a background AURN monitor, and also undertakes local passive monitoring through the use of NO_2 passive type diffusion tubes. Data from this monitoring is added to the national dataset to be included in national background air quality datasets.

3.4.2 Modelled background air quality is provided via the DEFRA review and assessment website (Ref. 13) at 1km grid square centres.

3.5 Assessment method

Temporary Effects

3.5.1 HA 207/07 requires that any sensitive receptors within 200m of a construction site should be identified so that mitigation can be applied. Any such mitigation should be designed in to the construction process to be included in the Construction Environmental Management Plan, and be reflective and appropriate to the type and size of construction being undertaken.

Permanent Effects

3.5.2 Those roads within the study area that meet the scoping criterion relating to affected roads will be assessed according to HA 207/07. Where roads are scoped in to the assessment, receptors within the study area will be counted. Exposure at key receptors modelled using supplied traffic data where the effects of the scheme are likely to be highest, and key sensitive receptors from susceptible groups will also be included. Receptors will be identified using professional judgement. Modelling will be undertaken using DMRB Screening Method V1.03c. Department for Transport Emission Factors v7 will be applied through the use of the GAP factor analysis described in IAN 170/12 v3 (Ref. 14).

3.5.3 The assessment of impacts at ecological receptors is not required because no designated sites are located within 200m of affected roads.

3.5.4 The acceleration zone methodology from IAN 185/15 (Ref. 15) will be applied in addition to the modelling described in HA 207/07, extending to 100m from junctions.

3.5.5 Calculations relating to the ratio of NO_X to primary NO_2 will be undertaken according to IAN 170/12 v3 using the Defra NO_X to NO_2 June 2016 calculator.

3.5.6 Verification will be undertaken using local diffusion tube monitoring data from Gloucester City Council where tubes are located in an area for which traffic data is available.

3.5.7 Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded unless the annual mean NO_2 concentration is greater than 60 $\mu g/m^3$. Thus exceedances of 60 $\mu g/m^3$ as an annual mean NO_2 concentration are used as an indicator of potential exceedances of the 1-hour mean objective as stated in paragraph 7.91 of LAQM TG (16).

3.5.8 Similarly, LAQM TG(16) sets out the method by which the number of days in which the PM_{10} 24-hour objective is exceeded, and can be obtained based on a relationship with the predicted annual mean.

3.5.9 As with all modelling, air quality modelling is subject to uncertainty. Meteorological, topographical and behavioural factors can all affect the dispersion of pollutants within a three-dimensional space, as can systematic errors within the model. This introduces a Measure of Uncertainty (MoU). A Root Mean Square Error method is applied to ensure that the model output remains within acceptable levels of error.

3.6 Traffic data

3.6.1 Amey has developed a S-Paramics micro simulation model for the A430 Llanthony Road widening scheme improvements. The Paramics model covers weekday peak periods only: AM Peak (07:00-10:00hrs) and PM peak (15:00-18:00hrs). To assess air quality, Annual Average Daily Traffic (AADT) is required. This was derived by applying a factor of 95% which is the ratio of AAWT to AADT from the local Churchends Automatic Traffic Counter. The data is fully validated and appropriate for use in this appraisal.

3.6.2 Speed and vehicle proportion data was extracted directly from the model outputs averaged over peak periods only.

3.6.3 Data was provided for an opening year of 2018 and future assessment year of 2031 derived from a historical base model. The base model was developed using traffic data from surveys carried out in October 2014.

3.6.4 The scenarios considered in the assessment reflect the traffic data provided and therefore consist of Do-Minimum (DM) scenarios which predict concentrations without the scheme in place and Do-Something (DS) scenarios which predict concentrations with the scheme in place. The specific scenarios considered in the assessment are:

- Model verification Baseline DM 2014
- Opening year DM 2018
- Opening year DS 2018
- Future year DM 2031
- Future year DS 2031

3.6.5 Vehicle speeds were assigned to each link during traffic modelling using the speed pivoting and assignment methodology described in IAN 185/15 as a guide.

3.7 Assessment of Significance

3.7.1 The significance air quality impacts are interpreted as the magnitude of change in annual average concentrations of pollutants, and is based on 10%, 5% and 1% MoU, and according to the number of receptors within these bandings as detailed in IAN 174/13 (Ref. 16) and shown in Table 3:1.

Table 3:1: Guideline to Number of Properties Constituting a Significant Effect

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

3.7.2 Professional judgment on significance should also be used dependant on the number of receptors with deteriorating or improving air quality.

3.8 EU Directive 2008/50/EC Compliance

3.8.1 The effect of the scheme on the compliance zone or agglomeration was assessed qualitatively assessed using the information from IAN 175/13 (Ref. 17) as guidance in tandem with the outcomes of the assessment. This provides an opinion on whether the scheme is likely to have an impact on the compliance with the EU Directive 2008/50/EC for Ambient Air Quality.

3.9 Greenhouse Gas

3.9.1 Emissions of greenhouse gas were calculated for specific links which met the screening criteria shown in Section 3.3.

3.9.2 It should be noticed this is an arbitrary approach to apportioning greenhouse gas emissions based on assigning links for which traffic flows were provided.

3.9.3 Emissions as fuel consumption were calculated using the formula and parameters given in in TAG Data Book Tables A1.3.8 and A.1.3.9 (Ref. 18). The amount of fuel consumed by different types of vehicle, expressed in litres/km travelled was determined using a function of average speed.

3.9.4 This was combined with the link length and yearly traffic counts to determine the carbon dioxide equivalent (CO_2e) which is a measure of carbon dioxide which includes nitrous oxide, methane and carbon dioxide.

3.9.5 The impact arising from the change in CO_2e emissions was determined using the Greenhouse Gases Workbook.

3.10 Economic Appraisal

3.10.1 As NO_x emissions can cause health problems over long distances through secondary particle formation, predicted values for NO_x emissions are used in economic valuation.

3.10.2 Valuation of changes in PM_{10} concentrations are also based on the damage cost approach because no exceedances of the daily mean limit value exceedances outside London are likely.

3.10.3 Table 3:2 shows the appraisal scoring criteria that was used to assess the change in local air quality for representative receptors. The appraisal score for air quality impacts will be included in the overall business case for the scheme.

Table 3:2: Scoring criteria for the appraisal summary table

Appraisal Rating	Appraisal Score
Large Beneficial	3
Moderate Beneficial	2
Slight Beneficial	1
Neutral	0
Slight Adverse	-1
Moderate Adverse	-2
Large Adverse	-3

3.10.4 For air quality, the TAG Local Air Quality Workbook was used to calculate property weighted NO_2 and PM_{10} concentrations and the number of properties where air quality improves, worsens or stays the same. The TAG Air Quality Valuation Spreadsheet was used to facilitate the calculation of monetary values for air pollution from the schemes.

4 Baseline Conditions

4.1.1 This section will describe the baseline air quality conditions in the area affected by the scheme with reference to DEFRA modelled background concentrations, monitoring undertaken by the responsible authority and an assessment of sensitive locations.

4.1 Air Quality Management Areas

4.1.1 There are three AQMAs in Gloucester designated on the basis of exceedances of the annual average NO_2 objective. These are located on Priory Road, Barton Street and Painswick Road. The AQMAs are located in areas which will not be impacted by the scheme itself and are not considered to be constraints to its design.

4.2 EU Directive 2008/50/EC Compliance Links

4.2.1 A review of the DEFRA UK Ambient Air Quality Interactive Map (Ref. 19) shows that the scheme and all roads affected may overlay any PCM modelled links for which compliance reporting to the European Union is required. However, the information was not available at the time of the assessment.

4.3 Background pollutant concentrations

4.3.1 Modelled background pollutant concentrations representing base year 2014, opening year 2018 and assessment year 2031 derived from the 2013-based background mapping at Llanthony Road are shown in Table 4:1.

Table 4:1: Background NO_2, NO_x and PM_{10} for grid square (381500, 217500)

Year	NO_x	NO_2	PM_{10}
2014	16.8	12.2	14.3
2018	14.3	10.5	13.7
2031	10.8	8.1	13.1

4.3.2 Table 4:1 shows that the AQS objective values (Table 2:1) are not exceeded by the background concentration in the study area for NO_2, NO_x or PM_{10}. The highest background concentrations in Gloucester can be expected in areas of high traffic density corresponding to the city's AQMAs.

4.4 Monitored pollutant concentrations

4.4.1 Local Air Quality Management (LAQM) in the area is the responsibility of Gloucester City Council who produce the screening, progress and status reports for submission to DEFRA.

4.4.2 The Updating and Screening and Assessment Report 2015 (Ref. 20) and the Air Quality Status Report 2017 (Ref. 21) show that air quality is typical of a city the size of Gloucester.

4.4.3 Gloucester City Council operates a network of diffusion tubes outside the AQMAs at kerbside and roadside locations close to the scheme. The diffusion tube results for 2012 to 2016 are shown in Table 4:2.

Table 4:2: Diffusion tube monitoring results

Site ID	Site Name	Site Type	Within AQMA?	Annual Mean NO_2 Concentration ($\mu g/m^3$) – Adjusted for Bias				
				2012	2013	2014	2015	2016
3	79 Millbrook Street	Roadside	N	31.7	36.6	31.3	29.2	31.3
4	57 Bristol Road	Roadside	N	30.9	38.0	27.6	25.9	27.2
5	157 Bristol Road	Roadside	N	27.2	30.5	26.9	25.3	26.2

4.4.4 All monitored concentrations are below the AQS objective for annual average NO_2 for the period 2011 to 2015. There are no NO_2 annual means exceeding 60µg/m^3 that would indicate exceedances of the 1-hour objective and limit values.

4.4.5 Gloucester City Council does not undertake any monitoring of traffic related PM_{10}, or emissions of SO_2 and benzene that might be associated with industrial emissions.

5 Air Quality Assessment

5.1 Sensitive Receptors

5.1.1 Sensitive receptors are defined as locations which are potentially sensitive to local air emissions. Examples include dwellings, hospitals, schools, community facilities, designated areas (e.g. SAC, SPA, SSSI, pSPA and Ramsar) and public rights of way.

5.1.2 Ordnance Survey AddressBase data points within each buffer are used to represent the receptors at risk from permanent air quality effects for each affected road.

5.1.3

5.1.4

5.1.5 Table 5:1 shows the number of sensitive receptors in proximity to the affected road links for 50m bands up to 200m.

Table 5:1 Sensitive receptor counts (permanent effects)

Link ID	Link Name	Distance Band			
		0-50m	50-100m	100-150m	150-200m
1	Secunda Way A430 - Northbound	126	188	156	46
2	Secunda Way A430 - Southbound	126	188	156	46
3	Hempsted Lane (S) - Northbound	48	36	18	13
7	Hempsted Ln (N) - Northbound	18	8	0	4
8	Hempsted Ln (N) - Southbound	18	8	0	4
14	Hegmminsdale Road - Eastbound	32	15	12	10
18	Castle Meads Way - Southbound	1	13	42	71
20	Severn Road - Southbound	60	35	169	110
22	Llanthony Road (E) - Westbound	7	0	0	0
23	Llanthony Road (W) - Westbound	36	8	3	0
25	Llanthony Road (N) - Northbound	36	8	3	0
26	Llanthony Road (N) - Southbound	6	28	22	112
29	St Ann Way (E) - Westbound	126	188	156	46

5.2 Temporary (Construction) effects

5.2.1 For temporary effects, a 200m buffer is applied to the scheme location and Ordnance Survey AddressBase data points within the buffers determined. This shows the distribution of potential receptors exposed to temporary air quality effects during construction.

5.2.2

5.2.3

5.2.4 Table 5:1 shows there are 112 sensitive receptors within 200 of the site boundary. Considering the size of the proposed works, the number of receptors and the potential routes of construction vehicles for each scheme it is considered that the sites should be classified as low risk for temporary releases of air emissions during construction.

5.2.5 Releases of dust, fine particles and vehicle emissions will be short lived and transient during the construction period. With the implementation of best practice measures for the minimisation and control of on-site and off-site dust and vehicle emissions it is considered that emissions from a construction site of this scale can be effectively managed and minimised. This can be executed through appropriately worded and executed planning conditions.

5.2.6 It is recommended that further assessment is undertaken to determine the level of mitigation required to minimise and control any emissions once further detail is available about the construction programme and methods. It is considered that with appropriate implementation of mitigation which is commensurate and to the risk the impacts of the all the schemes will be not significant.

5.3 Permanent (Operational) Effects

Local Air Quality

Affected Roads

5.3.2 For permanent effects on local air quality, the road links in Table 5:2 were determined as being affected by the scheme.

Table 5:2: Affected roads for local air quality

Link ID	Link Name	Alignment change ≥ 5m	AADT change ≥ 1000	HDV change ≥ 200 AADT	Daily average speed change by ≥ 10km/hr	Peak hour speed change by ≥ 20km/hr
1	Secunda Way A430 - Northbound	-	-	-	2018 and 2031	n/a
2	Secunda Way A430 - Southbound	-	2031	-	-	n/a
3	Hempsted Lane (S) - Northbound	-	-	-	2031	n/a
7	Hempsted Ln (N) - Northbound	-	-	-	2031	n/a
8	Hempsted Ln (N) - Southbound	-	2031	-	-	n/a
14	Hegmminsdale Road - Eastbound	-	-	-	2018 and 2031	n/a
18	Castle Meads Way - Southbound	-	2031	-	-	n/a
20	Severn Road - Southbound	-	-	-	-	n/a
22	Llanthony Road (E) - Westbound	-	-	-	2031	n/a
23	Llanthony Road (W) - Westbound	-	-	-	2018 and 2031	n/a
25	Llanthony Road (N) - Northbound	2018 and 2031	-	-	-	n/a
26	Llanthony Road (N) - Southbound	2018 and 2031	2031	-	2018 and 2031	n/a
29	St Ann Way (E) - Westbound	-	-	-	2018 and 2031	n/a

- affected road criterion not met n/a data unavailable

5.3.3 Appendix A shows the locations of each affected road in the study area against which 200m buffers have been applied.

Plan Level WebTAG

5.3.4 Annual average NO_2 and PM_{10} predicted concentrations for the baseline, opening year and assessment year are shown in Table 5:3, Table 5:4, Table 5:5 and Table 5:6. All the tables show that an additional 3 receptors will be exposed to air pollution as a result of the widening scheme.

Table 5:3 Annual average NO_2 net route assessment (opening year 2018)

NO_2 summary of routes	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
Total properties across all routes (min)	514	535	581	416	2,046
Total properties across all routes (some)	517	534	582	416	2,049
Do-minimum NO_2 assessment across all routes	11,571	7,812	6,700	4,460	Total assessment NO_2 (I): **30,543**
Do-something NO_2 assessment across all routes	11,256	7,639	6,659	4,443	Total assessment NO_2 (II): **29,997**
Net total assessment for NO_2, all routes (II-I)					**-545**
Number of properties with an improvement					**1,999**
Number of properties with no change					**0**
Number of properties with a deterioration					**50**

Table 5:4 Annual average NO_2 net route assessment (assessment year 2031)

NO_2 summary of routes	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
Total properties across all routes (min)	514	535	581	416	2,046
Total properties across all routes (some)	517	534	582	416	2,049
Do-minimum NO_2 assessment across all routes	9,992	6,566	5,423	3,555	Total assessment NO_2 (I): **25,535**
Do-something NO_2 assessment across all routes	9,622	6,346	5,361	3,530	Total assessment NO_2 (II): **24,860**
Net total assessment for NO_2, all routes (II-I)					**-676**
Number of properties with an improvement					**1,339**
Number of properties with no change					**0**
Number of properties with a deterioration					**710**

5.3.5 Table 5:3 shows the scheme is expected to lead to the deterioration in annual average NO_2 at 50 receptors in the study area in opening year 2018. However, it is predicted to improve at 1,999 existing receptors.

5.3.6 Table 5:4 shows annual average NO_2 is anticipated to deteriorate at 710 receptors in assessment year 2031. However, it will improve at 1,339 in the study area.

5.3.7 The total assessment values for annual average NO_2 which is the sum of the products of predicted concentration and number of receptors in each band is lowest in assessment year 2031. This is determined because predicted concentrations are expected to be lower in 2031 as a result of reductions in NO_2 releases from improved vehicle emissions technologies. In both 2018 and 2031, the net route assessment, which is the difference between the Do-Something and Do-Minimum route assessments is negative and of a similar magnitude. This means that the scheme will have an overall beneficial impact on annual average NO_2 in the opening and assessment years.

Table 5:5 Annual average PM_{10} net route assessment (opening year 2018)

PM_{10} summary of routes	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
Total properties across all routes (min)	514	535	581	416	2,046
Total properties across all routes (some)	517	534	582	416	2,049
Do-minimum PM_{10} assessment across all routes	8,633	7,852	8,103	5,722	Total assessment NO_2 (I): **30,310**
Do-something PM_{10} assessment across all routes	8,498	7,777	8,097	5,716	Total assessment NO_2 (II): **30,087**
Net total assessment for PM_{10}, all routes (II-I)					**-223**
Number of properties with an improvement					**1,830**
Number of properties with no change					**0**
Number of properties with a deterioration					**219**

Table 5:6 Annual average PM_{10} net route assessment (assessment year 2031)

PM_{10} summary of routes	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
Total properties across all routes (min)	514	535	581	416	2,046
Total properties across all routes (some)	517	534	582	416	2,049
Do-minimum PM_{10} assessment across all routes	8,686	7,660	7,794	5,481	Total assessment NO_2 (I): **29,622**
Do-something PM_{10} assessment across all routes	8,477	7,557	7,779	5,473	Total assessment NO_2 (II): **29,285**
Net total assessment for NO_2, all routes (II-I)					**-336**
Number of properties with an improvement					**1,368**
Number of properties with no change					**-**
Number of properties with a deterioration					**681**

5.3.8 Table 5:5 shows the scheme is expected to lead to the deterioration in annual average PM_{10} at 219 receptors in the study area in opening year 2018. However, it is predicted to improve at 1,830 existing receptors.

5.3.9 Table 5:6shows annual average PM_{10} is anticipated to deteriorate at 681 receptors in assessment year 2031. However, it will improve at 1,368 receptors in the study area.

5.3.10 The total assessment values for annual average PM_{10} is lowest in assessment year 2031. This is determined because predicted concentrations are expected to be lower in 2031 as a result of reductions in vehicle emissions. In both 2018 and 2031, the net route assessment, which is the difference between the Do-Something and Do-Minimum route assessments is negative and of a similar magnitude. This means that the scheme will have an overall beneficial impact on annual average NO_2 in the opening and assessment years.

5.3.11 Overall more receptors will experience an improvement in air quality as a result of the widening in 2018 and 2031 which are a result of improvements to traffic flow with the scheme in place. No predicted concentrations are expected to exceed the objective of 40 $\mu g/m^3$ in any of the bands for NO_2 or PM_{10}. This scheme is therefore not considered highly unlikely to be the cause of significant health effects in the general population.

Regional Air Quality

Affected Roads

5.3.12 For permanent effects on regional air quality, the road links in Table 5:5 were determined as being affected by the scheme.

Table 5:7: Affected roads for regional air quality

Link ID	Link Name	AADT change > 10%	HDV change > 10%	Daily average speed change by > 20km/hr
2	Secunda Way A430 - Southbound	2031	2031	-
3	Hempsted Lane (S) - Northbound	2031	2031	2031
6	Hempstead Lane (W) - Eastbound	-	2018	-
8	Hempsted Lane (N) - Southbound	2031	2031	-
13	Hegmminsdale Road – Westbound	-	2018, 2031	-
15	Hempsted Lane (Llanthony Industrial Estate) - Westbound	-	2018	-
18	Castle Meads Way - Southbound	2031	-	2031
19	Severn Road - Northbound	-	2031	-
20	Severn Road - Southbound	-	2031	2031
26	Llanthony Road (N) - Southbound	2031	2031	-
27	St Ann Way (W) - Eastbound	2031	-	-
28	St Ann Way (W) - Westbound	2031	2031	-
29	St Ann Way (E) - Westbound	2031	2031	-
32	Sainsburys entry (N) - Southbound	-	2031	-
34	Sainsburys entry (S) - Eastbound	2031	-	-

- affected road criterion not met n/a data unavailable

Plan Level WebTAG

5.3.13 NO_x emissions for the opening year and assessment year with and without the schemes in place are shown in Table 5:6.

Table 5:8 Regional NO_x Emissions From Air Quality Valuation Spreadsheet (tonnes/year)

Scheme	Links exceeding limit values?	Without Intervention		With Intervention		Change in Emissions	
		Opening Year	Forecast Year	Opening Year	Forecast Year	Opening Year	Forecast Year
Llanthony Road	Yes	n/a	n/a	n/a	n/a	n/a	n/a
	No	3.59	4.97	3.30	4.72	-0.28	-0.25

n/a limit values not exceeded

Table 5:6 shows that the scheme will lower NO_x emissions although these emissions are expected to be higher in the assessment year due to traffic growth.

Limitations

5.3.14 Given the traffic data supplied, it was necessary to use DEFRA's 2011-based background mapping. The base year for the supplied traffic data was 2014.

5.3.15 The latest modelling year possible using the DMRB Screening Method V1.03c is 2025 for local and regional assessment. Therefore this year was used to model the results with the traffic data supplied for the assessment year 2031.

5.3.16 The latest year in the NO_X to NO_2 June 2016 calculator is 2030, which was used with the traffic data supplied for the operational year 2031. These years are the same for the Sector Removal Tool and Gap Factor Analysis Tool.

5.3.17 It was not possible to access data from the DEFRA UK Ambient Air Quality Interactive Map which indicates that the scheme and all roads affected may overlay any PCM modelled links for which compliance reporting to the European Union is required. However, the predicted concentrations it eh assessment are such that the damage cost approach to assessing emissions from all links is appropriate and no new exceedances of the annual mean objective at on any compliance links that may in the study area is highly unlikely.

Greenhouse Gas

5.3.18 Estimated greenhouse gas from the scheme in the opening year and assessment year is shown in Table 5:9.

Table 5:9: Greenhouse Gas Emissions (tonnes CO_2e)

Scheme	DM 2018	DS 2018	DM 2031	DS 2031
Llanthony Road	3,128	2,731	3,760	3,061

5.4 Economic Valuation

Air Quality

5.4.1 As no exceedances of the EU NO_2 annual mean limit value have been predicted at any of the sensitive receptors, changes in NO_x emissions have been valued using the damage cost approach in accordance with DfT TAG Unit A3 Environmental Impact Appraisal.

5.4.2 Table 5:10 shows the appraisal score for the scheme in both the short term and the long term. The appraisal rating for scheme is assessed as neutral with the majority of receptor impacts imperceptible.

Table 5:10 Appraisal rating for the Llanthony Road scheme

Scheme	Appraisal Rating		Appraisal Score	
	Short Term	Long Term	Short Term	Long Term
Llanthony Road	Slight beneficial	Slight beneficial	1	1

5.4.3 Table 5:11 below shows the results from the TAG Unit A3 local air quality assessment worksheets.

Table 5:11: Results of TAG Unit A3 Local Air Quality Assessment

Scheme	Net present value of change in air quality (£)
Llanthony Road (NO_x)	13,199
Llanthony Road (PM_{10})	1,017,347
Total value of change in air quality	**1,030,546**

5.4.4 Table 5:11 shows that the scheme is expected to provide an overall improvement in air quality quantified at over a million pounds.

Greenhouse Gas

5.4.5 Table 5:12 shows the net present value of greenhouse gas emissions for the combined scheme.

Table 5:12: Results of TAG Unit A3 Greenhouse Gas Assessment

Scheme	Net present value of change in greenhouse gas (£)
Llanthony Road	1,786,353

5.4.6 Table 5:12 indicates likely savings in greenhouse gas emissions with the schemes in place. This can be explained by improvements in fuel efficiency relating to the increased speeds achievable with the scheme in place in the opening and assessment years.

6 Mitigation Measures

6.1.1 The predicted concentrations and greenhouse gas estimates are such that no specific mitigation measures should be considered for the scheme. The results show that Part 1 claims under the Land Compensation Act are unlikely because they would be unfounded.

7 Summary

7.1.1 An air quality and greenhouse gas assessment was carried out to assess the potential effects during construction and operation in line with DMRB HA207/07 and the NPPF. Potential impacts on local air quality (nitrogen dioxide (NO_2) and particulate matter (PM_{10})) and regional air quality (oxides of nitrogen (NO_x)) were scoped using the DMRB HA207/07 criteria and where impacts were identified as likely, quantitative assessment completed. Greenhouse gas emissions (CO_2) were scoped using the same criteria.

7.1.2 An assessment of projected traffic data with the scheme in place against the scoping criteria indicated the potential for impacts on local air quality. A quantitative assessment of permanent operational effects and qualitative assessment of temporary construction phase effects on local air quality has therefore been completed.

7.1.3 There are sensitive receptors in the study area and in proximity to affected road links of which the majority are residential. There are no designated ecological sites that require assessment. The scheme does not lie in one of Gloucester's Air Quality Management Areas. An assessment against Compliance Risk Road Network (CRRN) links in accordance with the EU Directive on ambient air quality (2008/50/EC) has been completed qualitatively in the absence of the required datasets.

7.1.4 The 2008 ambient air quality directive sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as NO_2 and PM_{10}. Following the 'Simple' assessment level described in DMRB HA207/07, predicted traffic flows have been combined with estimates of background and vehicle emissions to predict NO_2 and PM_{10} concentrations at key sensitive receptors. Predictions have been made using the HA207/07 Air quality Screening Method Spreadsheet and verified using monitoring data. These predictions have been compared with the statutory objectives for acute (short term) and chronic (long term) effects. The significance or measure of uncertainty (MoU) of these local effects has been assessed in accordance with Highways England's interim advice on the desirability of achieving 10% verifications between modelled and monitored concentrations. Temporary, construction phase effects have not been assessed in the absence of detailed information about the construction programme and methods

7.1.5 The scheme met the criteria for 'Simple' assessment of local air quality because of changes to the road alignment, AADT and average speed. It met the criteria for regional assessment because of changes to the criteria for AADT, average speed and changes to the proportion of HGVs.

7.1.6 In the scheme opening year 2018, concentrations are predicted to fall marginally with the scheme in place as a result of improvements to traffic flow resulting from the widening and signalisation works. The largest change in annual average NO_2 and PM_{10} concentrations resulting from the scheme were predicted to be 'small' and in most cases 'imperceptible' within 200m of the affected roads. For annual average NO_2 and PM_{10}, all predictions were under the annual average objective and there is no risk of any exceedance of the objective on the compliance road links.

7.1.7 Overall predicted concentrations of NO_2 and PM_{10} were lower in assessment year 2031 than opening year 2018 as a result of lower anticipated vehicle emissions and background concentrations. . This is because there is more time for improvements in vehicle emissions technology to be realised in the fleet.

7.1.8 The magnitude of change as a result of the scheme is assessed as 'small' at the receptors close to affected roads. However, no new exceedances of the objective or worsening of air quality at receptors already exceeding is predicted to occur. For annual average PM_{10}, all predictions were under the objective and impacts imperceptible.

7.1.9 Several links in the study may be CRRN links in accordance with the EU Directive on ambient air quality. However, at this time it was not possible to obtain the required data to undertake the comparison between the local modelling assessment and the PCM data for future year scenarios. However, the results have shown that a new exceedance of the annual average NO_2 objective on a compliance link is highly unlikely and roadside concentrations at these links will in fact improve as a result of the scheme.

7.1.10 The Simple level assessment has determined that no new exceedances of the objective or worsening of local air quality at sensitive receptors already exceeding is predicted to occur. Furthermore, it is considered unlikely that new exceedances will occur at the CRRN links. As a result, it is judged that impacts on local air quality from the scheme will not be significant and can be considered as slight beneficial. For regional air quality and greenhouse gas emissions, impacts in the opening and assessment years are also anticipated to be slight beneficial.

8 References

Ref. 1 United Kingdom Government. Land Compensation Act 1973 (as amended).

Ref. 2 DfT. Transport Analysis Guidance (TAG) Unit A3 – Environmental Impact Appraisal, November 2014.

Ref. 3 European Union, 'Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.'

Ref. 4 United Kingdom Government. Air Quality Standards Regulations, 2010.

Ref. 5 United Kingdom Government. Environment Act, 1995.

Ref. 6 United Kingdom Government. 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007.'

Ref. 7 United Kingdom Government. Climate Change Act, 2008

Ref. 8 United Kingdom Government. UK Low Carbon Transition Plan, 2009

Ref. 9 Department for Communities and Local Government, National Planning Policy Framework, March 2012

Ref. 10 Department for Communities and Local Government. Planning Practice Guidance Notes, https://www.gov.uk/guidance/air-quality--3.

Ref. 11 Highways Agency. Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 1 HA 207/07 Air Quality, 2007.

Ref. 12 DEFRA. Local Air Quality Management Technical Guidance LAQM.TG (16), 2016.

Ref. 13 DEFRA. Background maps to assist local authorities in support of review and assessment of local air quality, http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Ref. 14 Highways Agency. IAN 170/12 Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

Ref. 15 Highways Agency. IAN 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3, Part 7 'Noise'.

Ref. 16 Highways Agency. IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)

Ref. 17 Highways Agency. IAN 175/13 Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans fir user of DMRB Volume 11, Section 3, Part 1 'Air Quality'

Ref. 18 UK GOVERNMENT. TAG data book, July 2017.

Ref. 19 DEFRA. UK Ambient Air Quality Interactive Map. https://uk-air.defra.gov.uk/data/gis-mapping.

Ref. 20 Gloucester City Council. Updated Screening and Assessment Report 2015.

Ref. 21 Gloucester City Council. Air Quality Status Report 2017.

Appendix A Affected Road Links

Appendix B TAG Local Air Quality Worksheet Results (2018)

PM_{10} 1	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 18.80	At 70m: 15.15	At 115m: 14.15	At 175m: 13.84	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.91	At 70m: 14.90	At 115m: 14.07	At 175m: 13.81	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	2368.50	2849.04	2207.65	636.73	Total route assess PM_{10} (I): 8061.92
Do-something PM_{10} assessment (c = asome*bsome)	2256.97	2800.53	2194.33	635.25	Total route assess PM_{10} (II): 7887.08
Net total route assessment for PM_{10} (II-I)					-174.84

NO_2 1	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 29.76	At 70m: 16.48	At 115m: 12.40	At 175m: 11.12	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 27.88	At 70m: 15.84	At 115m: 12.18	At 175m: 11.04	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	3749.78	3098.74	1935.02	511.73	Total route assess NO_2 (I): 9295.27
Do-something NO_2 assessment (c = asome*bsome)	3512.32	2977.61	1900.08	507.68	Total route assess NO_2 (II): 8897.68
Net total route assessment for NO_2 (II-I)					-397.58

PM_{10} 2	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 16.85	At 70m: 14.59	At 115m: 13.96	At 175m: 13.77	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 16.85	At 70m: 14.59	At 115m: 13.96	At 175m: 13.77	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	2123.53	2742.49	2178.38	633.48	Total route assess PM_{10} (I): 7677.88
Do-something PM_{10} assessment (c = asome*bsome)	2123.32	2742.40	2178.36	633.48	Total route assess PM_{10} (II): 7677.55
Net total route assessment for PM_{10} (II-I)					-0.32

NO_2 2	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 23.79	At 70m: 14.48	At 115m: 11.72	At 175m: 10.85	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 23.67	At 70m: 14.44	At 115m: 11.71	At 175m: 10.84	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	2997.13	2722.72	1827.97	499.22	Total route assess NO_2 (I): 8047.05
Do-something NO_2 assessment (c = asome*bsome)	2982.89	2715.47	1826.45	498.77	Total route assess NO_2 (II): 8023.57
Net total route assessment for NO_2 (II-I)					-23.47

PM_{10} 3	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	48	36	18	13	115
Properties (asome)	48	36	18	13	115
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 13.90	At 70m: 13.73	At 115m: 13.68	At 175m: 13.66	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 13.89	At 70m: 13.72	At 115m: 13.68	At 175m: 13.66	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	667.28	494.18	246.23	177.64	Total route assess PM_{10} (I): 1585.32
Do-something PM_{10} assessment (c = asome*bsome)	666.60	494.03	246.20	177.63	Total route assess PM_{10} (II): 1584.46
Net total route assessment for PM_{10} (II-I)					-0.86

NO_2 3	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	48	36	18	13	115
Properties (asome)	48	36	18	13	115
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 11.11	At 70m: 10.56	At 115m: 10.39	At 175m: 10.35	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 11.10	At 70m: 10.55	At 115m: 10.39	At 175m: 10.35	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	533.51	379.99	187.08	134.56	Total route assess NO_2 (I): 1235.14
Do-something NO_2 assessment (c = asome*bsome)	532.57	379.64	187.08	134.56	Total route assess NO_2 (II): 1233.85
Net total route assessment for NO_2 (II-I)					-1.29

PM_{10} 7	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 18.75	At 70m: 15.14	At 115m: 14.15	At 175m: 13.84	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 18.08	At 70m: 14.94	At 115m: 14.08	At 175m: 13.82	N/A
Do-minimum PM_{10} assessment (*c = amin*bmin*)	337.56	121.13	0.00	55.36	Total route assess PM_{10} (I): 514.06
Do-something PM_{10} assessment (*c = asome*bsome*)	325.35	119.55	0.00	41.45	Total route assess PM_{10} (II): 486.35
Net total route assessment for PM_{10} (II-I)					-27.71

NO_2 7	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 28.21	At 70m: 15.96	At 115m: 12.23	At 175m: 11.04	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 26.61	At 70m: 15.42	At 115m: 12.04	At 175m: 10.97	N/A
Do-minimum NO_2 assessment (*c = amin*bmin*)	507.82	127.66	0.00	44.15	Total route assess NO_2 (I): 679.64
Do-something NO_2 assessment (*c = asome*bsome*)	478.90	123.33	0.00	32.91	Total route assess NO_2 (II): 635.14
Net total route assessment for NO_2 (II-I)					-44.50

PM_{10} 8	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 16.09	At 70m: 14.36	At 115m: 13.89	At 175m: 13.74	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 16.11	At 70m: 14.37	At 115m: 13.89	At 175m: 13.74	N/A
Do-minimum PM_{10} assessment (*c = amin*bmin*)	289.57	114.91	0.00	54.97	Total route assess PM_{10} (I): 459.46
Do-something PM_{10} assessment (*c = asome*bsome*)	290.05	114.98	0.00	41.23	Total route assess PM_{10} (II): 446.26
Net total route assessment for PM_{10} (II-I)					-13.20

NO_2 8	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 21.25	At 70m: 13.66	At 115m: 11.44	At 175m: 10.74	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 21.30	At 70m: 13.68	At 115m: 11.45	At 175m: 10.74	N/A
Do-minimum NO_2 assessment (*c = amin*bmin*)	382.42	109.28	0.00	42.97	Total route assess NO_2 (I): 534.67
Do-something NO_2 assessment (*c = asome*bsome*)	383.45	109.44	0.00	32.22	Total route assess NO_2 (II): 525.11
Net total route assessment for NO_2 (II-I)					-9.56

PM_{10} 14	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	32	15	12	10	69
Properties (asome)	31	14	12	10	67
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 13.74	At 70m: 13.68	At 115m: 13.66	At 175m: 13.66	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 13.72	At 70m: 13.67	At 115m: 13.66	At 175m: 13.66	N/A
Do-minimum PM_{10} assessment (*c = amin*bmin*)	439.59	205.19	163.96	136.58	Total route assess PM_{10} (I): 945.32
Do-something PM_{10} assessment (*c = asome*bsome*)	425.31	191.44	163.94	136.58	Total route assess PM_{10} (II): 917.26
Net total route assessment for PM_{10} (II-I)					-28.06

NO_2 14	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	32	15	12	10	69
Properties (asome)	31	14	12	10	67
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 10.64	At 70m: 10.41	At 115m: 10.35	At 175m: 10.33	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 10.59	At 70m: 10.39	At 115m: 10.35	At 175m: 10.33	N/A
Do-minimum NO_2 assessment (*c = amin*bmin*)	340.43	156.15	124.21	103.34	Total route assess NO_2 (I): 724.14
Do-something NO_2 assessment (*c = asome*bsome*)	328.27	145.47	124.21	103.34	Total route assess NO_2 (II): 701.30
Net total route assessment for NO_2 (II-I)					-22.84

PM_{10} 18	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	1	13	42	71	127
Properties (asome)	1	13	42	71	127
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 17.98	At 70m: 14.92	At 115m: 14.07	At 175m: 13.81	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.56	At 70m: 14.79	At 115m: 14.03	At 175m: 13.80	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	17.98	193.92	591.06	980.67	Total route assess PM_{10} (I): 1783.63
Do-something PM_{10} assessment *(c = asome*bsome)*	17.56	192.33	589.37	979.60	Total route assess PM_{10} (II): 1778.86
Net total route assessment for PM_{10} (II-I)					-4.77

NO_2 18	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	1	13	42	71	127
Properties (asome)	1	13	42	71	127
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 26.80	At 70m: 15.47	At 115m: 12.06	At 175m: 10.98	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 25.48	At 70m: 15.03	At 115m: 11.91	At 175m: 10.92	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	26.80	201.17	506.35	779.55	Total route assess NO_2 (I): 1513.87
Do-something NO_2 assessment *(c = asome*bsome)*	25.48	195.39	500.20	775.37	Total route assess NO_2 (II): 1496.45
Net total route assessment for NO_2 (II-I)					-17.42

PM_{10} 20	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	60	35	169	110	374
Properties (asome)	60	35	169	110	374
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 14.74	At 70m: 13.97	At 115m: 13.76	At 175m: 13.69	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 14.54	At 70m: 13.91	At 115m: 13.74	At 175m: 13.69	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	884.42	489.01	2325.45	1506.42	Total route assess PM_{10} (I): 5205.30
Do-something PM_{10} assessment *(c = asome*bsome)*	872.44	486.97	2322.20	1505.63	Total route assess PM_{10} (II): 5187.24
Net total route assessment for PM_{10} (II-I)					-18.06

NO_2 20	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	60	35	169	110	374
Properties (asome)	60	35	169	110	374
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 13.57	At 70m: 11.29	At 115m: 10.64	At 175m: 10.44	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 13.32	At 70m: 11.21	At 115m: 10.61	At 175m: 10.43	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	814.00	394.98	1798.14	1147.92	Total route assess NO_2 (I): 4155.04
Do-something NO_2 assessment *(c = asome*bsome)*	798.99	392.25	1793.17	1146.84	Total route assess NO_2 (II): 4131.24
Net total route assessment for NO_2 (II-I)					-23.80

PM_{10} 23	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	7	0	0	0	7
Properties (asome)	7	0	0	0	7
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 15.06	At 70m: 14.06	At 115m: 13.79	At 175m: 13.71	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 14.84	At 70m: 14.00	At 115m: 13.77	At 175m: 13.70	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	105.39	0.00	0.00	0.00	Total route assess PM_{10} (I): 105.39
Do-something PM_{10} assessment *(c = asome*bsome)*	103.91	0.00	0.00	0.00	Total route assess PM_{10} (II): 103.91
Net total route assessment for PM_{10} (II-I)					-1.48

NO_2 23	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	7	0	0	0	7
Properties (asome)	7	0	0	0	7
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 14.47	At 70m: 11.56	At 115m: 10.73	At 175m: 10.48	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 14.03	At 70m: 11.42	At 115m: 10.68	At 175m: 10.46	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	101.31	0.00	0.00	0.00	Total route assess NO_2 (I): 101.31
Do-something NO_2 assessment *(c = asome*bsome)*	98.23	0.00	0.00	0.00	Total route assess NO_2 (II): 98.23
Net total route assessment for NO_2 (II-I)					-3.09

PM_{10} 25	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 17.68	At 70m: 14.83	At 115m: 14.04	At 175m: 13.80	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.59	At 70m: 14.80	At 115m: 14.03	At 175m: 13.80	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	636.38	118.62	42.13	0.00	Total route assess PM_{10} **(I)**: 797.13
Do-something PM_{10} assessment *(c = asome*bsome)*	668.31	118.41	42.10	13.80	Total route assess PM_{10} **(II)**: 842.62
Net total route assessment for PM_{10} (II-I)					45.49

NO_2 25	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 27.86	At 70m: 15.84	At 115m: 12.18	At 175m: 11.03	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 27.97	At 70m: 15.88	At 115m: 12.19	At 175m: 11.04	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	1002.98	126.71	36.55	0.00	Total route assess NO_2 **(I)**: 1166.24
Do-something NO_2 assessment *(c = asome*bsome)*	1062.96	127.02	36.58	11.04	Total route assess NO_2 **(II)**: 1237.60
Net total route assessment for NO_2 (II-I)					71.36

PM_{10} 26	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 18.50	At 70m: 15.07	At 115m: 14.12	At 175m: 13.83	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.21	At 70m: 14.69	At 115m: 14.00	At 175m: 13.78	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	665.87	120.53	42.37	0.00	Total route assess PM_{10} **(I)**: 828.77
Do-something PM_{10} assessment *(c = asome*bsome)*	653.83	117.52	41.99	13.78	Total route assess PM_{10} **(II)**: 827.13
Net total route assessment for PM_{10} (II-I)					-1.64

NO_2 26	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 27.68	At 70m: 15.78	At 115m: 12.17	At 175m: 11.02	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 24.82	At 70m: 14.82	At 115m: 11.84	At 175m: 10.89	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	996.63	126.24	36.50	0.00	Total route assess NO_2 **(I)**: 1159.37
Do-something NO_2 assessment *(c = asome*bsome)*	943.16	118.54	35.51	10.89	Total route assess NO_2 **(II)**: 1108.10
Net total route assessment for NO_2 (II-I)					-51.27

PM_{10} 29	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	6	28	22	112	168
Properties (asome)	6	28	23	112	169
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 16.22	At 70m: 14.40	At 115m: 13.90	At 175m: 13.75	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 15.65	At 70m: 14.24	At 115m: 13.85	At 175m: 13.73	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	97.30	403.26	305.86	1539.81	Total route assess PM_{10} **(I)**: 2346.22
Do-something PM_{10} assessment *(c = asome*bsome)*	93.91	398.64	318.50	1537.51	Total route assess PM_{10} **(II)**: 2348.57
Net total route assessment for PM_{10} (II-I)					2.35

NO_2 29	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	6	28	22	112	168
Properties (asome)	6	28	23	112	169
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 19.68	At 70m: 13.16	At 115m: 11.28	At 175m: 10.68	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 18.13	At 70m: 12.67	At 115m: 11.11	At 175m: 10.62	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	118.08	368.49	248.09	1196.41	Total route assess NO_2 **(I)**: 1931.06
Do-something NO_2 assessment *(c = asome*bsome)*	108.80	354.89	255.54	1189.81	Total route assess NO_2 **(II)**: 1909.04
Net total route assessment for NO_2 (II-I)					-22.02

Appendix C TAG Local Air Quality Worksheet Results (2031)

PM_{10} 1	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 20.03	At 70m: 15.09	At 115m: 13.73	At 175m: 13.31	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 18.34	At 70m: 14.60	At 115m: 13.56	At 175m: 13.25	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	2524.41	2836.76	2141.52	612.13	Total route assess PM_{10} (I): 8114.81
Do-something PM_{10} assessment (c = asome*bsome)	2311.23	2744.04	2116.05	609.31	Total route assess PM_{10} (II): 7780.62
Net total route assessment for PM_{10} (II-I)					-334.19

NO_2 1	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 27.83	At 70m: 14.67	At 115m: 10.41	At 175m: 9.02	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 24.37	At 70m: 13.35	At 115m: 9.92	At 175m: 8.82	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	3507.10	2758.65	1624.12	415.04	Total route assess NO_2 (I): 8304.92
Do-something NO_2 assessment (c = asome*bsome)	3071.05	2510.17	1547.92	405.95	Total route assess NO_2 (II): 7535.09
Net total route assessment for NO_2 (II-I)					-769.83

PM_{10} 2	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 16.44	At 70m: 14.04	At 115m: 13.38	At 175m: 13.18	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 16.80	At 70m: 14.15	At 115m: 13.42	At 175m: 13.19	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	2071.49	2639.76	2087.41	606.13	Total route assess PM_{10} (I): 7404.79
Do-something PM_{10} assessment (c = asome*bsome)	2117.14	2659.61	2092.86	606.74	Total route assess PM_{10} (II): 7476.35
Net total route assessment for PM_{10} (II-I)					71.57

NO_2 2	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	126	188	156	46	516
Properties (asome)	126	188	156	46	516
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 19.20	At 70m: 11.58	At 115m: 9.29	At 175m: 8.59	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 20.43	At 70m: 12.02	At 115m: 9.46	At 175m: 8.65	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	2419.12	2177.86	1449.84	395.08	Total route assess NO_2 (I): 6441.90
Do-something NO_2 assessment (c = asome*bsome)	2573.96	2259.17	1475.57	397.82	Total route assess NO_2 (II): 6706.52
Net total route assessment for NO_2 (II-I)					264.61

PM_{10} 3	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	48	36	18	13	115
Properties (asome)	48	36	18	13	115
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 13.32	At 70m: 13.13	At 115m: 13.08	At 175m: 13.06	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 13.33	At 70m: 13.13	At 115m: 13.08	At 175m: 13.06	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	639.47	472.76	235.44	169.83	Total route assess PM_{10} (I): 1517.50
Do-something PM_{10} assessment (c = asome*bsome)	639.86	472.85	235.45	169.83	Total route assess PM_{10} (II): 1517.99
Net total route assessment for PM_{10} (II-I)					0.49

NO_2 3	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	48	36	18	13	115
Properties (asome)	48	36	18	13	115
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 8.77	At 70m: 8.33	At 115m: 8.20	At 175m: 8.17	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 8.88	At 70m: 8.36	At 115m: 8.21	At 175m: 8.17	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	420.75	299.95	147.63	106.19	Total route assess NO_2 (I): 974.53
Do-something NO_2 assessment (c = asome*bsome)	426.40	301.03	147.81	106.19	Total route assess NO_2 (II): 981.44
Net total route assessment for NO_2 (II-I)					6.92

PM_{10} 7	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 19.19	At 70m: 14.84	At 115m: 13.65	At 175m: 13.28	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 18.11	At 70m: 14.53	At 115m: 13.54	At 175m: 13.24	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	345.48	118.75	0.00	53.11	Total route assess PM_{10} (I): 517.34
Do-something PM_{10} assessment (c = asome*bsome)	326.02	116.23	0.00	39.71	Total route assess PM_{10} (II): 481.96
Net total route assessment for PM_{10} (II-I)					-35.37

NO_2 7	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 25.07	At 70m: 13.63	At 115m: 10.03	At 175m: 8.85	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 22.72	At 70m: 12.77	At 115m: 9.71	At 175m: 8.74	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	451.31	109.08	0.00	35.42	Total route assess NO_2 (I): 595.80
Do-something NO_2 assessment (c = asome*bsome)	409.02	102.17	0.00	26.21	Total route assess NO_2 (II): 537.39
Net total route assessment for NO_2 (II-I)					-58.41

PM_{10} 8	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 15.54	At 70m: 13.78	At 115m: 13.29	At 175m: 13.14	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 15.92	At 70m: 13.89	At 115m: 13.33	At 175m: 13.16	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	279.64	110.22	0.00	52.58	Total route assess PM_{10} (I): 442.43
Do-something PM_{10} assessment (c = asome*bsome)	286.51	111.11	0.00	39.47	Total route assess PM_{10} (II): 437.09
Net total route assessment for PM_{10} (II-I)					-5.34

NO_2 8	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	18	8	0	4	30
Properties (asome)	18	8	0	3	29
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 17.01	At 70m: 10.87	At 115m: 9.06	At 175m: 8.50	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 18.32	At 70m: 11.32	At 115m: 9.22	At 175m: 8.56	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	306.27	86.97	0.00	34.00	Total route assess NO_2 (I): 427.23
Do-something NO_2 assessment (c = asome*bsome)	329.68	90.58	0.00	25.68	Total route assess NO_2 (II): 445.93
Net total route assessment for NO_2 (II-I)					18.70

PM_{10} 14	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	32	15	12	10	69
Properties (asome)	31	14	12	10	67
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 13.15	At 70m: 13.08	At 115m: 13.06	At 175m: 13.06	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 13.13	At 70m: 13.07	At 115m: 13.06	At 175m: 13.06	N/A
Do-minimum PM_{10} assessment (c = amin*bmin)	420.69	196.21	156.76	130.57	Total route assess PM_{10} (I): 904.23
Do-something PM_{10} assessment (c = asome*bsome)	406.89	183.05	156.73	130.57	Total route assess PM_{10} (II): 877.24
Net total route assessment for PM_{10} (II-I)					-26.99

NO_2 14	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	32	15	12	10	69
Properties (asome)	31	14	12	10	67
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 8.44	At 70m: 8.23	At 115m: 8.18	At 175m: 8.16	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 8.38	At 70m: 8.21	At 115m: 8.17	At 175m: 8.15	N/A
Do-minimum NO_2 assessment (c = amin*bmin)	269.94	123.38	98.14	81.55	Total route assess NO_2 (I): 573.01
Do-something NO_2 assessment (c = asome*bsome)	259.64	114.87	98.02	81.45	Total route assess NO_2 (II): 553.98
Net total route assessment for NO_2 (II-I)					-19.03

PM_{10} 18	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	1	13	42	71	127
Properties (asome)	1	13	42	71	127
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 18.22	At 70m: 14.56	At 115m: 13.55	At 175m: 13.24	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.89	At 70m: 14.46	At 115m: 13.52	At 175m: 13.23	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	18.22	189.30	569.23	940.15	Total route assess PM_{10} (I): 1716.90
Do-something PM_{10} assessment *(c = asome*bsome)*	17.89	188.01	567.85	939.27	Total route assess PM_{10} (II): 1713.02
Net total route assessment for PM_{10} (II-I)					-3.88

NO_2 18	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	1	13	42	71	127
Properties (asome)	1	13	42	71	127
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 23.54	At 70m: 13.09	At 115m: 9.84	At 175m: 8.79	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 22.57	At 70m: 12.73	At 115m: 9.71	At 175m: 8.74	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	23.54	170.17	413.32	623.94	Total route assess NO_2 (I): 1230.97
Do-something NO_2 assessment *(c = asome*bsome)*	22.57	165.54	407.63	620.42	Total route assess NO_2 (II): 1216.16
Net total route assessment for NO_2 (II-I)					-14.81

PM_{10} 20	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	60	35	169	110	374
Properties (asome)	60	35	169	110	374
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 14.43	At 70m: 13.45	At 115m: 13.19	At 175m: 13.10	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 14.14	At 70m: 13.37	At 115m: 13.16	At 175m: 13.10	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	865.66	470.91	2228.54	1441.43	Total route assess PM_{10} (I): 5006.53
Do-something PM_{10} assessment *(c = asome*bsome)*	848.45	467.98	2223.86	1440.66	Total route assess PM_{10} (II): 4980.96
Net total route assessment for PM_{10} (II-I)					-25.58

NO_2 20	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	60	35	169	110	374
Properties (asome)	60	35	169	110	374
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 11.32	At 70m: 9.09	At 115m: 8.46	At 175m: 8.27	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 10.98	At 70m: 8.98	At 115m: 8.42	At 175m: 8.26	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	678.92	318.09	1429.51	909.20	Total route assess NO_2 (I): 3335.72
Do-something NO_2 assessment *(c = asome*bsome)*	658.87	314.32	1422.76	908.09	Total route assess NO_2 (II): 3304.04
Net total route assessment for NO_2 (II-I)					-31.68

PM_{10} 23	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	7	0	0	0	7
Properties (asome)	7	0	0	0	7
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 14.99	At 70m: 13.62	At 115m: 13.24	At 175m: 13.12	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 14.54	At 70m: 13.49	At 115m: 13.20	At 175m: 13.11	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	104.91	0.00	0.00	0.00	Total route assess PM_{10} (I): 104.91
Do-something PM_{10} assessment *(c = asome*bsome)*	101.77	0.00	0.00	0.00	Total route assess PM_{10} (II): 101.77
Net total route assessment for PM_{10} (II-I)					-3.13

NO_2 23	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	7	0	0	0	7
Properties (asome)	7	0	0	0	7
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 12.60	At 70m: 9.50	At 115m: 8.61	At 175m: 8.31	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 11.70	At 70m: 9.21	At 115m: 8.51	At 175m: 8.27	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	88.23	0.00	0.00	0.00	Total route assess NO_2 (I): 88.23
Do-something NO_2 assessment *(c = asome*bsome)*	81.92	0.00	0.00	0.00	Total route assess NO_2 (II): 81.92
Net total route assessment for NO_2 (II-I)					-6.31

PM_{10} 25	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 17.41	At 70m: 14.32	At 115m: 13.47	At 175m: 13.21	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.31	At 70m: 14.29	At 115m: 13.46	At 175m: 13.21	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	626.62	114.58	40.42	0.00	Total route assess PM_{10} (I): 781.63
Do-something PM_{10} assessment *(c = asome*bsome)*	657.63	114.35	40.39	13.21	Total route assess PM_{10} (II): 825.58
Net total route assessment for PM_{10} (II-I)					43.95

NO_2 25	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 22.72	At 70m: 12.78	At 115m: 9.72	At 175m: 8.74	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 22.85	At 70m: 12.83	At 115m: 9.73	At 175m: 8.75	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	818.02	102.24	29.16	0.00	Total route assess NO_2 (I): 949.42
Do-something NO_2 assessment *(c = asome*bsome)*	868.15	102.60	29.19	8.75	Total route assess NO_2 (II): 1008.70
Net total route assessment for NO_2 (II-I)					59.27

PM_{10} 26	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 19.21	At 70m: 14.85	At 115m: 13.65	At 175m: 13.28	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 17.66	At 70m: 14.40	At 115m: 13.50	At 175m: 13.22	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	691.63	118.79	40.94	0.00	Total route assess PM_{10} (I): 851.37
Do-something PM_{10} assessment *(c = asome*bsome)*	671.25	115.19	40.50	13.22	Total route assess PM_{10} (II): 840.16
Net total route assessment for PM_{10} (II-I)					-11.21

NO_2 26	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	36	8	3	0	47
Properties (asome)	38	8	3	1	50
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 25.10	At 70m: 13.67	At 115m: 10.04	At 175m: 8.87	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 21.87	At 70m: 12.47	At 115m: 9.60	At 175m: 8.70	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	903.61	109.35	30.13	0.00	Total route assess NO_2 (I): 1043.09
Do-something NO_2 assessment *(c = asome*bsome)*	830.96	99.78	28.81	8.70	Total route assess NO_2 (II): 968.25
Net total route assessment for NO_2 (II-I)					-74.84

PM_{10} 29	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	6	28	22	112	168
Properties (asome)	6	28	23	112	169
PM_{10} concentration at average point within band for *do-minimum* (bmin)	At 20m: 16.32	At 70m: 14.01	At 115m: 13.37	At 175m: 13.17	N/A
PM_{10} concentration at average point within band for *do-something* (bsome)	At 20m: 15.33	At 70m: 13.72	At 115m: 13.27	At 175m: 13.14	N/A
Do-minimum PM_{10} assessment *(c = amin*bmin)*	97.91	392.15	294.12	1475.31	Total route assess PM_{10} (I): 2259.49
Do-something PM_{10} assessment *(c = asome*bsome)*	92.00	384.12	305.30	1471.31	Total route assess PM_{10} (II): 2252.73
Net total route assessment for PM_{10} (II-I)					-6.76

NO_2 29	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Properties (amin)	6	28	22	112	168
Properties (asome)	6	28	23	112	169
NO_2 concentration at average point within band for *do-minimum* (bmin)	At 20m: 17.53	At 70m: 11.07	At 115m: 9.13	At 175m: 8.52	N/A
NO_2 concentration at average point within band for *do-something* (bsome)	At 20m: 15.02	At 70m: 10.21	At 115m: 8.84	At 175m: 8.40	N/A
Do-minimum NO_2 assessment *(c = amin*bmin)*	105.16	309.95	200.89	954.47	Total route assess NO_2 (I): 1570.46
Do-something NO_2 assessment *(c = asome*bsome)*	90.11	285.90	203.24	941.04	Total route assess NO_2 (II): 1520.29
Net total route assessment for NO_2 (II-I)					-50.17